

RNI REGN No. UPENG/2006/22508

PRINT ISSN: 0973-7251

ONLINE ISSN: 2230-729X

MANGALMAY JOURNAL OF MANAGEMENT & TECHNOLOGY

Volume 7, Number 2, July - December, 2017



Mangalmay Institute of Management & Technology
8 & 9, Knowledge Park – II, Greater Noida

AUM

In Collaboration with:
Auburn University Montgomery, USA

**MANGALMAY JOURNAL
OF MANAGEMENT & TECHNOLOGY**

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With technology advancing leaps and bounds, modern management mantras and techniques abounding, social and environmental issues gaining widespread attention and the globe becoming one small village, the day of reckoning for the stakeholders has come. The time to understand, that the past is history, the present is also going to be history and what now counts is the future. And the future is now!

It is the next generation and its needs and drives that will make or break the aspirations of business organizations ranging from conglomerates to start-ups. Therefore it is time to start investing in Next Generation Transformation.

The Nexters (also called Generation Y) have lived much of their lives with ATMs, DVDs, smart phones, laptops and the Internet along with the onset of the robotics phenomenon. More than any other generation they tend to be questioning, socially conscious and entrepreneurial.

Such a scenario, where there is a paradigm shift in the composition, perception and wants of the customers, underscores the fact that there are, and going to be, multi-faceted challenges for industry and the State.

With a view to challenge rather than succumb, create rather than surrogate and lead rather than follow – organizations and other stakeholders will have to plan and execute options through global, innovative and inclusive technological and managerial strategies, keeping in mind the bottom-line and other socio-economic factors.

This is an effort to collect, assimilate, synthesize and disseminate the thoughts, views, opinions and knowledge of the contributors with a view to provide a comprehensive and integrated action framework within which strategies for the future may be evolved.

The present volume includes selected research articles/papers/case studies as received from the contributors. The research papers have been compiled and presented in a logical and sequential manner keeping in mind the diverse and multifarious needs of academicians, research scholars, students and practitioners.

We expect this volume to be beneficial and provide insights into the finer points of the theme.

Editor-in-Chief

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DEMONETIZATION IN INDIA: GOVERNANCE FOR A CASHLESS ECONOMY WITH ROBUST ECONOMIC GROWTH

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ABSTRACT

The demonetization drive announced by the Government of India may be examined against stated objectives of reduction of black money, corruption, terror finance, counterfeit currency and above all against the strategy of making the Indian economy cashless. The analysis of demonetization may proceed along the lines of its impact in the short run and in the long run. Exploratory research has been used to examine technological, cultural and economic aspects of cashless economy and to suggest a roadmap for digitization of the Indian economy based on the share, trajectory and velocity of the shift towards the same. The making of a cashless economy requires a big push of policy initiative from the government and thereafter needs to proceed in stages post demonetization. The transition from being a paper currency based economy towards being a cashless economy is expected to aid GDP growth rate, investment and employment generation in the long run. Fundamentally it can alter the basis of taxation way from income and towards consumption.

Keywords: demonetization, cashless economy, digital transactions, consumption tax, GDP, growth rate, black money, black wealth, Reserve Bank of India, Government of India

Objectives of Demonetization

“There comes a time in the history of a country's development when a need is felt for a strong and decisive step.” These were the words of the Indian Prime Minister Shri Narendra Modi on November 8, 2016 as he went on to announce the demonetization of the notes of the denominations of Rs 500 and Rs 1000. Since then various press briefings chaired by the Indian Prime Minister Shri Narendra Modi, Finance Minister Shri Arun Jaitley, Chief Economic Secretary Shri Shaktikanta Das and the Chief Economic Advisor Shri Arvind Subramanian have stated the objectives of the demonetization exercise to be as follows:

- Reduction of black money

The Prime Minister has on various occasions since his election in 2014 pursued the objective of reduction of black money in the economy and integration of the parallel economy with the mainstream economy. This pursuit has led to various structural initiatives in the past that have been engineered and implemented as a strategy to reduce black money.

- Reduction of black wealth



The Prime Minister has on various occasions since his election in 2014 pursued the objective of reduction of black wealth in the economy and integration of the parallel economy generated by black wealth in the economy in the forms of illicit transactions in real estate, bullion and other fixed assets with the mainstream economy. This pursuit has led to investigations and raids by the Income Tax Department and close coordination with other apex and allied intelligence and investigative agencies in India like the National Intelligence Agency (NIA), the Central Bureau of Investigation (CBI), the Central Vigilance Commission (CVC) and the Crime Investigation Department (CID). The total quantum of black wealth by one estimate assessed by Dr. Bhaskar Chakravorty of Tufts University USA stands at USD 2 trillion.

- Destruction of counterfeit currency

An study “Estimation of the Quantum of FICN in Circulation” published by the Indian Statistical Institute, (ISI) Kolkata and submitted to the National Intelligence Agency (NIA) asserts that the total quantum of counterfeit currency in circulation in India stands at Rs400 crore. The study conducted by ISI, Kolkata recommends the Government of India to take “immediate action” on the same. The move of demonetization was aimed at strangulating the supply side of terror finance and counterfeit currency racket that is allegedly run by cross border terrorist organizations.

- Reduction of income inequality

In the recent past there have been at least two instances when the International Monetary Fund (IMF) has asserted the existence of increasing income inequality in India. First a newspaper report published in the leading Indian business daily Mint quoted and claimed the IMF as reporting to have categorized India in the group of nations with increasing income inequality.

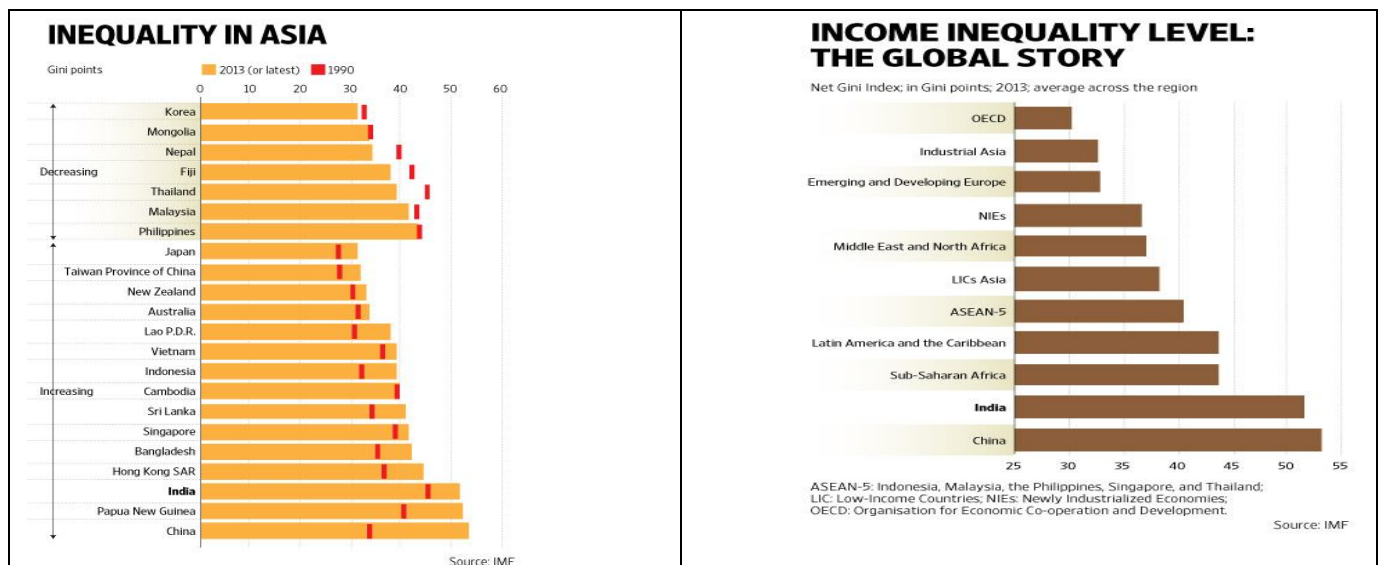


Figure 1 Income Inequality in IMF Member Nations



Second, an International Monetary Fund (IMF) Working Paper titled “Sharing the Growth Dividend: Analysis of Inequality in India” authored by Sonali Jain-Chandra, Tidiane Kinda, Kalpana Kochchar, Shi Piao, and Johanna Schauer published in March 2016 asserts that India is ranked second only behind China in income inequality as measured through the Gini coefficient since the year 2013. Reduction of income inequality has been a big motivation for the Government of India to take the step of demonetization.

- Big push towards a cashless economy

The Prime Minister Shri Narendra Modi, the Finance Minister Shri Arun Jaitley and the former Governor of Reserve Bank of India Shri Raghuram Rajan have all unanimously pursued policy initiatives to give the Indian economy a big push towards digital transactions and becoming a cashless economy. The objective of becoming a cashless economy is inexplicably linked to the former objectives of reduction in black money, reduction in black wealth, reduction in income inequality and reduction in corruption that is largely financed in cash. Policy initiatives to give a big push to the Indian economy towards being cashless include:

- The conferring of the status of a payments bank to a number of financial technology (FINTECH) companies, public sector and corporate sector banks. The complete list of FINTECH companies and licensed banks that have been approved by the Reserve Bank of India to operate as “payment operators” under the Payment and Settlement Systems Act, 2007 has been published in the press release of the Reserve Bank of India dated November 03, 2016. The complete list of such payment operators approved by RBI for due fulfilment of business regulatory framework obligations consists of 77 entities that include 8 new entrants like Vodafone, Airtel Money, Paytm, Reliance Industries Limited, etc.
- The linking of UIDAI authorized Adhar cards to savings bank accounts (both old and new opened under the Pradhan Mantri Jan Dhan Yojna) to enable efficient, seamless and fast tracking of financial transactions of all Adhar card holders.
- The launch of the United Payments Interface that covers 19 banks and works on the principle of a virtual address of the payer and hence is safe, secure, fast and accurate.
- The launch of the Digital India campaign that has seen expressions of interest from Microsoft, Facebook and Google.

Global Scenario of Cash Payments

The global outlook for cash payments and the alternative of cashless economy present a fallacy of composition. It makes enormous good sense to assert that the world over economies of nations may be classified as belonging to different stages of the transition from being completely cash based to being nearly cashless. As such the global outlook of the cash economy is best summarized in terms of the following statements:

- Around 85% of all global retail transactions are done in cash.



- This equates 60% of all retail transaction value.
- Cash costs society as much as 1.5% of the GDP.
- Consumer payments for goods and services account for 11% of the value of payments around the globe amounting to approximately USD 63trillion.
- Consumer payments for goods and services account for 90% of the volume of payments (number of transactions) around the globe.

As per the share of cashless payments in the private final consumption expenditure data developed by World Bank and derived from the central banks of economies of different nations there emerges a stratification of four different economy types in the transition to being cashless.

Nearly Cashless (85% and above share)	Tipping Point (62% -80%share)	Transitioning (41%-57% share)	Inception (7%-32% share)
Belgium France Canada United Kingdom Sweden Australia Netherlands	United States of America Germany South Korea Singapore Japan	Brazil China Spain Mexico Malaysia Italy Greece Taiwan South Africa Poland Thailand	India Russia Indonesia Kenya UAE Colombia Peru Saudi Arabia Nigeria Egypt

Table 1Share of Cashless Payments in Private Final Consumption Expenditure

As per the trajectory that is calculated from the same set of data available from the World Bank to assess the shift in the share of cashless payments as a proportion of private final consumption expenditure in the last five years, economies of nations may be classified into the following categories on a scale from 1-100:

Nearly Cashless	Tipping Point	Transitioning	Inception
Belgium France Canada United Kingdom Sweden Australia Netherlands	United States Germany South Korea Singapore Japan	Brazil China Spain Mexico Italy Greece Taiwan South Africa Poland Thailand	India Russia Indonesia Kenya UAE Colombia Peru Saudi Arabia Egypt Nigeria

**Table 2 Trajectory of Cashless Payments**

The third parameter that is built on the data derived from the same source to objectively assess the readiness of the economy of a nation to move from being a cash based economy to being a cashless economy is based on the following four factors:

- Access to financial services
- Macroeconomic and cultural factors
- Merchant scale and competition
- Technology and infrastructure

Based on these 4 factors the economies of nations may be classified into the following categories:

Nearly Cashless	Tipping Point	Transitioning	Inception
Belgium	United States	Brazil	India
France	Germany	China	Russia
Canada	South Korea	Spain	Indonesia
United Kingdom	Singapore	Mexico	Kenya
Sweden	Japan	Italy	UAE
Australia		Greece	Colombia
Netherlands		Taiwan	Peru
		South Africa	Saudi Arabia
		Poland	Egypt
		Thailand	

Table 3 Transition Phases in Cashless Journey**Cash Outlook in India**

The cash outlook for India is best captured in the profiling of cash and non-cash transactions that have taken place in India. Data available from the Euromonitor 201 for the years 2007-2012 presents the following insights on the cash outlook in India.

Payment Type	2007	2008	2009	2010	2011	2012
Card Payment Transactions (excluding commercial)	2.8%	3.1%	2.9%	2.8%	3.5%	4.1%
Electronic Direct Transactions	2.6%	3.0%	3.8%	4.5%	5.6%	6.8%
Cash Transactions	90.6%	90.0%	89.7%	89.5%	87.9%	86.6%
Other Paper Transactions (Checks, Drafts)	4.1%	3.9%	3.6%	3.2%	2.9%	2.5%



Table 4 Cashless Outlook in India

- At 12.04% India has a higher cash intensity measured as percentage of the value of notes and coins in circulation in the GDP against 3.93% in Brazil, 5.32% in Mexico and 3.72% in Mexico.
- India’s monetary base M0 as percentage of m2 that consists of bank deposits and savings accounts stands at 50%, much higher than 9% in Mexico and South Africa and 24% in Egypt.
- As per the Global Financial Inclusion Index, only 35% of the Indian population above the age of 15 has a savings bank account, only 9% has a debit card and less than 2% has a credit card.
- Only 7% of the population has used a check to make a payment, only 2% has used mobile phones for payments and the numbers are even lower for women in rural areas.

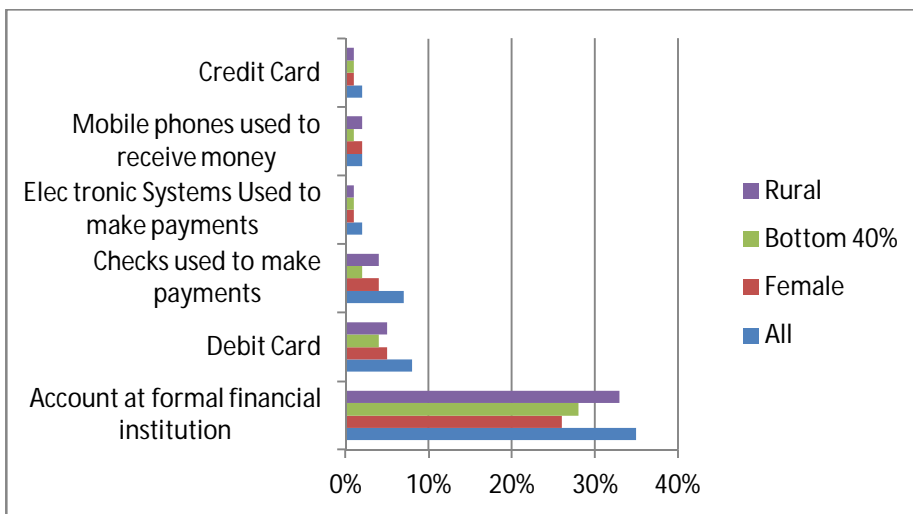


Figure 2 Demographic Distribution and Mode of Payments in India

- India fares poorly in savings with only 1 in 10 persons having saved money in the last financial year. India is at par with Brazil and behind China, Nigeria and Kenya that are evenly placed.

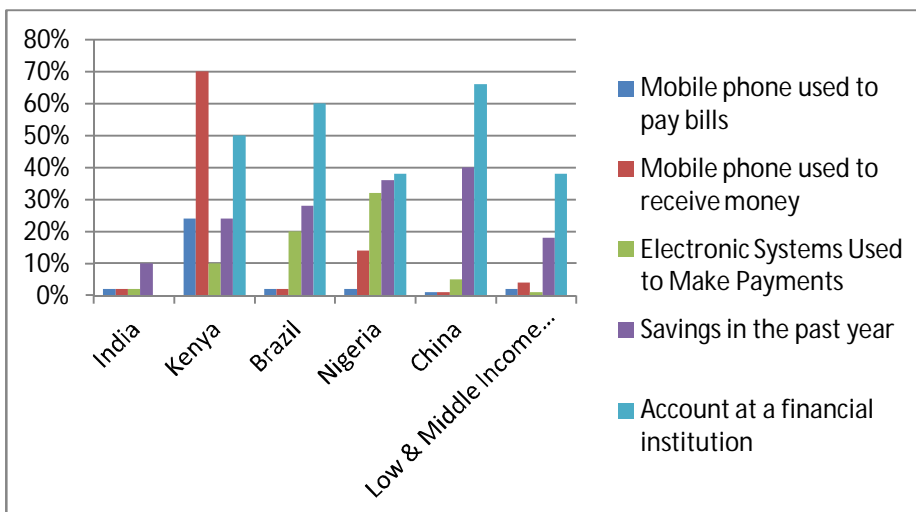




Figure 3 Mobile Payments in Select Nations

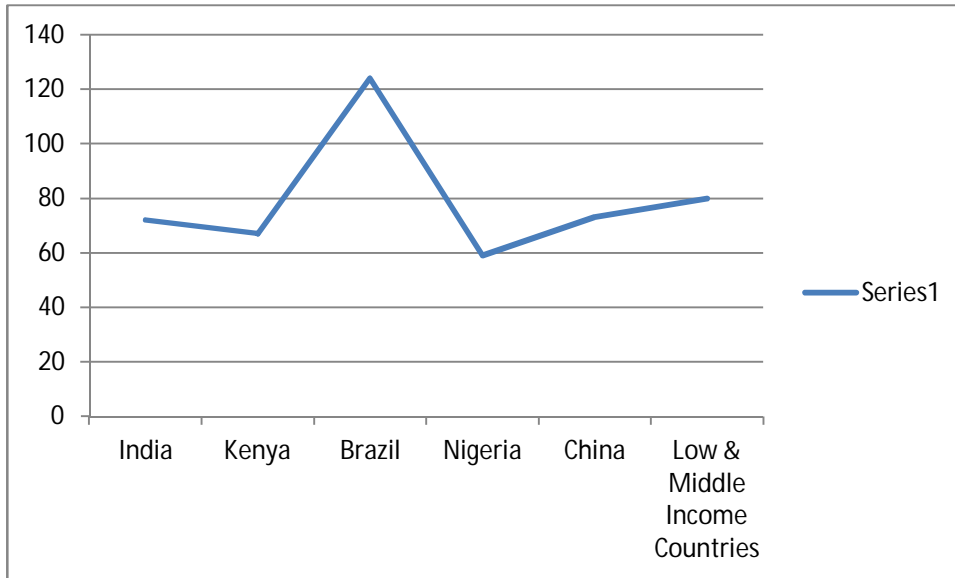


Figure 4 Savings in Select Nations

Data derived from a study conducted by the Tufts University, USA and published in the year 2016 asserts the following reasons and attitudes for the use of cash in India:

Description of the activity	Unaccounted Transactions	Illegal Transactions	Informal Sector Transactions	Accounted Transactions
Medium of exchange		Payments for crime	Incomes are earned and spent in cash	Transaction demand for money
Store of value	Balances held in the interim until alternative investment options become available (there exist a number of instruments which yield better return than cash-real estate, gold, lending in the unaccounted or informal sector and so on)	Balances held in the interim until alternative investment options become available (there exist a number of instruments which yield better return than cash-real estate, gold, lending in the unaccounted or informal sector and so on)	Savings as well as precautionary purposes	For emergencies (precautionary demand for money)



Table 5 Motives of Cash Holding in India

Types of Non-Cash Payment Systems in India

System Type	Description
RTGS	<ul style="list-style-type: none"> • Since 2004 mandatory for all large scale transactions • Operated by RBI
NEFT	<ul style="list-style-type: none"> • Allows funds to be transacted from one bank to another • Final settlement of NEFT batches occurs through RTGS
NECS	<ul style="list-style-type: none"> • Involves transactions that require transfer from one to many accounts (salary, pension) and many to one account (utility bill payments)
Checks	<ul style="list-style-type: none"> • Most popular form of non-cash payment by volume
Payment Cards	<ul style="list-style-type: none"> • Card based transactions-credit, debit, and prepaid. • At present only banks can issue prepaid cards.

Table 6 Non Cash Payments in India

Costs of Currency Operations in India

One of the primary goals of banks is to increase the efficiency of the supply chain management of cash in the economy by undertaking steps for production, forward distribution, processing, reverse distribution and redistribution of notes. In doing so, banks incur significant costs of operations. Based on the estimates offered in the Annual Reports of RBI the following costs of currency operations have been derived:

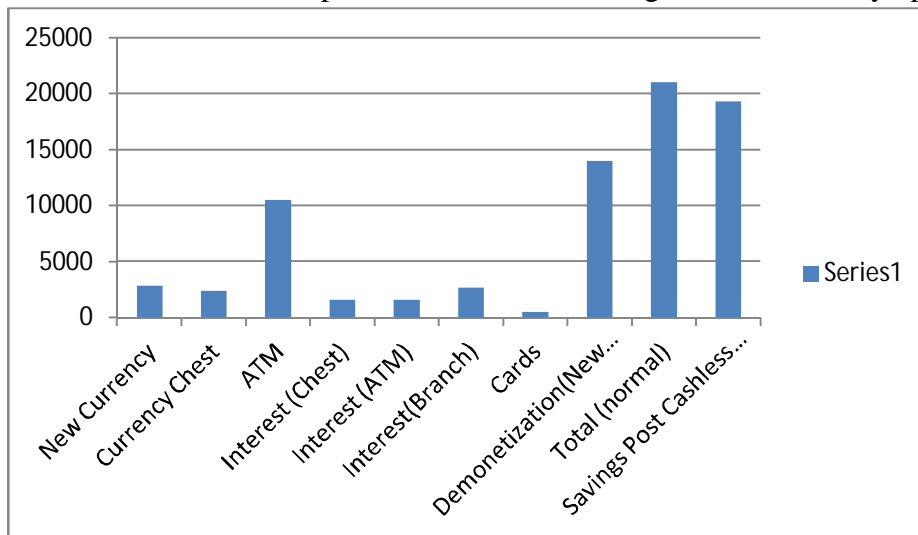




Figure 5 Cost of Cash Model for India

Excerpts From the White Paper on Black Money Published by Government of India in 2012

Definition of Black Money

The “White Paper on Black Money” published by the Government of India in 2012 duly signed and presented by the then Finance Minister and now President, Shri Pranab Mukherjee acknowledges the absence of a formal definition of black money in the academic literature on economics. However the report confirms to the definition offered by the National Institute of Public Finance and Policy (NIPFP). The NIPFP defines black income as the aggregates of incomes which are taxable but not reported to the tax authorities. The report further asserts that black money by the above definition shall include both income generated through illegal means and income generated through legal means and not reported to the ex chequer because of motives of tax evasion and tax avoidance. It is noteworthy to observe that the definition used by the NIPFP uses the income approach to define black income and thus does not discriminate between the store of value that such black income (black money) may assume either in the form of hard cash or fixed assets like bullion, real estate, automobiles, etc. The policy initiative of demonetization then does not hold much water in the sense that it does not touch upon the condensed and crystallized store of value of black income (black money) in the form of fixed assets that Dr.Montek Singh Ahluwallia, the former Deputy Chairman of the National Planning Commission prefers to call black wealth, not black income (black money).

Modi Operandi of Black Money Generation in India

The report further identifies two modi operandi for the generation of black money. It states the first approach to be that of not declaring or reporting the whole of income to the ex chequers and is likely to be the means in cases of black money generated through illegal means. The report states that black money generated through legal means is less likely to follow the above approach with tendencies to manipulate financial records and accounting. The report further asserts that the best way to deal with such black income is to follow the financial statement approach, while focusing on the means by which the financial statements and accounting procedures are reported to the tax authorities. The report may therefore be presumed to have considered the motive of tax evasion behind the generation of black income.

Frequently Used Means of Tax Evasion in India

The question of the motive and extent of tax evasion and failure to comply with tax laws gives rise to the following classification of frequently used means of tax evasion. The report asserts the following typology:

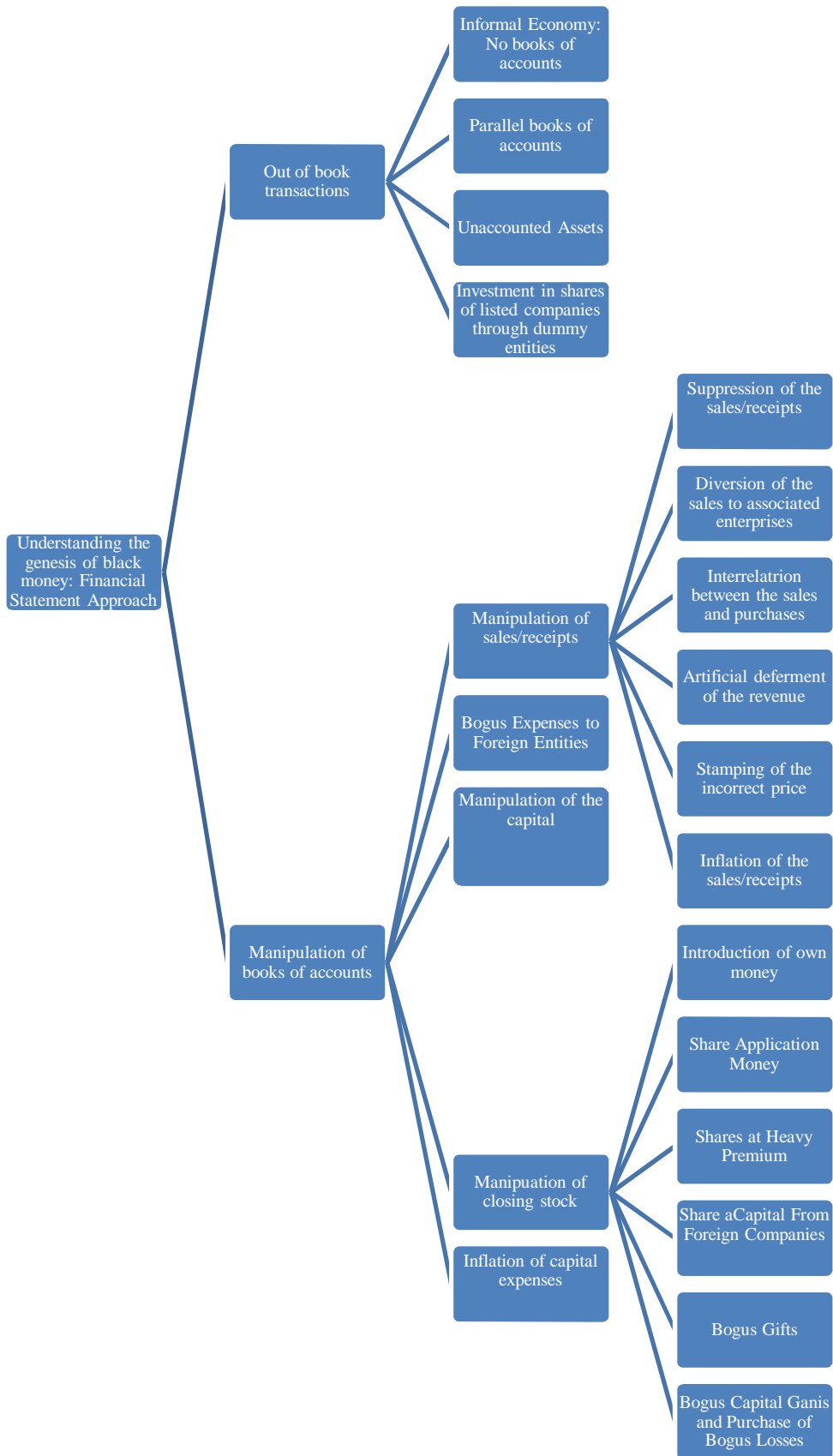




Figure 6 Manipulation of Accounts for Tax Evasion

Assessments of Black Money in India

Assessments of black money in India in the past have relied on either of the following approaches:

1. Kaldor's approach for quantifying non-salary incomes above the income tax
2. Edger L. Feige's approach for working out transaction income on the basis of currency- deposit ratio and deriving from it the black income of the economy.

As such the following are the major works on assessment of black money in India:

1. The Direct Taxes Enquiry Committee (Wanchoo Committee) adopted the Kaldor approach non salary income that escaped the tax net in the year 1961-62 to be at INR811 crore.
2. Dr.D.K.Rangnekar, a member of the Wanchoo Committee estimated tax evaded income for the year 196-62 at INR 1150 crore. The projection for 1969-70 was INR 3080 crore.
3. O.P. Chopra's estimate of the non-salary income that evaded tax stood at INR 916 crore for 1960-61 and INR 8098 crore for 1976-77.
4. The NIPFP estimated black income for the year 1983-84 to be at INR 31,584 to 36, 784 amounting to 19-21% of the GDP.
5. The World Bank Development Research Group on Poverty and Inequality in and Europe and Central Asia Region Human Development Economic Unit in July 2010 estimated shadow economies in countries across the world and reported the weighted average size of the shadow economy as a percentage of the GDP of these 162 countries at 34% in 1999 and 31% in 2007. The corresponding assessments for India stood at 23.2% and 20% respectively.

Return of the Money Transferred Abroad Illicitly

The report quotes the data released by the Department of Industrial Policy and Promotion from April 2000 to March 2011 FDI from Mauritius at 41.80 percent and that from Singapore at 9.1 percent respectively of the FDI received by India. The report further hints at the string prospect of investments routed through jurisdictions of investments by resident Indians that have invested in their own companies through a process known as round tripping.

Findings: Macroeconomic Analysis of Opportunities and Threats Post Demonetization in India

The benefits and threats accruing to the Indian economy may be classified as per the short run and long run. Further the benefits and threats may be classified under different heads of particulars as follows:

Policy Variable	Short Run Effect	Long Run Effect	Overall Effect
GDP	Negative Consumption and investment demand to see some dent as	Net positive Increased direct tax collections to create room for investment spending. Also, disposable income may go up	↑



	the cash based economy feels a crunch. Also, not all the black money may get declared and therefore the overall money available with people for cash based consumption demand would be lower.	in the long term, if government chooses to bring down income tax rates given that the tax base will widen. Higher disposable income to bode well for consumption. On the other hand some sectors of the economy (mainly those in construction) can get negatively impacted. It is also a worry because these sectors generate huge employment.	
Fiscal Deficit	The government has already announced 30-120% penalty on black money. Going forward it should lead to better tax revenue generation marginally	It shall the pave the way for widening of the tax base of the economy. As of now only 3% of India's population pays tax. Going forward this will improve greatly. It shall also lead to lower tax rates keeping in sync with the economic reforms for growth.	↑
Liquidity	Positive Increased liquidity in the banking system led by higher deposits. Will help mitigate any short term liquidity concerns on account of FCNR redemption.	Neutral RBI's stance is to maintain neutral liquidity in the banking system. RBI will suck out any excess liquidity through open market operations.	↔
Currency Circulation	Negative As on 31 March, 2016, 500 and 1000 rupee notes constituted around 86% (Rs 14.8 trillion) of the total currency in circulation Short-term reduction in usage of these notes shall lead to a crisis.	Neutral As new currency notes are introduced, currency in circulation is expected to revert to normal levels. However, if people are averse to holding cash and if there is a greater move towards accepted electronic money the situation shall improve.	↔
Inflation	Downward pressure on prices due to lower demand, especially in rural areas and for sectors such	Neutral To have minimal impact in the long run, as demand will bounce back up with increased government spending and positive impact on employment and incomes.	↔



	as housing, transport and food where share of cash transactions is high. Sharper fall in rural inflation Vs urban is possible.		
Gainers by Verticals	Banking and infrastructure to gain.	Banking and infrastructure to gain. Ecommerce, fintech, consumer durables, consumer goods, heavy engineering and capital goods, logistics verticals to gain on the back of reduced corruption and directly rent seeking unproductive activities. Affordable housing to rise. Derivatives market may see a potential rise in investments.	↑
Losers by Verticals	Consumer durables, luxury items, entertainment, restaurants, unorganized retail, gems and jewelry, agriculture and real estate set to lose productivity and revenue in the short run.	Improvements may take 2-3 years of time for real estate and jewelry. Bullion set to loss demand as a result of attacks on black wealth. “Benami” real estate buying to be drastically hit.	↔
Employment Generation			

Table7 Effects of Demonetization in Short Run and Long Run on Select Verticals

Suggestions

The impact of demonetization is being felt to varying degrees by different verticals in the economy. To chronicle the impact in quantitative terms, the academic community should ideally wait for the availability of data at the end of the ongoing financial quarter. Yet it is possible to report the drivers of growth in the



context of demonetization targeted at being a cashless economy on the following industry verticals objectively albeit qualitatively:

Ecommerce

Demand	Supply
<ul style="list-style-type: none"> • Convenience • Product Range • Discounted Price • Nuclear Families and Urbanization • Growing number of women customers • Lack of brick and mortar retailers beyond large cities 	<ul style="list-style-type: none"> • Growth in internet penetration • Growth in use of smart phone • VC Funding • Robust Logistics Infrastructure • Varied Payment Options • Growing demand from semi-urban and rural areas

Travel & Hospitality

Demand	Supply
<ul style="list-style-type: none"> • Convenience of making bookings for travel & accommodation • Discounted pricing making travel more affordable • More women travelling alone • Increase in social travel including pilgrimages, visiting friends, etc. • Increase in aspirational travel • Urbanization and hectic lifestyles lead to an increase in number of breaks taken per month 	<ul style="list-style-type: none"> • Growth in internet penetration and smart phone usage • Growth in good quality and verifiable budget accommodation • Better connectivity by road, rail, bus, all of which can be booked online • Increasing purchasing power of a growing middle class • Competitive pricing for travel & hospitality as number of airlines increase after the Open Skies Policy • Government campaigns like Incredible India

Media & OTT

Demand	Supply
<ul style="list-style-type: none"> • Growing demand for personalized entertainment in rural areas • Growing demand for original content • Convenience of viewing through smart phone and tablet screens • Growing middle class with rising disposable incomes 	<ul style="list-style-type: none"> • Increasing internet penetration and smart phone usage • Increasing affordability of data plans • Growth of original online-only content providers • Affordable/free only original content



Financial Technology

Demand	Supply
<ul style="list-style-type: none"> • Large unbanked population without access to financial institutions • A larger, younger and digital savvy population seeking newer, more efficient technologies driving convenience • Growth in ecommerce needs smart solutions for better payment systems • Need to improve profitability, both by banks and customers, specifically the large MSME base • Need for rich analysable data to address the growing needs of a large unbanked population 	<ul style="list-style-type: none"> • Increased proliferation of connected devices, coupled with falling device and data costs • Availability of new technology that improves speed, accuracy, efficiency and convenience of financial transactions • Initiatives such as Aadhar (UIDAI), Jan Dhan, UPI, BHIM and Digital India • The right policies and initiatives for companies working for innovation in fintech • Emergence of start-ups working on newer technologies, backed by VC funding

Table 8 Suggestions to Boost AED and Aggregate Supply

Limitations

- Fragility of the Digital Economy in India

India ranks among the top 5 countries in terms of attacks of web applications, as per a report “The Future of Internet in India” published by NASSCOM in 2015.

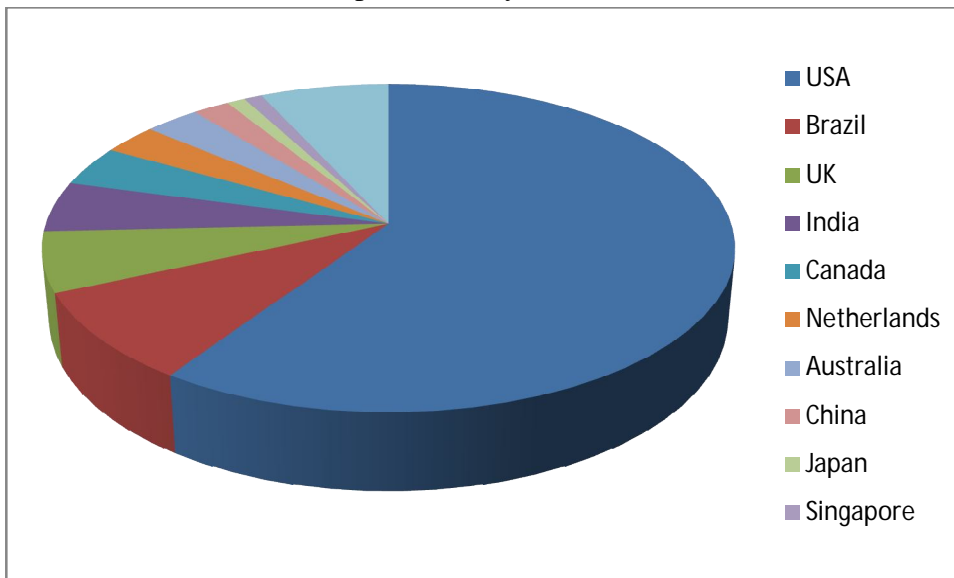


Figure 7 Vulnerability of India to DDOS Attacks



India also ranks among the top 10 source countries for DDOS attacks as in Q1, 2016 as per data collected by CERT-in and published by NASSCOM. The very prospect of cyber attacks on payment applications renders the battle in favour of a cashless economy futile even before taking position in the battlefield.

- The new notes of the denomination of INR500 and INR2000 bear the signature of the Governor of Reserve Bank of India, Shri Urjit Patel who ascended to his chair on September 4, 2016. This indicates the printing of the new currency notes to have taken place after Shri Urjit Patel had assumed office. While the Ministry of Finance has stated a 10- month planning period for the implementation of the demonetization exercise, it is subversive if not paradoxical that 2,300 crore pieces of currency notes were flushed out with the possibility of a maximum of 300 crore pieces of notes that can be printed in a month provided that the personnel of the Reserve Bank of India work twenty four hours for seven days. Assuming that the entire 2,300 crore pieces shall at the end be brought back into circulation it shall take the Reserve Bank of India, 8 months to do so. Such implementation carried out after 10 months of planning hints towards no planning at all!
- In light of the findings of the “White Paper on Black Money”, it is interesting to note that it refers to cash as a facilitator of black money. Yet the whitepaper cautions that cash is indispensable to the poor, particularly in the rural sector and accordingly payments to casual daily wage labour need to be made in cash. Presuming that the exercise of demonetization was executed with complete knowledge of the whitepaper, the implementation leaves much to be desired in the sense that the informal economy in India that is cash dependent contributes 45% of GDP and 80% of the jobs as per varied estimates of economists. Following Okun’s law that associates GDP growth rate to employment generation, 1% of the GDP translates to 1.77% of the jobs created through the informal sector of the economy and hence leaves a strong impression of the possibility of a recession in the rural areas routed through massive retrenchments in the informal sector of the economy in India leading to a decline in consumption spending and fall in aggregate effective demand (AED) triggering the necessity for pump priming the economy by means of heavy public expenditure on infrastructure development projects and MGNREGA in the Union Budget 2017 that shall consequently drive the government away from fiscal prudence and towards fiscal profligacy.

Impact of Demonetisation on GDP Growth in the Short Run

According to official statistics, demonetisation hardly dented economic momentum. India’s GDP growth slowed only marginally to 7% y-o-y in Q4 from 7.4% in Q3, above expectations (6%). Private consumption, fixed investment and industrial output growth all accelerated in Q4, with only the services sector witnessing a slowdown. This does not add up. High frequency real activity data released since demonetisation suggest that consumption and services were hit after demonetisation because they are more cash-intensive.



There could be three reasons for this discrepancy:

- (1) the inability of official statistics to capture the negative growth effects on the unorganised sectors; (2) positive base effects created by the 0.8pp upward revision in Q4 2015 GDP growth; and
- (3) companies may have showed their cash in hand as sales.

Some of the numbers beneath the surface however signify the impact of demonetization. For example, growth in Construction and Finance sub-segments are at seven-quarter low and at an all-time low respectively in the current base year. But what is intriguing is that growth rates of these segments show a significant recovery in Q4. With cement dispatches for January 2017 declining by a whopping 13%, it is not clear how construction activity is reviving in Q4FY17. Similarly bank credit growth is still at Dec 2016 levels. Overall, the GDP numbers seems to suggest we may have just leapfrogged the impact of demonetisation!

This study is of the view that, official GDP statistics are significantly underestimating the growth impact of demonetisation.

Conclusion

- Article 300A of the Indian Constitution vide 44th Amendment Act, 1978 states right to property to be a constitutional right. A good part of the demonetization exercise has been followed by caps on withdrawal from ATMs and bank branches, with riders for farmers, marriages, etc. Constitutional economics forms the base of public finance and policy. In this context it is tough for an economist or otherwise to reconcile the cap on taxable income with the spirit of the Indian Constitution. Without any rhetoric it makes enormous good sense to quote Dr. Manmohan Singh: “The road to hell is paved with good intentions.”
- Demonetization is an economic reform that aims at a cashless economy as stated by the Finance Minister Shri Arun Jaitley and the Prime Minister Shri Narendra Modi. Digitization of the economy requires a big push as argued by economists like Leibenstein and proponents of the low level equilibrium trap theory. For India to sneak out of the low level equilibrium trap, digitization of the economy including the informal economy shall increase the GDP growth rate, the direct and indirect tax revenue (through GST) and optimize the tax to GDP ratio without resorting to tax terrorism by widening the tax base. The long run benefits of an addition of 3% of GDP in the short run and the prospect of the complete inclusion of the parallel economy to the GDP of India(20% of the GDP) raises hope for not only economic growth but poverty eradication and reduction of income inequality.
- MSMEs in the informal economy have a consistent history of tax evasion that needs to be dealt with. This requires implementation of labour reforms and compliance with the Factories Act and compliance with provision of the MSME Act, 2006.



- Real Estate Regulation Act(RERA) needs to be passed as a reform for the real estate sector and must be monitored continuously for channelling of black income. Demonetization shall create a boom in the affordable housing segment with lowering of interest rates on housing credit.
- The role of the Reserve Bank of India needs to be analyzed. The remarks of the RBU Staff Union to Governor of Reserve Bank of India, Shri Urjit Patel asking to end government interference raises questions on the autonomy of the institutions of policy making.
- Democracy and capitalism are two sides of the same coin. Economic development calls for economic growth plus, in a democracy the guarantee of social and political citizenship, as stated by Prof. Sunanda Sen. The exercise of demonetization could have been better executed with greater application of thought to the modus operandi. 2,330 crores of pieces of currency notes were scrapped. Estimates by Soumitra Chadhuri assert that the Reserve Bank of India can only print 300 crores of pieces of currency notes a month assuming twenty four –seven working. At that rate it shall take 8 months to replenish the entire stock of cash that has been scrapped. The Government of India had only 300 crores of pieces of currency notes ready at the time demonetization was announced by the honourable Indian Prime Minister Shri Narendra Modi. Caps on withdrawal for citizens cannot be the solution to an issue of cash crisis. To quote Dr.Manmohan Singh: “There can be no free market without freedom.”
- The responsibility of cash printing, replenishment of ATMs and reinforcing the credibility of the currency notes is of the Governor, Reserve Bank of India. It is outright incorrect and unethical to attempt the creation of political dividend by blaming the Prime Minister, the Finance Minister and the Government of India for an economic reform that shall in the long run add to the GDP, employment, velocity of money and volume of transactions- all of them being separate but related components of economic development. May truth alone triumph.

Bibliography

- Chakrovrti, Bhaskar. (2016). *the cost of cash in India*. Available: fletcher.tufts.edu/~media/Fletcher/.../Cost%20of%20Cash/COC-India-lowres.pdf.
- CRISIL. (2016). *Significant Structural Benefits on the Cards for India*. Available: <https://www.crisil.com/Ratings/.../significant-structural-benefits-on-the-cards-for-india.p...>
- RAO, D. K., MUKHERJEE, D. S., KUMAR, D. S., SENGUPTA,, M. D., TANDON, S. AND NAYUDU, WWW.NIPFP.ORG.IN
- deloitte. (2017). *pre budget expectations*. Available: <https://www2.deloitte.com/in/en/pages/tax/.../pre-budget-expectations-2017.html>. Last accessed 25th Jan 2017
- Google. (2016). *Digital payments 2020: The Making of a \$500 billion ecosystem in India*. Available: <https://www.bcg.com/.../25July2016-digital-payments-2020-making-500-billion-ecos..>
- HDFC Bank. (2016). *Event Update Demonetisation*. Available: https://www.hdfcbank.com/assets/.../Event_Update_Demonetization_and_its_impact.p...



- Sankaran, Kamala. (2004). *WIEGO Pilot Project on the Informal Economy*. Available: http://wiego.org/sites/wiego.org/files/resources/files/fw_background_note.pdf.
- Singh, Dr.Manmohan. (2016). *The Making of a Mammoth Tragedy*. Available: <http://www.thehindu.com/opinion/lead/Making-of-a-mammoth-tragedy/article16779252.ece>.
- Singh, Dr.Manmohan. (2016). *Inaugural Speech at RGICS*. Available: <http://inc.in/In-Focus/588/Inaugural-Speech-of-Dr-Manmohan-Singh-at-the-National-Conference-of-RGICS-in-celebration-of-the-125th-Birth-Annivrsary-of-Pt-Jawaharlal-Nehru>.
- Singh, Dr.Manmohan. (2016). *demonetisation of currency*. Available: <https://www.youtube.com/watch?v=pGoGMfib1G0>.
- Ahluwalia, Dr. Montek Singh. (2016). *demonetisation of currency*. Available: <https://www.youtube.com/watch?v=7T0HTD5D0JA>.
- Mastercard. (2016). *the global journey from cash to cashless* . Available: https://newsroom.mastercard.com/wp.../Cashless-Journey_WhitePaper_FINAL.pdf.
- Mukherjee, Pranab. (2016). *White Paper on Black Money*. Available: www.incometaxindia.gov.in/Communications/Circular/9101100000000000365.htm.
- VISA. (2016). *Accelerating the Growth for India: 5 year outlook*. Available: www.visa.co.in/aboutvisa/research/include/Digital_Payments_India.pdf.
- Reliance Mutual Funds. (2016). *demonetisation drive: biggest economic reform by the MODI government*. Available: <https://www.reliancemutual.com/.../Demonetization-Drive-Biggest-Economic-Reform-....>
- Mukherjee, Sampat (2009). *Analytical Public Finance*. Kolkata: New Central Book Agency. 222-235.
- Chaudhuri, Saumitra. (2016). *printing-of-rs-100-notes-stalled-as-focus-shifts-to-rs-2000-rs-500-notes-demonetisation-black-money-rbi-currency-ban*.
- Sen, Sunanda (2007). *Globalisation and Economic Development*. New Delhi: National Book Trust of India. 34-56.



IMPACT OF ORGANIZATIONAL CHANGE AND ORGANIZATIONAL STRESS TOWARDS EMPLOYEES' PERFORMANCE IN IT SECTOR

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ABSTRACT

IT organizations have been facing tremendous changes after globalization. These changes have been diversely called organizational restructuring, revitalization, or reorganization, and in most cases have been accompanied by considerable reductions in the employment workforce. These remarkable changes are related to the international markets and the propensity of most companies to amalgamate into big multinational enterprises. Given the frequency of these organizational changes, it is shocking how tiny we know about how different employees groups respond to these changes and how employees' physical condition and well-being can be affected by them. This is even more astonishing that it is well recognized that the success of organizational changes often rests on the motivation and commitment of employees themselves. Moreover, one can assume that if organizational changes adversely impact employee health and well-being, they may indirectly decrease employees' performance, and ultimately lead to decrease the organizational performance. This purpose of this study is to analyze the impact of organizational stress, organizational change on employees' performance. The study uses questionnaire that was distributed to middle level managers of IT sector. The research findings help managers to understand the change process and also focus on stress management for improving employees' performance.

Key words- Employees' Performance, stress management, Organizational Change, Globalization, Motivation.



1. Introduction

Organizations throughout the world are deeply focusing on implementing organizational change practices that can enhance the organizational effectiveness. Organizations that have learning environment are more competitive in this changing environment. Organizational learning contributes positively to organizational effectiveness. There are many factors, such as excessive workload isolation, extensive working hours, stress work environments, lack of autonomy, co-workers and management difficult associations, management bullying, harassment and lack of opportunities or as motivation to improve that are contributing to workplace stress on the skill level. Pressure on the current account of the demands of the workplace, the work environment is inevitable. A person is regarded as acceptable by the pressure, even warning workers, work and learn, depending on available resources and personal characteristics may be capable, motivated. However, when the pressure becomes excessive or uncontrollable then it leads to stress. Stress can damage the employee's health and business performance. Job stress can lead to burnout of employees. Work-related stress, poor work organization, poor management, poor job design, poor working conditions, and lack of support from colleagues and supervisors can be the major factors contributing to stress.

A large number of workers are affected; the work stress and healthiness of their organization's performance could cope. Job stress has a negative impact on organizations. Organizations work stress increased because of high absenteeism, labor turnover, poor time-keeping, poor productivity and performance, poor motivation, low morale can cope, poor health, increased employee complaints increased accidents and incidents reports. At the end of these things affect organizational effectiveness. The work stress affects the performance of employees and the employees will be unable to give their best to the organization to effectively achieve their goals will not be able. One of the main reasons for work stress is work-family conflict. An employee of a balance between your work life and family life will fail to maintain it certainly will face job stress will affect their performance. As technology changes rapidly, organizations need to modify ways of doing things. To be competitive, organizations must respond quickly to change. Most organizations implement changes to improve their effectiveness. Organizational culture that influences organizational effectiveness have an impact on organizational change. Cultural norms, values, beliefs, and expectations of individuals in organizations is set. Due to their shared values, beliefs, and nature, culture has a significant effect on efforts to change. Organizational performance, namely financial performance, innovation, and employee and customer satisfaction has been linked to



various aspects of the characteristics of the organizational culture. There are also other obstacles that come across poor communication during major organizational change, employee resistance to change, mergers and acquisitions and inadequate timeframe for implementing effective change in the cultural mismatch are developed. These are all obstacles that will affect the implementation of change in an organization and affect the performance of an organization. And the change that is necessary to define the organization and management culture change within the organization is critical to organizational effectiveness to identify needs. Stress is a universal factor in the whole world is faced by employees. IT organizations do not much focus on stress management. Managers should realize the effect of workplace stress otherwise the potential of competent employees can be wasted causing lowering the overall organizational performance and lowering organizational effectiveness. It is the requirement of today organizations to remain competitive and respond to change quickly. IT organizations have very rigid structure so that organizations cannot easily adopt change. IT Organizations usually do not respond to change and prefer things to stay the way they are and view the change as an inconvenience. Organization management needs to understand the change process so that organizations can better help managers and employees to deal with change. The objective of this study is to analyze the impact of organizational stress, and organizational change on employees' performance.

2. Literature Review

Global sourcing has become initial step for any organizations to survive in the global environment with competitive advantage .Global outsourcing is helping the organisations to maintain their relationship with outsment himplemented to protect information assets to help the organiz. There are a few factors to organizational size and industry type of organization, etc. (Chang and Ho, 2006) .Non- profit organizations like the Information Security Management (ISM) implementation and public organizations to influence and pressure of profit-making strategy are also under the management of such methods which help to achieve organizational effectiveness. Organizational effectiveness as non-profit organizations to take advantage (Papadimitriou, 2007). The effectiveness of the organizations that they innovation, managerial capacity and different kind of strategic HRM technology through its efforts to develop manpower one approach is to be as important for the (Wang, 2005) the 'learning organizations and networks is a relationship between orientation. The process of learning to drive co-innovation focus of an organization (Westerlund and Rajala, 2010) .The staff varies in their attitudes about the management of stress. Around the world every small organization, individual employees and managers face stress should



strive to enable the best that they can deal with emotional reactivity and a well (Hede, 2010) .Humor is an essential part of human life and it helps a lot of their employees to relieve stress of dealing with stress. So it is good sense of humor to relax and also helps individuals improve personal conversation. Studies show that workers are happy they Organization (Lee and cleaners, 2005) .job stress burnout conditions and further cause's burnout can lead to mental stress and be more productive. The mental stress in organization, which ultimately negatively affects interpersonal relationships of employees' and finally affects performance. All these tensions and disturbing construction activities of the project manager (Leung and Chan, 2011) .Today organizations are changing very rapidly, according to the environment and to compete in the global world. Research shows that behavioral change is difficult to implement. Other authors have said that the top and middle managers and their communication to the complexities of the different experiences in implementing organizational change is a problematic factor. Competencies that help them change managers after they experienced (Andrews, 2008) .The research "make sense" show found that managing change is hard and change management practices of a firm and change initiatives towards changing process because employees do not pay much attention to management and to adjust with the changes do not provide enough time to have failed. Useful changes will involve a multi-step process and each step that staff organization providing sufficient time to make a part of tends to be associated with (Stanleigh, 2008). There are different methods were used and these methods were appropriate and consistent. The result of data sufficient shows evidence of correlation between development and organizational culture, organizational learning and employee satisfaction (Singh, 2011)

Technology can play an important role in gaining competitive advantage. Organizations should use the strategic vision of the management of their technology. Organizations in order competitive advantage that those strategies to gain access to promote continuing education needs (Ahmed, 2011).

This literature explains the complexities of change management in university libraries and reading indicates that the university management, library manager, university libraries and library staff are very important to change. In particular that the management changes as well as develop your employees are important is equally important. Regular checks and balances and development of technologies and staff training in effective change (Malhan, 2006) is used. Examination and managers working reality and life as a result of high pressure is much lighter penalties. Stress communication and team working discussions can be reduced by proper planning. But there are always disasters (Flin, 1999) to polish their performance in upper management and a lower level employee to reduce stress is a significant need for authentic



research. Research shows that there is a huge level of concern because of employees who are satisfied with their jobs at very low levels. The research results obtained from the performance of working with accounting statements that science educational background educational background (Pop-Vasileva, Baird, and Blair, 2011) is significantly better than the performance of the work. IT projects all the time to get the most success are uncertain. But the project manager handles it in a way so that excellent results can be achieved. For this purpose, the project manager will have additional technical expertise. The success of the IT project managers' optimism and the stress depends on the project.

On the basis of above literature review following hypothesis are drawn:

H₀₁: Organizational Stress has no significant relationship with organizational performance.

H₀₂: Organizational Change has no significant relationship with organizational performance. **3.**

Methodology

To obtain the most important information questionnaires are filled by the respondents and separate questionnaires are distributed to middle level employees' of IT Companies to determine the impact of organizational stress, organizational change on organizational performance. Questionnaires contain two sections demographic and subjective. Demographic section comprises of Gender, Age, Marital Status, Establishment size, Sector, Job tenure, Industrial Sector, and Position. Subjective section comprises of Organizational Stress, Organizational Change, and Organizational Performance. Out of 120 respondents 50 Engineers, 45 Managers 25 Senior managers were taken as a sample in this study. 32 items are taken in questionnaire and 5-points Likert scale is used to measure the responses. Data is gathered from Accenture, Wipro and TCS with convenient and simple random sampling techniques. A survey instrument in the form of close ended questionnaire was developed for the purpose of data.

4. Results and Discussion

To examine the impact of organizational stress, organizational change on organizational effectiveness, Pearson's correlation was examined and to test the relationship linear regression was applied. To test the reliability of the variables Cronbach's alpha was measured.

Table 1: Cronbach's alpha

S.No.	Dimensions	No of items	Cronbach's alpha
1	Organizational Change	20	.879
2	Organizational Stress	12	.923

Table 1 show that all the items are good as it is under the acceptable level of reliability.

**Table 2: Pearson's moment correlation N=120**

		Employees' Performance	Organizational Change	Organizational Stress
Employees' Performance	Pearson Correlation	1	-.688**	-.590**
	Sig. (2-tailed)		.000	.000
	N	120	120	120
Organizational Change	Pearson Correlation	-.688**	1	-.687**
	Sig. (2-tailed)	.000		.000
	N	120	120	120
Organizational Stress	Pearson Correlation	-.590**	-.687**	1
	Sig. (2-tailed)	.000	.000	
	N	120	120	120

** . Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows that the significant p-value is 0.000 which is less than the significant level of 0.01, ($p < 0.01$) Therefore H_{01} is rejected. So result shows that there is significant relationship between Organizational Stress and employees' Performance.

The analysis shows that Person Correlation (r-value) is -0.688, 68.8%, this indicates that there is a negative relationship between Organizational Stress and employees' Performance. Therefore, when Organizational Stress increased it will lead to decrease in employees, performance. The value of this correlation coefficient -0.688 is fall under coefficient range from + 0.41 to + 0.70. Thus, it shows the relationship between Organizational Stress and employees' Performance is moderate.

Table 2 shows that the significant p-value is 0.000 which is less than the significant level of 0.01, ($p < 0.01$) Therefore H_{02} is rejected. So result shows that there is significant relationship between Organizational change and employees' Performance.

The analysis shows that Person Correlation (r-value) is -0.590, 59.0%, this indicates that there is a negative relationship between Organizational change and employees' Performance. Therefore, when



Organizational change increased it will lead to decrease in employees, performance. The value of this correlation coefficient -0.590 is fall under coefficient range from $+ 0.41$ to $+ 0.70$. Thus, it shows the relationship between Organizational change and employees' Performance is moderate.

Table 3: Model Summary

Model Summary^a

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.807 ^b	.651	.642	4.702

a. Predictors: (Constant), Organizational Change, Organizational Stress

b. Dependent Variable: Employees' Performance

Table 3 shows $R=.807$ shows 80.7% variation in organizational stress, organizational change, and employee' performance. R Square is the coefficient of determination which shows that 65.1% total variation with its linear relationship of organizational stress and employee' performance.

Table 4: ANOVA^a

ANOVA^a

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	9359.238	6	1559.873	70.540	.000 ^c
Residual	5019.724	227	22.113		
Total	14378.962	233			

a. Predictors: (Constant), organizational change, Organizational Stress

b. Dependent Variable: Employees' Performance

From Table 4 of ANOVA shows level of significance since the value of "P" is less than .05 so it is accepted that impact of organizational stress and organizational change on employees' Performance is highly significant.

**Table 5: Coefficients a**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	2.750	1.361		2.021	.044
Organizational Change	-.106	.121	.068	.872	.384
Organizational Stress	-.223	.103	.127	2.172	.031

The elements of independent variables are the factors influence employees' Performance in IT sector.

This can be determined by the following equation method as below:-

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e$$

$$\text{Employees' Performance} = 2.750 - .106 - .223$$

In this Regression equation, it illustrates the relationship between the Organizational Change, organizational stress towards employee' Performance in IT sector .

Based on the Coefficient table, organizational change have the significant positive influence towards employees' performance since the $t = 0.872$, $p = 0.384$, $b_1 = -0.106$, which is statistically significant at 5% significance level. This means that for every one unit increase in organizational change, employees' performance will decrease by 0.106 units.

Based on the Coefficient table, organizational change have the significant positive influence towards employees' performance since the $t = 2.172$, $p = 0.031$, $b_1 = -0.233$, which is statistically significant at 5% significance level. This means that for every one unit increase in organizational stress, employees' performance will decrease by 0.233 units.

5. Conclusion-

As a conclusion, this research paper had been done on investigation on impact of organizational stress and organizational change towards of employees' performance in IT sector. However, this study explored the relationship of employees' performance in IT industry with organizational Stress and organizational change. Both stress and change has negative impact on employees' Performance. As stress and changes increase in IT sector employees' Performance decreases. Reasons behind this is that employees' always resist changes as they are very comfortable with their previous job and changes in their job causes too



much pressure and tension which finally leads to stress among employees and reduce the employees' Performance.

6. References-

- I. Aleksandra Pop-Vasileva, K. B. (2011). University corporatization the effect on academic work-related attitudes. *Accounting, Auditing & Accountability Journal* , 408-439.
- II. Andrews, J. (2008). All change? Managers' experience of organizational change in theory and practice. *Journal of Organizational Change Management* , 300-314.
- III. Aronsson, G. (1989). Swedish research on job control, stress and health. In S.L. Sauter, J.J.
- IV. Hurrell, JR, & C.L. Cooper (Eds.), *Job control and worker health* (pp. 75-90).
- V. Ashford, S.J. (1988). Individual strategies for coping with stress during organizational transitions. *Journal of Applied Behavioral Science*, 24, 19-36.
- VI. Barbaroux, P. (2011). A design-oriented approach to organizational change. *Journal of Organizational Change* , 626-639.
- VII. Buchanan, D., & Huczynski A. (1997). Part 4: Organizational change and development. In
- VIII. *Organizational behavior: An introductory text* (pp. 455-587). Prentice Hall Europe.
- IX. Chang, S. E., & Ho, C. B. (2006). Organizational factors to the effectiveness of implementing information security management. *International Journal of Manpower* , 345-361.
- X. Chrusciel, D. (2006). Considerations of emotional intelligence (EI) in dealing with change decision management. *Management Decision* , 644-657.
- XI. Cooper, C.L., Dewe, P.J., & O'Driscoll, M.P. (2001). *Organizational stress: A review and critique of theory, research, and applications*. Thousand Oaks, CA: Sage Publications.
- XII. Coffey, M., & Tattersall, L. D. (2009). Designing a stress management intervention in social services. *International Journal of Workplace Health Management* , 98-114.
- XIII. Coffey, M., Dugdill, L., & Tattersall, A. (2009). Designing a stress management intervention in social services. *International Journal of Workplace Health Management* , 98-114.
- XIV. D.C. Smith, M. B. (2011). A project manager's optimism and stress management and IT project success. *International Journal of Managing Projects in Business* , 10-27.
- XV. Dewe, P.J. (1992). Applying the concept of appraisal to work stressors: Some exploratory analysis. *Human Relations*, 45, 143-164.
- XVI. Elmiti, D., & Kathawala, Y. (2000). the effects of global outsourcing, strategies on participants' attitudes and organizational effectiveness. *international journal of manpower* , 112-128.
- XVII. Flin, D. P. (1999). Disaster stress: an emergency management perspective. *Disaster Prevention and Management* , 261-267.
- XVIII. Grigorut a, M. V. (2006). Change in Romanian organizations: a management culture approach. *Journal of Organizational Change Management* , 747-752.
- XIX. Glogow, E. (1986). Research note: Burnout and locus of control. *Public Personnel Management*, 15, 79-83.



- XX. Hede, A. (2010). The dynamics of mindfulness in managing emotions and stress. *Journal of Management Development* , 94-110.
- XXI. Jesus, S. N., & Conboy, J. (2001). A stress management course to prevent teacher distress. *The International Journal of Educational Management* , 131-137.
- XXII. Lee, Y.-P., & Kleiner, B. H. (2005). How to Use Humour For Stress Management. *Management Research News* , 179-186.
- XXIII. Leung, M.-y., & Chan, Y. S. (2011). Structural linear relationships between job stress, burnout, physiological stress, and performance of construction project managers. *Engineering, Construction and Architectural Management* , 312-328.
- XXIV. Maria Vakola, K. E. (2007). Competency management in support of organizational change. *International Journal of Manpower* , 260-275.
- XXV. Shannon K. Ronnenberg, M. E. (2011). The important role of change management in environmental management system implementation. *International Journal of Operations & Production Management* , 631-647.
- XXVI. Smith, I. (2006). Continuing professional development and workplace learning – 15. *Library Management* , 300-306.
- XXVII. Stanleigh, M. (2008). Effecting successful change management initiatives. *Emerald Group Publishing Limited* , 34-37.
- XXVIII. Treven, S., & Potocan, V. (2005). Training programmes for stress management in small businesses. *Education þ Training* , 640-652.
- XXIX. Wang, Z. (2005). Organizational effectiveness through technology innovation and HRM strategies. *International Journal of Manpower* , 481-487.
- XXX. Westerlund, M., & Rajala, R. (2010). Learning and innovation in inter-organizational network collaboration. *Journal of Business & Industrial Marketing* , 435-442.



PERFORMANCE MANAGEMENT SYSTEM: PUBLIC V/S PRIVATE SECTOR BANKS IN THE STATE OF UTTARAKHAND

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ABSTRACT

In the present age of hard-hitting competition due to liberalization and globalization, business organizations have realized the growing importance of adopting strategic HR practices to gain competitive advantage over their competitors. An effective performance management system plays a significant role in reforming the actions of the employees in an organization for realizing the ultimate corporate objectives and strategies. Performance management is considered as a key instrument for aligning all the major organizational HR functions and sub-functions so that the focus remains on attaining organizational objectives fully. Performance management is a process of planning, reviewing and evaluating performance for enhancing productivity and development of employees and organization. The present study aims at the comparison between public and private sector banks for their performance management systems. The study is based on primary data collected from 100 employees of selected public sector bank and private sector bank in the state of Uttarakhand. A structured questionnaire was used as an instrument for the collection of primary data. Suitable statistical techniques have used for analysis of data. The findings of the study revealed that there exists no significant difference between the performance management systems of public and private sector banks.



Keywords: Performance Management, Performance Planning, Performance Review, Implementation, Feedback, Strategic HR

INTRODUCTION

One of the biggest challenges faced by the business organizations today is managing performance of their employees which is completely dependent upon employee's own commitment, competence, clarity of his job-roles and ability as well as willingness to perform. If managed proficiently through well planned practices and mechanism, a performance management system can serve as an effective tool for employee development. Due to the absence of a transparent feedback mechanism and lack of employee involvement in the entire process of appraisal, the traditional appraisal system lacks in fulfilling the requirement of the organization effectively. So, there arises a need to introduce such a system which can overcome the flaws of the traditional appraisal system. A performance management system overcomes the drawbacks of the traditional performance appraisal system by maintaining an innovative, revolutionary and futuristic approach instead of assessing the past assistance of the employees for reviewing the performance of the employees.

Performance Appraisal generally reviews past behavior and as a result provides an opportunity to reveal the past performance of the bank employees. But in order to be successful they should also use a tool which can act as a basis for development and improvement plans and reaching to the agreement about what should be done in the future so as to improve organization's effectiveness. Performance Appraisal is considered as the central pillar of performance management system to keep the motivation of the employees high.

Banking services is one sector where a great extent of consideration is being paid to manage performance of employees. A number of the public sector banks (PSBs) have altered their Performance Management policies or are in the process of making changes in them. In general, it reveals that a good Performance Management System is the foundation to steer an organization successfully in today's scenario of uncertainty and steady changes under the effect of globalization. Therefore, they have developed and



employed such system which can provide maximum benefits. But, like many areas of organizational development, the public sector banks are contending with private sector banks in this concern as well. The Performance Appraisal System as an important element of Performance Management System has been made operational. But developing and implementing a performance management system seems to be a big challenge to all.

REVIEW OF LITERATURE

In the era of extreme competition and the battle of leadership, performance management system in both public and private sector organizations helps to enhance performance of employees as well as organizations. Various researches have been conducted in the area of performance management however there are very few studies which compare the performance management system of public and private sector banks in India.

Jain, S. and Gautam, A. (2016) concluded in a study on the comparison between performance management systems in the Indian manufacturing industries that Performance Management System is the vital key in Human Resource Management (HRM). In other words, PMS is a crucial business driver that helps to achieve business result. An efficient PMS can boost the firms to maximize the employee performance. An effective system should be such that it can encourage an organizational climate of trust, autonomy, collaboration, communication and teamwork etc. It is important for an organization to have such system that not only identify and recognize the top performers rather help the employees and organization to achieve sustainable growth. Most of the modern day organizations identify this need and are spending a huge amount of money to develop and implement an effective Performance Management System still a huge amount of variation can still be noticed in the employees' performance. In order to gain the competitive advantage, the organization's performance management system should be designed in such a way that it can connect the employee's performance expectations to that of the organization's goals.

Yaseen and Afghan (2016) founded in the study at a national bank at Pakistan that Bell Curve technique is used in performance management system. However no proper feedback regarding employee's performance is given. The Employees' performance weaknesses and strengths are not discussed openly



with them as a result motivation level of employees regarding performance management system of the National Bank is low. An annual performance appraisal system is followed in the bank. Performance criterion is set without mutual consent. Performance Objectives are not mutually discussed and agreed upon and the participation level of employees in performance management system is very low. Employees are rewarded according to the performance appraisal. Supervisors are sometimes biased as the performance appraisal is only done by immediate boss.

R. Alamelu et al. (2014) studied the opinions of employees of banks towards their existing performance management system. Employees were aware about the PMS practices in workplace. It was acknowledged that increased responsibilities and efficient management control are the main expected qualitative outcomes of PMS, while higher productivity is identified as quantitative outcome of PMS. Moreover, the strength of PMS identified was simple or practical and well thought system while weakness is that it is subjective in nature and a slow procedure. The study also suggested that PMS can be improved by identifying performance measures, providing training to employees, proper communication between employees and management and proper maintenance of PMS records. A progression plan of performance linked pay, allowances and rewards can help the employees to achieve their performance measures objectively.

According to the study conducted by Upadhyay and Gupta (2012) on the efficacy of PMS in a commercial bank, the effectiveness of PMS was determined by clear job descriptions, clarity of goals, flexible goals and broader mapping of performance rather than just job.

Nair and Pareek (2011) studied the types of performance management systems adopted by various private sector organizations in India. A lot of performance indicators were identified including both financial and non-financial measures in all the aspects i.e. customers, employees and environment etc. most widely used measure include 360 degree appraisal , then Total Quality Management (TQM) and Activity Based Costing (ABC). However there are few employees who want to change the measure to Balance Scorecard (BSC).

Performance management is a process to establish an understanding about what is to be achieved at an organization level. It is a tool that aligns the organizational goals with the employees decided standards



and competency requirements. The emphasis is made on improvement, learning and development in order to achieve the business objectives and to create a high performance workforce. It is also about helping the management of an organization to achieve its strategic business objectives (Aguinis& Pierce, 2008).

According to Lawler (2008); PMS is the main process through which task is completed and should therefore be a top priority for the managers to review. Public organizations, at all levels of government, have made progress on using performance management systems to capture the complexities of accountability and transparency; however, research have shown that performance management is still gaining importance as an effective organizational approach in the public sector, Bouckaert and Halligan, (2008), stated that performance is the main focus of international public management research.

Helm et al. (2007) have also noted that PMS is important to organizational performance for reasons such as: a) facilitating the organization in achieving its vision and objectives. b) Acting as a prerequisite to develop a performance culture within the organization. c) Helps in aligning the employees' performance goals with the organization's goals. d) Ensuring that the employees are clear about their performance expectations. e) Improving employee performance and identifies talented individuals for promotion and f) Providing reinforcement by linking pay and performance.

According to Veberteen (2007), the definition of clear and quantifiable goals is positively associated with the quality and quantity performance while the use of incentives is positively associated with only quantitative performance. He also discerns that performance management practices in public sector are influenced by various institutional factors. Overall it shows that the behavioral effects of performance management practices on public sector managers are as important as the economic effects.

Performance management includes activities like joint goal-setting, continuous performance review and frequent communication, feedback, coaching to improve performance, implementation of development programs and rewarding achievements. It is regarded as a systematic process through which the overall performance of an organization can be improved by improving the performance of employees within a team framework (Drumm, 2005).



According to Roberts (2001), performance management involves setting of corporate, individual, team and organizational objectives, use of performance appraisal systems, proper rewards and recognition plans; training and developmental schemes; feedback and coaching, counseling, career planning etc for observing the effectiveness of performance management system. Therefore, performance management involves the everyday management and the support of people as well. So a performance management system should be based on specific, realistic, measurable and achievable performance targets. The standards are set so that there would be no doubt about whether the predetermined standards were achieved or not.

According to Carla Joinson (1996), In a survey of more than 350,000 government employees it was identified that more than half of them believed that there are few people who handles entire tasks and responsibilities while there are some others who do just enough to get by. Most of the respondents were not in favor that job performance was not an important factor in getting promotion, nor did they believe that the best people reach to the top of the organization. Top management makes decisions related to salary, rewards and promotions based on employee's or team's performance; however, it is important that these decisions should be perceived as just, fair and equitable by all the employees of the organization.

It is obvious from the above review of available literature in this area that not many studies have been conducted so far. So filling this gap research gap the study has been conducted to compare the performance management system of the public and private sector banks.

RESEARCH OBJECTIVE

On the basis of review of literature objective of the present research is to study the comparison between performance management systems exist in the public and the private sector banks. To achieve this objective the performance management systems of public and private sector banks have been compared on the basis of the factors identified for managing performance, i.e., performance planning, performance review, implementation, performance feedback, rewards and recognition, performance improvements.



RESEARCH METHODOLOGY

The literature review has yielded certain important variables related to performance management system and on the basis of that the comparison has been made using ANOVA.

Sampling Technique: Convenience sampling was adopted while selecting the banks and their branches while a random sampling method used selecting the employees from the branches. One public and one private sector bank from the state of Uttarakhand were chosen as sample for conducting the study. The employees from each type of banks were selected using systemic random sampling.

Sample Size: A sample of 50 employees from Punjab National Bank, a public sector bank and 50 employees from Axis Bank, a private sector bank was drawn. Thus the study was conducted over total 100 employees from both sectors.

Data Collection: The study was conducted using both types of data, i.e., primary and secondary for analysis and drawing the conclusion of present study.

(i) **Primary data:** The collection of primary data was done using field surveys which included developing and administering the questionnaire on the sample identified. In conducting the survey, employees at all levels from different branches at both banks in Uttarakhand were randomly approached to fill in the survey questionnaire.

A questionnaire with different types of questions based on the components/ factors related to performance management system in an organization was used. Close-ended statements were adopted and measured at a five point Likert Scale.

(ii) **Secondary data:** The collection of secondary data was based on literature review through online research databases such as EBSCO, Pro-Quest, Scopus, etc.



ANALYSIS OF DATA

In the paragraphs is given the detailed analysis of data collected from the sample units through pre-tested questionnaire. Factors such as performance planning, performance review, implementation, feedback, rewards and recognition and performance improvement were measured by asking respondents to rate certain statements on a five point Likert scale (1=Strongly Disagree, 2=Disagree,3=Neutral, 4=Agree, 5=Strongly Agree). These were defined as "scale variables" in the SPSS 20.0 data editor.

Descriptive Statistics

Table-1 presents descriptive statistics of the sample of employees from public and private sector banks. It gives a detail about the mean, standard deviation and standard error on the various components of performance management system identified for the present study.

Table-1 Descriptive Statistics

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
						Lower Bound	Upper Bound		
Performance Planning	Public	50	29.02	5.988	0.847	27.32	30.72	8	37
	Private	50	27.06	6.264	0.886	25.28	28.84	13	39
	Total	100	28.04	6.176	0.618	26.81	29.27	8	39
Performance Review	Public	50	41.20	7.918	1.120	38.95	43.45	20	51
	Private	50	39.90	6.139	0.868	38.16	41.64	28	51
	Total	100	40.55	7.079	0.708	39.15	41.95	20	51
Implementation	Public	50	34.12	5.630	0.796	32.52	35.72	14	40
	Private	50	33.88	4.758	0.673	32.53	35.23	25	43
	Total	100	34.00	5.187	0.519	32.97	35.03	14	43
Feedback	Public	50	14.34	3.426	0.485	13.37	15.31	6	20
	Private	50	14.46	2.332	0.330	13.80	15.12	8	18
	Total	100	14.40	2.916	0.292	13.82	14.98	6	20



Rewards and Recognition	Public	50	25.40	5.635	0.797	23.80	27.00	9	33
	Private	50	25.88	4.222	0.597	24.68	27.08	18	34
	Total	100	25.64	4.959	0.496	24.66	26.62	9	34
Performance Improvement	Public	50	22.78	4.900	0.693	21.39	24.17	7	28
	Private	50	22.06	3.582	0.507	21.04	23.08	15	29
	Total	100	22.42	4.286	0.429	21.57	23.27	7	29

Reliability Statistics

The reliability test was conducted using Cronbach's Alpha as a measure of internal consistency. Cronbach's Alpha is a reliability coefficient that indicates how well items in a set are positively correlated to one another. As to some literature, Nunally (1967) maintained that in theoretical studies, even modest reliabilities of 0.60 or 0.50 may be acceptable. To agree, Hair et al. (2006) proposed that though "generally agreed" lower limit for Cronbach's alpha value is 0.70, it may decrease to 0.60 and still be acceptable, especially in exploratory studies and in research in the Social Sciences. Furthermore, Aron and Aron (1999) proposed that in research in psychology, Cronbach's α of 0.60 or even lower could be adequate; however, values exceeding 0.7 are preferable (Aron & Aron, 1999). Table-2 gives a summary of the reliability test based on the Cronbach's alpha values for the five scales items in the survey instrument.

Table-2 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.920	0.930	6

Correlation Matrix

Table-3 shows the correlation matrix among the various factors of a performance management system. The correlation has been calculated from the responses of 100 respondents.

**Table-3 Correlation**

		Performance Planning	Performance Review	Implementation	Feedback	Rewards and Recognition	Performance Improvement
Performance Planning	Pearson Correlation	1	.781**	.722**	.603**	.697**	.741**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	100	100	100	100	100	100
Performance Review	Pearson Correlation	.781**	1	.742**	.682**	.739**	.775**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	100	100	100	100	100	100
Implementation	Pearson Correlation	.722**	.742**	1	.550**	.712**	.733**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	100	100	100	100	100	100
Feedback	Pearson Correlation	.603**	.682**	.550**	1	.511**	.612**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	100	100	100	100	100	100
Rewards and Recognition	Pearson Correlation	.697**	.739**	.712**	.511**	1	.723**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	100	100	100	100	100	100
Performance Improvement	Pearson Correlation	.741**	.775**	.733**	.612**	.723**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	100	100	100	100	100	100



It can be observed from the correlation table that the value correlations between the factors varies from 0.781 between factors Performance Planning and Performance Review as maximum and 0.511 between factors Feedback and Reward and Recognition as minimum. The correlations of almost all the variables are above 0.5 and close to 1 that shows a high degree of positive correlation among them.

Moreover the significance value (2-tailed) is 0 in all the cases, i.e., less than 0.5 hence it can be concluded that there is a statistically significant correlations between the variables, which implies, increases or decreases in one variable do significantly relate to increases or decreases in other variable.

Analysis of Variance

One way ANOVA has been used for analyzing the comparison of factors of performance management systems between private and public sector banks, to find out whether the difference between two sample means is significant or not. For this test the significance level of $p < 0.05$ was taken. Table-4 gives a detail about the sample means and F ratio analyzing the primary data collected through a pre tested questionnaire.

Table-4 ANOVA

		Sum of Squares	d.f.	Mean Square	F	Sig.
Performance Planning	Between Groups	1.604	1	1.604	2.711	.103
	Within Groups	57.995	98	0.592		
	Total	59.6	99			
Performance Review	Between Groups	.653	1	.653	1.687	.197
	Within Groups	37.947	98	.387		
	Total	38.601	99			
Implementation	Between Groups	.048	1	.048	.143	.707
	Within Groups	33.282	98	.34		
	Total	33.33	99			
Feedback	Between Groups	.023	1	.023	.042	.838
	Within Groups	52.603	98	.537		



	Total	52.625	99			
Rewards and Recognition	Between Groups	.118	1	.118	.232	.631
	Within Groups	49.577	98	.506		
	Total	49.695	99			
Performance Improvement	Between Groups	.36	1	.36	.703	.404
	Within Groups	50.15	98	.512		
	Total	50.51	99			

Performance Planning: With the help of the values of F ratio given in the Table 4, it is evident that the value of $F(1,98) = 2.711$ for which the value of p is 0.103 i.e. $p > .05$, that shows there exists no significant difference between the Performance Planning of public and private sector banks, as the P value is more than 0.05 for 5% significance level, so there exists no significant difference between the two samples.

Performance Review: Table 4 shows that in case of Performance Review the value of $F(1,98) = 1.687$ for which the value of p is 0.197 which means that $p > .05$ and shows that there exists a significant difference between the performance review of public and private sector banks, as the P value is more than 0.05 for 5% significance level, so there exists no significant difference between the two samples.

Implementation: From Table 4 it is clear that the value of $F(1,98) = 0.143$ for which the value of p is 0.707 which means that $p > .05$, shows that there exists a significant difference between the Implementation of public and private sector banks, as the P value is more than 0.05 for 5% significance level, so there exists no significant difference between the groups. Null hypothesis 3 in case of public and private sector banks is accepted.

Feedback: It is clear from Table 4 that for the for the factor Feedback value of $F(1,98) = 0.042$ with $p > .05$, shows that there exists no significant difference between the feedback given to the employees of public and private sector banks as the P value is more than 0.05 for 5% significance level, so there exists no significant difference between the public and private sector banks.

Rewards and Recognition: Table 4 shows that for the hypothesis it is evident that the value of $F(1, 98) =$



0.232, the value of $p = 0.631$ with $p > 0.05$, shows that there exists no significant difference between the rewards and recognition given to the employees of public and private sector banks, as the P value is more than 0.05 for 5% significance level, so there exists no significant difference between the two samples.

Performance Improvement: Table 4 shows that for performance improvement the value of $F(1, 98) = 0.703$, the value of $p = 0.404$ with $p > 0.05$, shows that there exists no significant difference between the performance improvement of public and private sector banks, as the P value is more than 0.05 for 5% significance level, so there exists no significant difference between the two samples.

FINDINGS:

As a result of the analysis inference can be drawn that there is no difference in the in public sector bank or private sector banks. Both types of banks have the same system.

On the basis of ANOVA conducted for various factors of a Performance Management System, i.e., Performance Planning, Performance Review, Implementation, Feedback, Rewards and Recognition and Performance Improvement, we find no significant difference between the two banks. It means the both types of bank follow the same practices.

CONCLUSION

According to Bassey B. Esu and Benjamin J. Inyang (2009) performance management system in public and private sectors have no difference between them. This is because they both want to achieve goals whether micro or macro. They also stated that Performance management is a widespread approach for planning and maintaining improvements in the performance of employees as well as teams, so as to meet the standards. In the public sector, annual budget and annual performance evaluation are used in managing performance. These two deal with past and not future. The absence of Performance Management System has contributed to the high rate of business failure in the public sector. The adoption of an effective Performance Management System will make public business effective, efficient and sustainable.



It can be concluded through the findings of present study as well that there exists no significant difference in the performance management practices of selected public and private sector banks. However organizations whether public or private have been repetitively searching for an effective performance management system. Assessing organizational performance management has diversity of applications. As Kellen (2003) explained that measuring uses of the organization can be as monitoring and controlling activities, enhancing organizational improvement, increasing the effectiveness of the improvement, aligning the individual goals with organizational goals, providing rewards and maintaining discipline etc.

Many of the reasons organizations report disappointing results from their PMS can be attributed to either implementation or execution, resulting in line managers and employees not taking ownership of the process and treating the PMS as a compliance activity rather than an opportunity to improve performance. When these issues are addressed, and the organization commits resources to the process. The primary purpose of PMS is to facilitate discussion between the employee and their manager. The organization benefits by the day-today activities of employees aligned with and promoting the organizational goals. The employee will benefit by having continual feedback regarding performance and opportunities to improve.

The organization should not consider its Performance Management System as a liability, but should take it as an asset for the development of organizations future. When the organization commits to making the necessary investment, the benefits that organizations can realize are ample. The association of individual performance with organizational goal is also of extreme importance by introducing an appropriate set of performance indicators. Analyzing performance is beneficial only when it is translated into actions. It is essential to create a favorable and healthy environment for maintaining effective and efficient performance with a system to build capacity at all levels of government in order to get results.

RECOMMENDATIONS

Here are some of the recommendations to get an effective performance management in order to successfully achieve the organizational objectives in both public and private sector banks.



- Gaining employee commitment is important as it will improve the employee performance. It helps in building employees' integrity and thus preparing employees to become self-motivated to perform their tasks. Proper recognition of high level performance, by the management is required. The employees should be aware of, the performance management system which helps the employees to discover their potential.
- Healthy interpersonal relationship should be maintained in the organization which will help improve their performance review.
- Engage employees in all decisions concerning performance management. This, according to Nelson and Quick (2008) will make people employ and convey themselves physically and emotionally as they perform their jobs and their work roles.
- One performance appraisal program is generally not designed to serve a number of purposes because it may be vague which can result into failure. The solution is that separate appraisal programs should be designed which can cater the requirement of employees and organization.
- Implementing HR score card in a banking system can ensure the quantitative method of measuring HR related activities and linked with employee's performance measures which help to evaluate performance measures objectively without any biases and errors.

LIMITATIONS OF THE STUDY

The present study makes an effort to look into the difference between various components of performance management systems in public and private sector banks. The study has been conducted under the following limitations

- The findings of study may not be applicable universally as the data has been collected from the banks of Uttarakhand.
- The findings are entirely based on the perception of employees of banks on some components of performance management system.
- The time of research is also limited so it explains the findings for the given phase only.



REFERENCES

- Aguinis, H. & Pierce, C. (2008). Enhancing the relevance of organizational behaviour by embracing performance management research. *Journal of Organizational Behavior*, 29 (1), pp. 139–145.
- Alamelu R., Badrinath V. and Vivekapriya P. (2014), Performance management system (PMS) - a HR strategy in banks, *Advances In Management*, Vol. 7(4) April. pp 7-10.
- Aron, A., & Aron, E. (1999). *Statistics for psychology* (2 ed.). Upper Saddle River, NJ: Prentice Hall.
- Chartered Institute of Personnel and Development (2009), *Performance management: an overview*.
- Drumm, G. (2005), Putting the pieces back together to realign performance in the organization, *Performance Improvement*, Vol. 44 No. 6, pp. 26-30.
- Gautam, Aditya and Jain, Sameeksha (2015), Factors essential for an effective performance management system: a literature review, *Vidya International Journal of Management Research*, Vol. 2 (1-2).
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis*. Prentice Hall Pearson Education.
- Helm, C.; Holladay, C. L., & Tortorella, F.R. (2007). The performance management system: applying and evaluating a pay-for-performance initiative. *Healthcare Management*.
- [https://www.researchgate.net/post/Is it mandatory to have the value of Cronbachs alpha above 70](https://www.researchgate.net/post/Is_it_mandatory_to_have_the_value_of_Cronbachs_alpha_above_70) [accessed Oct 21, 2016].
- Inyang, J.; Esu, B. (2009) A case of performance management in the public sector in Nigeria, *International Journal of Business and Management*, Vol 4, No.4.
- Jain, Sameeksha and Gautam, Aditya (2014), Implementing performance management system: a strategic tool for effective human resource management. *Prabandhan Guru*, 5 (1-2) pp. 28-31.
- Jain, Sameeksha and Gautam, Aditya (2016). Comparison of performance management systems in public and private sector: a study of manufacturing organizations” *International Journal of Management, IT and Engineering*, Vol. 6, No. 5, 111-128.
- Jain, Sameeksha and Gautam, Aditya (2016). Employees’ perception towards performance management system: a study of selected PSUs of Uttarakhand, *International Journal in Management and Social Science*, Vol. 4, No. 3, 235-245.
- Joinson, Carla (January 1996). Reward your best employees. *HR Magazine*, April. p. 49-55.



- Kellen, V. (2003) *Business Performance Measurement: At the Crossroads of Strategy, Decision-Making, Learning and Information Visualization*. Faculty, Ecommerce DePaul University, Chicago, IL, US.
- Nelson, D. L., & Quick, J. C. (2008). *Understanding Organizational Behavior*. USA: Thomson South Western.
- Nunnally, J. C. (1967). *Psychometric theory*. New York: McGraw-Hill.
- Roberts, I. (2001) Reward and performance management. In I. Beardwell & L. Holden (Eds.), *Human Resource Management: A Contemporary Approach* (3rd edn). Edinburgh: Pearson.
- Upadhyay, D. and Gupta A. (2012) Efficacy of performance management system: an empirical study at ICICI bank. *International Journal of Advanced Research in Management and Social Sciences*, Vol. 1, No. 3, pp 216-225.
- Verbeeten, F. (2008) Performance management practices in public sector organizations impact on performance accounting. *Auditing and Accountability Journal* Vol. 21 No 3 pp 427-454.



CORPORATE SOCIAL RESPONSIBILITY

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ABSTRACT

"Corporate Social Responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large" by Lord Holme and Richard Watts Movement aimed at encouraging companies to be more aware of the impact of their business on the rest of society, including their own stakeholders and the environment.

Corporate social responsibility (CSR) is a business approach that contributes to sustainable development by delivering economic, social and environmental benefits for all stakeholders.

CSR is a concept with many definitions and practices. The way it is understood and implemented differs greatly for each company and country. Moreover, CSR is a very broad concept that addresses many and various topics such as human rights, corporate governance, health and safety, environmental effects, working conditions and contribution to economic development. Whatever the definition is, the purpose of CSR is to drive change towards sustainability.

While many companies now practice some form of social responsibility, some are making it a core of their operations. Ben and Jerry's, for instance, uses only fair trade ingredients and has developed a sustainability program for dairy farms in its home state of Vermont. Starbucks has created its C.A.F.E. Practices guidelines, which are designed to ensure the company sources sustainably grown and processed coffee by evaluating the economic, social and environmental aspects of coffee production.

There is a great need of Corporate Social Responsibility as it helps in enhancing the performance of employees as well as improving the image of the company. It not only benefits the shareholders but also satisfies the society.

Thus, this leads to the conclusion that CSR and social responsibility motivates the employees, whose work becomes more meaningful. Through a greater effort of communicating their activities and what it means



to the company and its stakeholders, the employees could gain a higher level of motivation. If a company is successful in communicating to its employees that CSR is important to the company and its stakeholders, such as the consumers, the employees will buy into that.

INTRODUCTION

Corporate social responsibility (CSR), also known as corporate responsibility, corporate citizenship, responsible business, sustainable responsible business (SRB), or corporate social performance .Corporate social responsibility (CSR) is a highly misunderstood & misinterpreted term in India. Some Indian companies believe that merely complying with laws & regulations fulfills their need for social responsibility. A responsible corporate recognizes that its activities have wider impact on the society in which it operates. Therefore it takes account of the economic, social, environmental & human rights impact of its activities on all stakeholders.

Although India is a favorable business destination for western investors it is to be tremendously challenging for any business to remain competitive here in the long term. Unless poor people have equity in the growth of economy, India can never achieve the title of super economy. Here comes the critical role of corporations. Corporate social responsibility is one such niche area of corporate behavior & governance that needs to get aggressively addressed & implemented tactfully in the organizations. At the same time CSR is one effective tool that synergizes the efforts of corporate & the social sector agencies towards sustainable growth & development of the societal objectives at large.

RESEARCH METHODOLOGY

The research paper is based on descriptive and exploratory research showing the role of Corporate Social Responsibility.

DATA SOURCES

The data used in this research is secondary data collected from journals, magazines, articles and media reports, government reports.

CONTENT

Corporate Social Responsibility (CSR) is a concept whereby companies integrate social, environmental and health concerns in their business strategy (policy) and operations and in their interactions with stakeholders on a voluntary basis. The social responsibility of business encompasses the economic, legal,



ethical, and discretionary expectations that society has of organizations at a given point in time. The European Commission's definition of CSR is: "A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis." According to CSR Asia, "CSR is a company's commitment to operating in an economically, socially and environmentally sustainable manner whilst balancing the interests of diverse stakeholders." Today the concept of CSR has undergone radical change. It has integrated social as well as environmental issues into their missions and decisions. Companies take keen interest in informing about their CSR activities to their stakeholders as well. Across the globe, business enterprises have undertaken CSR initiatives in the areas of water conservation, healthcare, rural welfare, environment protection, poverty alleviation, education, community investment projects, culture and heritage, bio-diversity, disaster management and relief, culture and heritage, green environment, product responsibility, governance, waste management and gender equality. While proposing the Corporate Social Responsibility Rules under Section 135 of the Companies Act, 2013, the Chairman of the CSR Committee mentioned the Guiding Principle as follows: "CSR is the process by which an organization thinks about and evolves its relationships with stakeholders for the common good, and demonstrates its commitment in this regard by adoption of appropriate business processes and strategies. Thus CSR is not charity or mere donations. CSR is a way of conducting business, by which corporate entities visibly contribute to the social good. Socially responsible companies do not limit themselves to using resources to engage in activities that increase only their profits. They use CSR to integrate economic, environmental and social objectives with the company's operations and growth."

CSR IN INDIA

CSR is not a new concept in India, Corporate like the Tata Group, the Aditya Birla Group, and Indian Oil Corporation, to name a few, have been involved in serving the community ever since their inception. Several other organizations have been doing their part for society through donations and charity events. India has been named among the top ten Asian countries paying increasing importance towards corporate social responsibility (CSR) disclosure norms. India was ranked fourth in the list, according to social enterprise CSR Asia's Asian Sustainability Ranking (ASR), released in October 2009. „Sustainability in Asia ESG reporting uncovered (September 2010) is based on four parameters viz. General, Environment, Social and Governance. In its study based on 56 companies in India, it observed that India is ranked second in country ranking in Asia and is ranked one ranking in general category. It is observed that reporting is strongly followed by companies as well as they seek international development standards. It could be attributed to the Indian government compelling the public sector companies to provide for community investment and other environmental, social and governance liabilities.

CSR IN SMEs

CSR in SMEs The concept of CSR has extended to SMEs as well. This sector was never taken into account for deliberations and conventional approach to CSR is generally assumed to be the part of large



companies. It is a well known fact that SMEs produce large proportion of country's output, provides huge employment and generate substantial revenues to the government not only in developed countries but developing countries as well. Small to mediumsized enterprises account for about 90 percent of businesses worldwide and are responsible for around 50 to 60 percent of employment. They, potentially have a significant impact on social welfare. As the SMEs also include stakeholders and an impact on the society, it is necessary to understand the role of SMEs in CSR activities.

ENTITIES COVERED UNDER THE CSR OBLIGATIONS

The threshold coverage levels for CSR are low. Companies are subject to the CSR requirements if they have, for any financial year:

- A net worth of at least Rs. 5 billion (approximately U.S.\$80 million);
- A turnover of at least Rs. 10 billion (approximately U.S.\$160 million); or
- Net profit of at least Rs. 50 million (approximately U.S. [\$800,000]).

Companies meeting these thresholds are required to develop a CSR policy, spend a minimum amount on CSR activities and report on these activities, or prepare to explain why they didn't. It is estimated that a total of 8,000 companies in India would be required to meet the CSR requirements among the 9 lakh active companies in India and the 2% CSR expenditure would translate to companies' spending around Rs 12,000 crore to 15,000 crore annually.

BENEFITS OF CSR

Now, business houses have realized that CSR is one of the important ways in which an organization can distinguish itself from its competitors. Some benefits of CSR are as follows:

Benefits to the Company:

1. Improved financial performance
2. Lower operating costs
3. Product safety and decreased liability
4. Workforce diversity
5. Access to capital
6. Reduced regulatory oversight
7. More ability to attract and retain employees
8. Greater productivity and quality
9. Increased sales and customer loyalty



10. Enhanced brand image and reputation

Benefits to the Community and the General Public:

1. Corporate involvement in community education, employment and homelessness programmes
2. Product Safety and quality
3. Charitable contributions
4. Employee volunteer programmes

Environmental Benefits:

1. Greater material recyclability
2. Greater use of renewable resources
3. Better product durability and functionality
4. Integration of environmental management tools into business plans.

LITERATURE REVIEW

1. Anupam Sharma and Ravi Kiran, School of Behavioural Sciences and Business Studies, Thapar University, Patiala, India (2012)- CORPORATE SOCIAL RESPONSIBILITY INITIATIVES OF MAJOR COMPANIES OF INDIA WITH FOCUS ON HEALTH, EDUCATION AND ENVIRONMENT -

In India, many firms have taken the initiatives of CSR practices which have met with varying needs of the society. The present study has made an attempt to understand the status, progress and initiatives made by large firms of India in context to CSR policy framing and implementation. Although India has entered or taken a transformational change by involving into new CSR initiatives, but still a lot has to be done in this area.

2. Bhupender & Vikas Kumar Joshiya, Assistant Professor, University of Delhi (2012)- ISSUES AND CHALLENGES OF CORPORATE SOCIAL RESPONSIBILITY IN INDIA-

Over the time, CSR expanded to include both economic and social interests. Companies have become more transparent in accounting and display „public reporting“ due to pressures from various stakeholders. In this research paper CSR status, challenges of CSR, policies for CSR in India are studied. The concept of CSR is now firmly rooted on the global business agenda. But in order to move from theory to concrete action, many obstacles need to be overcome. Many positive outcomes can arise when businesses adopt a policy of social responsibility.



CONCLUSION

Corporate sustainability is an evolving process and not an end. The Companies bill is a good initiative on the part of the government however what would be included in ,spending "on CSR is unclear and is left for the companies to decide. Across the globe, the concept of CSR has been accepted as an element for success and survival of business along with fulfilling social objectives. However, the challenge for the companies is to determine a strong and innovative CSR strategy which should deliver high performance in ethical, environmental and social areas and meet all the stakeholders objectives".

REFERENCES

- Wikipedia
- Journals of different researchers
- Books from library
- Information on different websites.



STRESS, SPIRITUALITY AND WORK LIFE BALANCE

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ABSTRACT

In the 21st century harmonizing one's personal and work life is not only challenging, but also incredibly important to lead a happier and fulfilling life. In this knowledge and information age, the present generation is in continuous search for exploring meaning in their personal and professional life and they are continuously in search of a job profile that may provide a sense of balanced motivation to them. Therefore, the current focus of organizations is to realize 'work-life balance' in their corporate culture while safeguarding the 'spiritual competence' of the individual professional. The article attempts to throw light on how corporate spirituality programs, de-stressing and restoration of a healthy work-life balance align with each other, in a synergistic manner to the twin benefit of the professional as well as the organization.

Introduction

Stress is basically your body's way of responding to any kind of demand. It can be caused by both good and bad experiences. When people feel stressed by something going on around them, their bodies react by releasing chemicals into the blood. The reality of working life today is that employees are constantly trying to juggle their work and personal lives. In their struggle to balance both, it is often the influence or the interference of one on the other that leads to positive or negative 'spillover'. One possible explanation for increasing work-life problems for employees and organisations around the world is ever increasing job stress. Many organisations today are facing the pressure of market-driven globalisation and an unwavering demand for growth and efficiency (Mauno, et al., 2006). As a result of the increased need for employee work-life balance initiatives, work-life balance and work-life conflict have been increasingly studied in the last two decades.

Spirituality is a broad concept with room for many perspectives. In general, it includes a sense of connection to something bigger than us, and it typically involves a search for meaning in life. Spirituality has many definitions, but at its core spirituality helps to give your life context. It's not necessarily connected to a specific belief system or even religious worship. Instead, it arises from your connection with yourself and with others, the development of your personal value system, and your search for meaning in life.

For many, spirituality takes the form of religious observance, prayer, meditation or a belief in a higher power. For others, it can be found in nature, music, art or a secular community. Spirituality is different for everyone.

Work life balance is a comfortable state of equilibrium achieved between an employee's primary priorities of their employment position and their private lifestyle. Work-Life Balance does not mean an equal



balance. Trying to schedule an equal number of hours for each of your various work and personal activities is usually unrewarding and unrealistic. Life is and should be more fluid than that.

The best individual work-life balance will vary over time, often on a daily basis. The right balance for today will probably be different for tomorrow. The right balance for the single will be different from that of married, having children; when you start a new career versus when you are nearing retirement.

There is no perfect, one-size fits all, balance you should be striving for. The best work-life balance is different for each of us because we all have different priorities and different lives.

Importance of Work Life Balance

- To motivate Employees
- Decreasing the volume of Absenteeism
- Enhance Creativity
- Customer satisfaction
- Quality
- Equal Opportunities/diversity
- Health Costs
- Working in Smarter Condition
- Creating better human beings

Reasons of Stress in life

We live in an era where success is often defined by over-achievement in either our professional or personal lives. When we focus too much on our business or professional goals, our relationships can suffer. Likewise, when we ignore our professional development needs, our job security or business can be put at risk. We're thrown into a constant state of unbalance between the relentless and competitive corporate work ethic, the "need-it-now" mentality encouraged by our dependency on technology, and the desire to see, do, and achieve more each day.

So often, we're driven by the desire for 'more' that we lose sight of what's really important: our relationships, health, and enjoyment of life.

Stress is the body's reaction to the external demands placed upon it by the environment. Stress can be either good or bad. Good stress creates the necessary excitement to perform an activity. This type of stress is temporary and has no long-term effects on the body. Bad stress creates an alarming reaction in the body. It affects the body's immune system and has detrimental effects on the body over a period.

There are many sources of stress for an individual. It can be family, friends, workplace, superiors, and colleagues. The sources of stress for an individual should be identified. The effects of stress may include minor symptoms like headache, irritability, loss of concentration, loss of appetite to major symptoms like insomnia, amnesia, heart attack, ulcers etc. Stress should be identified and treated in the early stages or it could result in a burnout. A severe case or neglected case of stress leads to burnout.

Excessive workloads and office politics can lead many people to a state of burnout, leaving them feeling tired, depressed and lethargic. Personal relationships, our health, and careers can suffer as a result. Even



people working from home question how to balance it all. Although the commute may be easier, the temptation to be glued to the computer and phone is stronger than ever!

We do certain official work often ignoring household responsibilities or children, just to earn extra money. Another type of imbalance can happen, when our personal lives are strained. Parental responsibilities, spousal difficulties, and even the support needs of our aging parents can create a disruptive level of stress. Strains in our personal life can affect our productivity at work and threaten our health and emotional well being.

Stress can be handled by practicing yoga, meditation, pranayama etc. In order to treat stress-related disorders, holistic therapies like aroma therapy, massage therapy, etc., can be very effective. Exercise, diet, and rest play a vital role in stress handling.

Career and Work Life Balance

Certain points have to be kept in mind regarding Work-Life Balance:

Be mindful of your capabilities when adding responsibilities. Acknowledge when certain relationships in your life require special attention to deal with an issue or concern. Trying to treat everything as normal, when it isn't, will catch up with you at one point or another. For example, if your teenager requires your special attention to deal with an urgent issue, it may be a bad time to take on added responsibilities at work and volunteer as a baseball coach. If you can postpone added duties or projects, try to do so.

Attempting to be all things to all people can lead to imbalance and exhaustion.

Communication is critical. Maintain clear lines of communication between you and the people in your important relationships.

Let those in your personal relationships (your spouse, children, or close friends) know when you have added responsibilities or challenges at work so they'll better understand the reasons behind your inaccessibility at certain times.

Miscommunication and misperceptions about behaviors can cause unnecessary and avoidable stress and conflict. Understand that certain relationships go dormant or evaporate over time due to life circumstances. Divorced friends often fall out of touch with married friends. Those with children often find less in common with their single friends.

Trying to salvage these relationships can be exhausting, especially if both people involved don't have the same interest in saving it.

Learning how to compromise. This can be difficult, especially if you feel like you're "giving in," but this skill will be useful in keeping the stress levels down in your life.

If one's boss wants you to work the weekend, ask instead if you can do the work from home in the evenings. In many work situations it doesn't matter how or where the work is done so long as it meets the deadline.



Compromising with your spouse and children will show them that you hear what they're saying and you're willing to come to a fair solution. Gain some more Knowledge related to the work field so that you can work confidently and without feeling overburdened at work place.

Body and health Problems

One of the ways we might discover that our lifestyle needs balance is through our bodies. Many believe our bodies have ways of alerting us to the need for positive lifestyle changes. Headaches, fatigue, sleeplessness, and irritability could all be signs that changes need to be made in our personal or professional lives. These physical signs often start off small, but if we don't make the necessary changes, the problems could continue to grow, thus causing physical harm or damage. Experts agree that serious illnesses can result from the unfortunate combination of mental stress, poor diet, and a heavy workload. You are in charge of how you allow people to treat you at work. Extensive hours at work, too little exercise, or intense strain in your personal relationships can all serve to make you feel unwell.

Spirituality: Discovering it

Uncovering your spirituality may take some self-discovery. Here are some questions to ask yourself to discover what experiences and values define you:

- What are your important relationships?
- What do you value most in your life?
- What people give you a sense of community?
- What inspires you and gives you hope?
- What brings you joy?
- What are your proudest achievements?

The answers to such questions can help you identify the most important people and experiences in your life. With this information, you can focus your search for spirituality on the relationships and activities in life that have helped define you as a person and those that continue to inspire your personal growth.

Cultivating your spirituality

Spirituality also involves getting in touch with your inner self. A key component is self-reflection.

- Prayer, meditation, mindfulness and relaxation techniques help focus your thoughts and find peace of mind.
- A journal helps one to express your feelings and record your progress.
- A trusted adviser or friend can help one to discover what's important to you in life. Others may have insights that you haven't yet discovered.
- Reading inspirational stories or essays help one to evaluate different philosophies of life.



- Talking to others whose spiritual lives one admires helps. Asking questions to learn how others found their way to a fulfilling spiritual life is also helpful.

Pursuing a spiritual life

Staying connected to ones inner spirit and the lives of those around one, can enhance ones quality of life, both mentally and physically. Ones personal concept of spirituality may change with age and life experiences, but it always forms the basis of ones well-being, helps one to cope with stressors large and small, and affirms ones purpose in life.

Spirituality has many benefits for stress relief and overall mental health. It can help one:

- Feel a sense of purpose. Cultivating ones spirituality may help uncover what's most meaningful in one's life. By clarifying what's most important, one can focus less on the unimportant things and eliminate stress.
- Connect to the world. The more you feel you have a purpose in the world, the less solitary one may feel — even when one is alone. This can lead to a valuable inner peace during difficult times.
- Release control. When one feels part of a greater whole, you may realize that you aren't responsible for everything that happens in life. You can share the burden of tough times as well as the joys of life's blessings with those around you.
- Expand your support network. Whether you find spirituality in a church, mosque or synagogue, in your family, or in nature walks with a friend, this sharing of spiritual expression can help build relationships.

People who consider themselves spiritual may be better able to cope with stress and may experience health benefits

Personal and spiritual growth means different things for different people. Most will still agree that people are spiritual beings and that the spiritual component of who we are needs to be satisfied and nourished like other aspects of our being.

We experience personal growth when we learn what our potential is for success and happiness, and at the same time, what our limits are in reaching for that potential.

Personal growth occurs with time, effort, and a willingness to adapt. Having supportive people in our relationships can also help us to grow personally. When we feel spiritually drained, it's a sign that there is some personal growth that needs to take place. It's hard to get through serious challenges in life – whether it's professional challenges or personal tribulations – when you're already suffering on the inside.

In becoming more caring people, we become more than just a workaholic or someone's sibling—we become part of a spiritual community that gives us strength. Taking the time to reflect on your life is an important part of one's development and growth. This is a necessary ingredient to achieve peace and balance in one's life.



Research Findings

The 'myth of separate worlds' where work and life are kept as separate bordered entities no longer reigns to be true (Kanter , 1977) . Hence, the capacity to bring one's whole self or one's spirituality to the workplace has steadily ascended as a topic of concern amongst researchers. Today's organization seeks greater levels of commitment, production, and efficiency from employees, at the same time it is expected that they must begin to care for the whole person (Bell and Taylor, 2001). It is said that when an organization cultivates an atmosphere of meaningfulness, concern & recognition in its work profile, the employee concerned will feel more engaged and committed. Therefore , the development and integration of HR initiatives , aiming to engage professionals is a prospective area for fostering meaningful workplace which will potentially address to realize the issues pertaining to work-life balance.

In present times, workplace spirituality occupies a prominent position in the field of organizational behavior and human resource management and even in other areas of research as the field has spread its wing from industry to academic to prove its significant and nurturance. In this connection, while exploring some of the related areas the researchers have sensed that the way forward for research with spiritual competence or spirituality in organizational setting appears most promising if it has a strong conceptual and theoretical grounding for developing valid measures of the construct.

Many scholastic findings in this connection have advocated that employee professionals who are provided to work in a meaningful job profile use to have a greater sense of responsibility, ownership and control of their working life (Galinsky & Johnson, 1998; Ferris & Weitzman et.al, 2001; Morris, 2008). Predominantly, professional individuals are found to be more attracted to organizations offering flexible and meaningful career paths regardless of whether the salient identities centred on other welfare amenities extended by traditional organizations (Honeycutt and Rosen 1997).

The findings are also consistent with research conducted by Greenhaus and Beutell (1985), Wallace (2005), Wong and Lin (2007) and O'Laughlin and Bischoff (2005), which have indicated that high levels of job stress tend to decrease work-life balance and increase work-life conflict among a variety of occupations across the globe.

It was found that there is a moderate positive relationship between spiritual competence and work life balance. (Jena L.K. , Pradhan R.K. , 2014) . Other findings have confirmed that increased spirituality was positively associated with increased well-being , increased sense of meaning and purpose in life found in an empirical study with medically based life style program (Kennedy , James E. et al 2003).

Findings also suggest that when people experience workplace spirituality, they feel more affectively attached to their organizations, experience a sense of obligation or loyalty towards them, and feel less instrumentally committed.



Conclusion

Life in the 21st century can be so complicated and fast paced that it's no wonder so many people are struggling to achieve balance in their lives.

Given the high escalation of stress in today's demanding world, and imminent pointers reflecting its effect on work life balance, there is something very substantial on the agenda. There is an use of workplace spirituality in organizational HR practices and it would not be illogical to assume the semblance with worklife balance. Therefore ,there emerges a direction showing the increasing relevance of spiritual competence into work-life balance.

In a new world of organizations, spiritual competence and skills of an individual may play a more crucial role to enhance one's satisfaction, health, commitment, confidence and all the factors responsible for maintaining work-life balance in a professional set up. Hence, it may be suggested that organizations need to provide emphasis upon their HR strategies especially employee centric welfare strategies towards deriving increased effectiveness in face of ever changing environment and mounting external pressure as careful handling of issues like spiritual competence and work-life balance is expected to provide an effective buffer for facing future challenges.

Spirituality has ancient roots in India and the world listens to India when it comes to some of its elements viz. yoga , meditation and relaxation techniques. Therefore it is high time that organization make a formal induction of spirituality based programs if not adding to their wellness programs.

References

1. Bell A.S. , Rajenderan D. & Theiler S. (2012) , Job Stress, Wellbeing, Work-Life Balance and Work-Life Conflict Among Australian Academics, *Electronic Journal of Applied Psychology*. 8(1): 25-37
2. Conger, J.(1994), *Spirit at work : Discovering the spirituality in leadership* . Jossey- Bass, San-Francisco.
3. Fairholm, G. W. (1996), *Spiritual leadership : fulfilling whole-self needs at work*. *Leadership and organization development journal*. Vol. 17(5); pp. 11-17.
4. Ferris A.J. & Weitzman, M. (2001). Finding an extra day a week: The positive influence of perceived job flexibility on work and family life balance. *Family relations*, 50, 49-58
5. Greenhaus, J. H., & Beutell, N. J. (1985). Sources of conflict between work and family roles. *Academy of Management Review*, 10(1), 76-88.
6. Jena L.K. & Pradhan R.K. , (2014) *Workplace Spirituality and Work-Life Balance : An Empirical Introspection in Indian Manufacturing Industries* , *International Journal of Applied Psychology* , Vol.4 No. 4
7. O'Laughlin, E., & Bischoff, L. (2005). Balancing parenthood and academia: Work/family stress as influenced by gender and tenure status. *Journal of Family Issues*, 26(1), 79-106.



8. Thompson, C.A., Beauvais, L.L., and Lyness, K.S. (1999), 'When work-family benefits are not enough: The influence of work family culture on benefit utilization, organizational attachment , and workfamily conflict', *Journal of vocational behavior*, 54(3), 392-415.
9. Wallace, J. E. (2005). Job stress, depression and work-to-family conflict: a test of the strain and buffer hypotheses. *Relations industrielles*, 60(3), 510-539.
10. Wong, J., & Lin, J. (2007). The role of job control and job support in adjusting service employee's work-to-leisure conflict. *Tourism Management*, 28(3), 726-735.
11. Work Life Balance , Altrade Group



CASHLESS ECONOMY: A STEP TOWARDS GREEN ECONOMY

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ABSTRACT

The Indian economy is moving towards cashless economy after the demonetization of Indian currency notes on November 8, 2016. The initial awe and confusion has given way to a whole lot of concerns debating the benefits and drawbacks of moving towards a digital market place. The government has come up with a bouquet of discounts and freebies on digital transactions to incentivize the move towards a cashless economy. However the way seems to be difficult as India has a low internet penetration of 34.8% (2016) according to Internet Live Stats and only 26.3% of all mobile users have a smartphone (2015) as per Statista figures.

The ease of conducting financial transactions is probably the biggest motivator to go digital. It is safer and easier to transact online while travelling, in case of medical and other emergencies, during peak office hours and busy schedules. But since we are culturally not attuned to digital transactions, we are more prone to fall into phishing traps. Even well educated people are facing the higher incidence of online frauds and the theft of identify is the biggest fear. Another weak link is the inadequate grievance redressal mechanism to deal with such kinds of frauds.

The present paper is an attempt to study the process of going cashless with a detailed insight into the advantages and disadvantages of digital transactions. The cashless economy will bring about convenience and tangible benefits or will just add to the stress and additional charges are a matter of discussion. This paper tries to bring together all these different aspects and viewpoints to a common platform and analyse whether India is truly moving towards the Green economy.

Introduction

Cashless economy is a situation in which the flow of cash within an economy is non-existent and all transactions are done through electronic media channels such as direct debit, credit and debit cards, electronic clearing, payment systems such as Immediate Payment Service (IMPS), National Electronic Funds Transfer (NEFT) and Real Time Gross Settlement (RTGS). Today, credit cards and online payment services are becoming increasingly popular in urban India but paper currency notes are still an essential



part of daily life. Cash may be defined as any legal medium of exchange that is immediately negotiable and free of restrictions.

Indians are the fourth-largest user of cash in the world. The rate of cash to GDP is the highest, i.e. 12.42 percent in India. Cash in circulation to private consumption ratio in India is 20 percent, and Card transactions account for 4 percent of the personal consumption expenditure. As most of people are illiterate, poor, engaged in small transactions and having less banking habits. For them cash is the most convenient and easy form of medium of exchange, free from hassles. A cash transaction is immediate and doesn't involve any intermediary. Cash provides individuals and families with liquidity. One need not to worry about a computer system crashing, power going off, and losing transaction midway. Use of cash doesn't involve any extra cost as in the use of debit/credit cards. Even in the most cashless countries like France and the Netherlands, cash still accounts for 40 percent or more of all consumer transactions. Usually cashless economies have low corruptions and less black money. Almost every country is bracing towards cashless economy, and many countries have made significant progress. It is just a world trend which India is trying to catch up.

With the announcement of the Government of India (GoI) on 8th November 2016 about the demonetization of existing INR500 and INR1,000 currency notes and introduction of new notes, the country is trying to move towards a cashless environment and the initial awe and confusion have given way to a flurry of concerns. The emphasis on online transactions provides convenience and tangible benefits to the people or just add to stress and additional transaction charges is still a matter of debate.

Why is Cash Required?

The magnificence of cash is that -- it just works; even in the isolated whereabouts of India, where the government might not be present physically with its paraphernalia, its injunction runs in the form of legal tender that public uses for business on an everyday basis. A large informal economy that supports a major part of Indian population and their livelihoods also runs in cash. This is why Cash is yet King.

The ground reality reveals, a majority of transactions in Kirana stores, the go-to shop for daily purchases in India are cash based transactions, because these are generally small ticket transactions. The customers, as well as Kirana store owners feel more comfortable in dealing with cash for small transactions, while these merchants also provide credit facility to customers.

However, the governments drive to incentivise consumers and merchants alike to move to electronic modes of payments has not found many takers because our cash driven economy is fuelled through rampant corruption in society and black money. The modus operations for corruption are cash so unless we rid our society of corruption at all levels this will be a huge task. Imagine paying a corrupt official through your e-wallet it will never happen.

Also another point to ponder on is why India has such less tax payers in a population of over 1.2 billion people. Is 98% of our population earning below 2.5 lakhs a year. This is one of the issues that needs to be addressed and hopefully with many more transaction moving electronic & records of the same being made available many more people should fall under the tax net be it small merchants, professionals etc. Will this



segment of society adapt to electronic modes of payment so that the nation can benefit from a higher tax collection leading to better benefits to society at large?

The challenge to go digital

A major obstacle for the quick adoption of alternate mode of payments is mobile internet penetration, which is crucial because point-of-sale (PoS) terminal works over mobile internet connections, while banks have been charging money on card-based transactions, which is seen as a hurdle. The low literacy rates in rural India, along with the lack of infrastructure like internet access and Power make things extremely difficult for people to adopt e-transaction route.

The financial safety over the digital payment channels is important for pushing the cashless economy idea. Imagine losing one's credit cards or being the victim of digital hackers can lead to a whole host of issues like denied payment, identity theft, account takeover, fraudulent transactions and data breaches. According to the digital security company Gemalto, more than 1 billion personal records were compromised in 2014.

'Cashless' economy is not an innocent or harmless goal. It conveys a complete lack of empathy for the poor and those who have minimal or no access to the digital world. No economy has become 'cashless', not even the most developed economies (see table):

	Cash(%)	Debit Card(%)	Credit Card(%)
Australia	65	21	09
Austria	80	15	02
Canada	52	25	20
France	55	30	01
Germany	80	12	02
Netherlands	50	40	01
United States	46	27	19

(Source: Bloomberg)

The value of dollars and euros in circulation has doubled since 2005 to \$1.48 trillion and €1.1 trillion respectively. The US and Europe are using more cash, not less cash! The world over, the necessary and desirable rule is that people must have cash in their hands and be able to carry out routine transactions using cash. It is perfectly legitimate for a government to make a law that high-value transactions shall be by cheque or any mode of digital payment — examples are real-estate transactions, high-value jewellery, large contractual payments, debt repayments, payment of certain taxes etc.

On the other hand, to insist that a farmer shall pay hired labour in digital mode or a homemaker shall buy vegetables by swiping a card is an unwarranted intrusion and puts an oppressive burden upon the payer and the payee. Remember, there is a cost to digital payment that will be borne by the consumer. Subject to



a reasonable law concerning high-value transactions, we must have the freedom to choose the mode of payment. That is our right and no government should be allowed to interfere with that right.

Up until this campaign, India was an incredibly cash-centric economy. Cash accounted for upwards of 95% of all transactions, 90% of vendors didn't have card readers or the means of accepting electronic payments, 85% of workers were paid in cash, and almost half of the population didn't even have bank accounts. Even Uber in India accepted cash — the only country in the world where this option is available — and “Cash on Delivery” was the preferred choice of 70% of all online shoppers.

By temporarily turning off the engines which drove the cash economy, India hoped that more people could be brought into the fold by using track-able — and taxable — digital financing vehicles, like debit cards and e-wallets. The digital era is something to embrace, and new methods of payments will continue to be introduced. But Indians need to recognize the risks and benefits of different payment instruments, the risks associated with electronic payment instruments are far more diverse and severe. Recently lakhs of debit card data were stolen by hackers; the ability of Indian financial institutions to protect the electronic currency came into question also an important reason why people favour cash.

Advantages of going cashless

➤ **Convenience**

The ease of conducting financial transactions is probably the biggest motivator to go digital. There will no longer be a need to carry wads of cash, plastic cards, or even queue up for ATM withdrawals. It's also a safer and easier spending option when one is travelling and also in case of emergencies as in hospitals. One has the freedom to transact whenever and wherever one wants. There is no need to be physically present to conduct a transaction and there is no compulsion of transacting during office hours only. The benefits are enormous, it is constructive and simple.

➤ **Discounts**

The recent waiver of service tax on card transactions up to Rs 2,000 is one of the incentives provided by the government to promote digital transactions. This has been followed by a series of cuts and freebies. It's a good time to increase the savings if one takes advantage of these. For instance, 0.75% discount on digital purchase of fuel means that the petrol price in Delhi at Rs 63.47 per litre can be brought down to Rs 62.99/l with digital payment.

Similarly, saving on rail tickets, highway toll, or purchase of insurance can help cut the costs. In addition to these the cashback offers and discounts offered by mobile wallets like Paytm, as well as the reward points and loyalty benefits on existing credit and store cards could help to improve the cash flow marginally.



➤ **Tracking expenditure**

It is easier to keep track of one's spending if all transactions are on record. It will also help while filing income tax returns and, in case of a scrutiny, people will find it easy to explain their spends. Besides the tax, it will also have a good impact on budgeting.

➤ **Budget discipline**

The written record will help keep tabs on people's spending and this will result in better budgeting. Various apps and tools will help people analyse their spending patterns and throw up good insights over a couple of years. Controlled spending could also result in higher investing. If the same amount of cash does not flow back into circulation and people continue to use mobile wallets and cards, it is also likely to bring down the latte factor. This means that the Rs 10 you spent on candy or chips, or that regular cup of coffee office is likely to take a hit since you will be short of loose change and smaller currency notes. There's a lesser chance of budgetary leaks and unaccounted for spends sneaking into your budget at the end of the month.

➤ **Lower risk**

If stolen, it is easy to block a credit card or mobile wallet remotely, but it's impossible to get your cash back. In that sense, the digital option offers limited security. This is especially true while travelling, especially abroad, where loss of cash can cause great inconvenience. Moreover if the futuristic cards are evolved to use biometric ID (finger prints, eye scan, etc), it can be extremely difficult to copy, making it a very safe option.

➤ **Small gains**

It may not seem like much of an advantage, but being cashless makes it easy to ward off borrowers. Another plus is that you can pay the exact amount without worrying about not having change or getting it back from shopkeepers.

Drawbacks of digital transactions

➤ **Higher risk of identity theft**

The biggest fear is the risk of identity theft. Since Indians are culturally not attuned to digital transactions, even well-educated people run the risk of falling into phishing traps. With the rising incidence of online fraud, the risk of hacking will only grow as more people hop on to the digital platform.



Besides, the latest move by the government to remove the two-factor authentication process for online transactions up to ₹2,000, will not help. Irrespective of the size of transaction, the absence of this additional layer of security will expose thousands to the risk of identity theft. Another weak link is the inadequate redressal mechanism.

Given the tedious process and poor grievance redressal, people will have no easy recourse if they lose money online. There is no stringent legal process to deal with this kind or scale of fraud. In addition to this there is risk of mass identity theft from banks' or companies' databases and it can turn into a financial nightmare akin to the data breach in the Indian banking system in October this year.

➤ **Losing phone**

Since one will be dependent on the phone for all transactions on the move, losing it can prove to be a double trouble. It can not only make one susceptible to identity theft, but one could also be rendered helpless in the absence of physical cash or any other payment option. This can be especially problematic if a person is travelling abroad or in smaller towns or villages with lack of banking infrastructure or other payment options. Another drawback is that one need to keep the phone constantly charged. If the phone gets discharged in the middle of an important purchase or dealing with an emergency, one will be stranded.

➤ **Difficult for tech-unsavvy**

India has a low Internet penetration of 34.8% (2016), according to the Internet Live Stats, and only 26.3% of all mobile phone users have a smart phone (2015), as per Statista figures. Besides the practical difficulty of going digital is the bigger block of the psychological shift. One is suddenly jumping three generations to the digital medium. It is a problem for the older people, who may suddenly find themselves locked out of their accounts if they can't download an app or don't have cash. The digital medium may prove a challenge for the tech-unfriendly people, who will need more time to adapt or the availability of other options to conduct transactions.

➤ **Overspending**

While there is no denying the convenience of card or mobile wallet transactions, it could open a spending trap for an unsuspecting population. According to behavioural finance theorists, the pain of parting with money is felt more acutely if one uses physical cash instead of a card. Hence, using cash instead of cards or mobile wallet will act as a natural bulwark for people who find it difficult to control their spending. This is the reason that people could end up overspending, throwing their budgets into a disarray.



Is it possible to go Cashless?

Cash is like water a basic necessity without which survival is a challenge. Nevertheless, cash use doesn't seem to be waning all that much, with around 85% of global payments still made using cash. One of the main reasons is that there is nothing to truly compete with the flexibility of notes and coins

A high penetration of the digital payment system is contingent on the fact that the same amount of cash does not come back into circulation. If it does, people are more likely to switch back to the former ease of using cash as it is a habit that they may find difficult to break. Even as ordinary citizens queue up for cash and economists are busy estimating the extent to which economic growth will be hit because of the ongoing drive to replace high-value banknotes, there has been a lot of discussion on whether the government can use the current situation to push India towards a cashless future.

Reducing Indian economy's dependence on cash is desirable for a variety of reasons. India has one of the highest cash to gross domestic product ratios in the world, and lubricating economic activity with paper has costs. According to a 2014 study by Tufts University, *The Cost Of Cash In India*, cash operations cost the Reserve Bank of India (RBI) and commercial banks about Rs21,000 crore annually. Also, a shift away from cash will make it more difficult for tax evaders to hide their income, a substantial benefit in a country that is fiscally constrained.

To be sure, the government on its part is working at various levels to reduce the dependence on cash. Opening bank accounts for the unbanked and adoption of direct benefit transfer is part of the overall idea to reduce usage of cash and increase transparency.

RBI has also issued licences to open new-age small finance banks and payments banks which are expected to give a push to financial inclusion and bring innovative banking solutions. Things are also falling in place in terms of technology for India. The recently launched Unified Payments Interface by National Payments Corporation of India makes digital transactions as simple as sending a text message.

Hurdles on the way

The exercise to exchange currency notes and the ongoing currency crunch be a decisive factor in making India a truly cashless economy. It is a defining point in India moving to cashless. Shortage of cash has significantly increased the use of digital modes of payment, but the actual shift will only be visible after the cash crunch eases. It is possible that a section of people which has used electronic mode of payment for the first time due to the cash crunch will continue to transact through this medium, but there are still a number of hurdles in making India a cashless economy.

First, a large part of the population is still outside the banking net and not in a position to reduce its dependence on cash. According to a 2015 report by PricewaterhouseCoopers, India's unbanked population was at 233 million. Even for people with access to banking, the ability to use their debit or credit card is limited because there are only about 1.46 million points of sale which accept payments through cards.

Consumers may be divided into three categories based upon the degree of access to the digital world: real access, minimal access and no access. 71 crore debit cards have been issued so far; in August 2016, these



cards were used to withdraw from ATMs Rs 2,19,657 crore but were used to make payments of only Rs 18,370 crore. To put a card or a smartphone in everyone's hand, to provide real access to everyone, and to make everyone adopt the digital mode will require advocacy, education and persuasion, not coercion — and without restricting the person's fundamental right to use cash.

Second, about 90% of the workforce, which produces nearly half of the output in the country works in the unorganized sector. It will not be easy for the informal sector to become cashless, and this part of the economy is likely to be affected the most because of the ongoing currency swap.

Third, there is a general preference for cash transactions in India. Merchants prefer not to keep records in order to avoid paying taxes and buyers find cash payments more convenient. Although cashless transactions have gone up in recent times, a meaningful transition will depend on a number of things such as awareness, technological developments and government intervention. For instance, mobile wallets have seen notable traction, and it is possible that a large number of Indians will move straight from cash to mobile wallets. A study by Boston Consulting Group and Google in July noted that wallet users have already surpassed the number of mobile banking users and are three times the number of credit card users

However, as noted above, a material transition to a cashless economy will depend on a number of factors. First, the availability and quality of telecom network will play an important role. Presently, people face difficulties in making electronic payments even in metro cities because of poor network. Second, as one of the biggest beneficiaries of this transition, banks and related service providers will have to constantly invest in technology in order to improve security and ease of transaction. People will only shift when it's easier, certain and safe to make cashless transactions. Third, the government will also need to play its part. It will have to find ways to incentivize cashless transactions and discourage cash payments. Implementation of the goods and services tax, for example, should encourage businesses to go cashless. Government should also use this opportunity to revamp the tax administration, as more than taxes, small businesses fear tax inspectors.

The government will have to create conditions—not necessarily by creating cash shortages—to push cashless transactions to a threshold level after which the network effect will take over. India may not become a cashless economy in the foreseeable future, but it needs to reduce its unusually high dependence on cash to bring in much needed transparency and efficiency in the system.

Cashless India: a rising hope

There is hope and greater scope for fast transition to cashless economy. A report by Google India and the Boston Consulting Group states that by the year 2020, \$500 Billion worth of transaction would happen online, increasing by 10 times. It is expected that the cash based payments would fall 40% by 2025.

India is currently in the middle of an all out movement to modernize the way things are paid for. New bank accounts are being opened at a heightened rate, e-payment services are seeing rapid growth, cash-on-delivery in e-commerce has crashed and digitally-focused sectors like the online grocery business have started booming. Even the vegetable vendors on the streets have opened up Paytm accounts and they have



a machine outside their shop where someone can scan the bar code and make the payment. A lot more retail outlets are accepting e-wallets, including the laundry provider and the *dabbawala*, this is revolutionary, and survival of the fittest.

Paytm reported a three-times surge in new users adding on over 14 million new accounts in November alone. While Oxigen Wallet's daily average users increased by 167% since demonetization began. Cryptocurrencies like Bitcoin and Asiadigicoin have also been the recipients of a positive upswing.

The lack of cash in the economy combined with the buzz around electronic payments systems has also sparked some very innovative solutions. The farmers' markets of Telangana began experimenting with their own electronic payment system where customers with Aadhar-linked bank accounts could buy vegetables using tokens which could be purchased via debit cards at specialized kiosks.

These changes indicate towards a more inclusive society in the future. There are several areas in which India is trying to improve its digital economy, which include simpler, more technologically advanced digital payment systems, increased merchant acceptance, improvements in UPI, which allows monetary transfers between any two bank accounts via a smartphone, as well as a reduction in cash-based transactions.

Conclusion

The Prime Minister's move to incentivize digital payments will offer a strong support to the ongoing efforts in helping the country leapfrog the cash generation to digital payment solutions. This will not only help millions of Indians overcome the hassles of dealing in cash but also act as a significant step towards propelling India to emerge as a truly cashless economy.

Digitalizing a wider swath of the economy is meant to be a fix for many aspects of India's society that the government aims to reform. First of all, it creates a way for all purchases to be tracked and recorded, which can work towards limiting the effectiveness of the black market as well as stemming the flow of capital that's destined to fund terrorist activities.

Economic digitization also increases the government's ability to enhance its taxation systems. India's informal economy is responsible for roughly 45% of GDP and 80% of employment, which means that billions of dollars are being exchanged each year without the tax collector taking his cut. Currently, only 1% of India's population pays income tax. A digital economy is an economy which is tracked in real time. Each transaction is mapped and it will certainly help expand the tax net.



India hopes to create a cleaner, more transparent economy via digitalization that will lead to an improved climate for foreign investment, boost economic growth, and ultimately propel the country to the next chapter of its emerging markets story i.e, the Green Economy, an economy that aims at reducing environmental risks and ecological scarcities, and that aims for sustainable development without degrading the environment.

References

- Dr Meenu Jain , “Globalization and Social Transformation: Indian Experience Research Process” International Journal of The Social Research Foundation Volume 2, Number 1 January –June 2014, pp. 120-131 © Social Research Foundation.
- Dr Meenu Jain , “Structural Change in the Course of Economic Development ; India’s experience”, Vol .5 issue 5 , pp 15-17 Indian Journal of applied Research Journal, May 2015
- Piyush kumar , “An analysis of growth pattern of cashless transaction system”, Vol. 3, Issue 9, Sep 2015, 37-44 © impact journals
- RBI Bulletin December 2016
- <http://www.theglobaljournals.com/ijar/issues.php?m=May&y=2015&id=47>
- <https://www.quora.com/What-is-the-history-of-demonetization-of-Indian-Currency>
- <http://blogs.timesofindia.indiatimes.com/cash-flow/demonetization-in-1946-and-1978-stories-from-the-past/>
- <https://www.studydhaba.com/demonetization-pdf/>
- <http://www.indiatimes.com/news/world/here-s-a-list-of-countries-that-have-trieddemonetisation-before-india-265743.html>
- <http://www.japantimes.co.jp/opinion/2016/11/27/commentary/worldcommentary/economic-political-risks-indias-demonetization/#.WFLBE>
- <http://www.livemint.com/Opinion/rMImvbuYNDk4RvWGfcMtQO/Ambedkarrupee-and-our-current-troubles.html>
- <http://qz.com/832111/the-rupees-long-journey-a-short-history-of-over-150-yearsof-paper-currency-in-india/Ground>
- <http://www.nipfp.org.in/publications/working-papers/1772/>
- <https://www.researchgate.net/...Cashless...India/.../0f317536c3b1b15565...>
- Who’s Powering the War on Cash? <http://wolfstreet.com/2016/10/19/powers-onforefront-of-war-on-cash/>
- <http://www.thehindu.com/news/resources/the-political-economy-of-demonetising-high-value-notes/article9348002.ece>
- http://www.mastercardadvisors.com/_assets/pdf/MasterCardAdvisors-CashlessSociety.pdf
- <http://www.governancenow.com/news/regular-story/-india-headed-wardsbecoming-a-cashless-economy#sthash.PgYw5ReU.dpuf>
- <http://indianexpress.com/article/opinion/columns/demonetisation-cashless-economy-a-distracting-mirage-black-money-income-tax-department-4443622/>
- <http://www.businesstoday.in/opinion/columns/money-today/cashless-indian-economy-%E2%80%933a-reality-/story/241987.html>



- <http://www.livemint.com/Opinion/XGbavEnoeP7dZITeh21MRM/Making-India-a-cashless-economy.html>
- <http://www.thehindu.com/opinion/lead/Notes-for-a-cashless-economy/article16760046.ece>
- <https://www.forbes.com/forbes/welcome/?toURL=https://www.forbes.com/sites/wadeshepard/2016/12/14/inside-indias-cashless-revolution/2/&refURL=&referrer=>
- <http://cashlessindia.gov.in/>
- <http://www.businesstoday.in/opinion/columns/money-today/cashless-indian-economy-%E2%80%93a-reality-/story/241987.html>
- <http://economictimes.indiatimes.com/wealth/spend/going-cashless-is-it-good-for-you/articleshow/55908649.cms>



STARTUP INDIA – A STEP TO BOOST DIGITAL ENTREPRENEURSHIP

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ABSTRACT

India is a developing country where the each person has a different type of quality and skills. Prime Minister Narendra Modi launched an ambitious program called Startup India (Standup India). It's aim at revolutionising and accelerating the startup revolution in India. It is a mechanism or strategy that help to find those quality and skills in economics way. This is a strategy to create employment through the Entrepreneurship .Entrepreneurs who are keen to setting up factories are support in their endeavours and several companies which are today household names were beneficiaries of this ecosystem .To name a few Reliance, Biocon, Infosys etc are some of the big names. However, the DFIs support predominantly through loans and earned healthy returns when a company do well. This reseach aim to investigate biggest question facing startups "financing".The research analysis included that making capital more accessible and cheaper, easier patent filing, giving research and development credits, and easier entry and exits are critical to the success of Startup India. **Keywords** – Startup India, Entrepreneur, Seed Funding, Incubators.

Introduction An initiative by our honorable Prime Minister Mr. Narendra Modi to create a great environment for startups in India .The campaign was first announced by Prime Minister Modi in his 15 August 2015 address from the Red Fort. Prime Minister Narendra Modi with Finance Minister Arun Jaitley and Commerce and Industry Minister Normal Sitharaman launching the “Startup India” action plan at Vigyan Bhawan in New Delhi on Saturday (16 JAN 2016).



- Among the attendees were around 40 top CEOs and startup founders and investors from Silicon Valley as special guests including
- Masayoshi Son, CEO of SoftBank,
- Kunal Bahl, founder Snapdeal,
- Bhavish Aggarwal, founder Ola
- Vijay Shekhar Sharma, founder Paytm
- Travis Kalanick, founder of Uber,
- Adam Neumann, CEO of WeWork,
- BJ Arun, CEO of July Systems,
- Prateek Kr. Bhowmick, Co-founder of ReviewAdda,
- Sachin Bansal, Co-founder of Flipkart,
- Naveen Tewari, Co-founder of Inmobi and others

India ranks third among global startup ecosystems with more than 4,200 new-age companies, IT industry body Nasscom said today. The Economic Survey 2015-16 released by the Government and which was tabled by finance minister Arun Jaitley the Economic Survey 2015-16 released by the Government and which was tabled by finance minister Arun JaitleyThe country has more than 19,000 technology-enabled startups .

Incubator and Accelerators across India

Mumbai	Chennai	Bangalore	Kerala	Ahmadabad	Delhi
Sine,IIT	The startup center	Microsoft accelerator	The startup Village	CIIE, IIM Ahmadabad	Indian angle network incubator
Venture nursery	RTBI,IIT Madras	Khosla Labs	Technopark TBI	NDBI,NIT Abd	The Hatch
Seedfarm	Villgro,IIT Madras	NSRCEL,IIM Bangalore	TBI,NIT Calicut	Comm.TBI MICA	TBIU,IIT Delhi
GSF	TBI,Anna Uni.	Angle prime			Tlabs
Un.Ltd India		Kyron GSf			GSF



<http://inc42.com/resources/50-amazing-startup-incubators-and-accelerators-in-india/>

The World's top 10 Startups 2015 to 2016

Companies	Total Equity Funds
Uber	\$ 51 Billion
Xiaomi	\$ 46 Billion
Airbnb	\$ 25.5 Billion
Palantir	\$ 20 Billion
Snapchat	\$ 16 Billion
Didi kuaidi	\$ 16 Billion
Flipkart	\$ 15 Billion
Space X	\$ 12 Billion
Pinterest	\$ 11 Billion
Dropbox	\$ 10 Billion

<http://www.businessinsider.com/startups-valued-at-more-than-10-billion/>

Purpose of the research

1. To understand the financing and funding problems
2. To understand the initiative of Startup India
3. To study about recent light changes announced by the government

Literature review

Fundraising problems

According to a recent study, over 94% of new businesses fail during first year of operation. Lack of funding turns to be one of the common reasons. Money is the bloodline of any business. The long painstaking yet exciting journey from the idea to revenue generating business needs a fuel named capital. That's why, at almost every stage of the business, entrepreneurs find themselves asking – How do I finance my startup? Now, when would you require funding depends largely on the nature and type of the



business. But once you have realized the need for fund raising, below are some of the different sources of finance available.

Initiative of startup India

Here is a comprehensive guide that lists 10 funding options for startups that will help you raise capital for your business. Some of these funding options are for Indian business, however, similar alternatives are available in different countries. Providing Funding Support through a „Fund of Funds“ with a Corpus of INR 10,000 crore .Government will set up a fund with an initial corpus of INR 2,500 crore and a total corpus of INR 10,000 crore over a period 4 years (i.e. INR 2,500 crore per year). The Fund will be in the nature of Fund of Funds, which means that it will not invest directly into Startups, but shall participate in the capital of SEBI registered Venture Funds. Key features of the Fund of Funds are highlighted below:

- The Fund of Funds shall be managed by a Board with private professionals drawn from industry bodies, academia, and successful Startups
- Life Insurance Corporation (LIC) shall be a co-investor in the Fund of Funds
- The Fund of Funds shall contribute to a maximum of 50% of the stated daughter fund size. In order to be able to receive the contribution, the daughter fund should have already raised the balance 50% or more of the stated fund size as the case maybe.
- The Fund shall ensure support to a broad mix of sectors such as manufacturing, agriculture, health, education, etc.

10 Funding Options To Raise Startup Capital For Your Business

1. Bootstrapping
2. Crowdfunding
3. Get Angel Investment
4. Get Venture Capital
5. Funding From Business Incubators & Accelerators
6. Raise Funds by Winning Contests
7. Raise Money through Bank Loans
8. Business Loans from Microfinance Providers or NBFCs

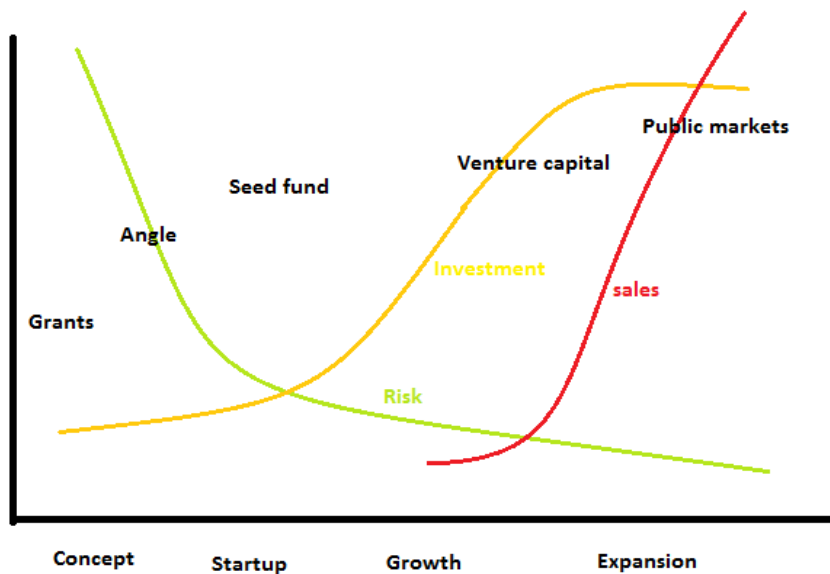


- 9. Govt Programs That Offer Startup Capital
- 10. Quick Ways to Raise Money for Business

Investments

Softbank (headquartered in Japan), has invested US\$2 billion into Indian start-ups. The Japanese firm had pledged the total investments at US\$10 billion. Google declared to launch a startup, based on the highest votes in which the top three start-ups will be allowed to join the next Google Launchpad Week, and the final winner could win an amount of US\$100,000 in Google cloud credits. Oracle on 12 February 2016 announced to set up nine incubation centres in Bengaluru, Chennai, Gurgaon, Hyderabad, Mumbai, Noida, Pune, Trivandrum and Vijayawada.

Startup funding process



Research Methodology In this research paper, secondary data is used to the greater extent. The data received from various sources are properly classified into table, graphs, etc. The information is transformed into meaningful conclusion in the form of percentages share, annul growth, etc. The secondary data is taken from <http://www.profitbooks.net/startup-india/>, <http://www.grantthornton.in/globalassets/1.-member-firms/india/assets>, etc. **Conclusion** The analysis shows that online startups in India have come a long way since the starting of internet technology in India. The central theme is that ease of starting and ending is critical in the context high rate of startup mortality. In this research paper found that respondents supported the idea of funding for incubation centers. The



Government proposal do so, across Universities, innovation movements, research parks and industry parks is on similar lines. The announcement of an initial capital of 10,000 crore over a period of four years from the government is capable of attracting tenfold investment by 2022. Credit guarantee for startup lending is dose required to promote entrepreneurship.

References

- 1) <http://economictimes.indiatimes.com/small-biz/startups/india-lacks-enough-angel-investors-to-fund-start-ups-nasscom/articleshow/49578399.cms>
- 2) <http://www.forbesindia.com/article/startup-india-2016/startup-india-is-workinprogress/41945/1>
- 3) Graham, Paul (September 2012). Startup Equals Growth, in Graham's Essays on entrepreneurship
- 4) https://en.wikipedia.org/wiki/Startup_India#Educational_Institution_Alliances
- 5) <http://www.profitbooks.net/startup-india/>
- 6) <http://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>



GREEN MARKETING CHALLENGES: THE ROAD AHEAD

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ABSTRACT

No one today can deny or even avoid environmental concerns. Pro-environment thinking is day by day becoming an integral part of our daily life. Going green, environmental protection, sustainable life style, sustainable development, protecting our earth, organic farming, are the buzz words that steer our choice of the products today. Green marketing is a tool used by many companies in various industries to follow this trend. It incorporates a broad range of activities, including product modification, changes to the production process, packaging changes, as well as modifying advertising. Some other terms used synonymously for Green marketing are Environmental Marketing and Ecological Marketing. There has been a lot of literature review on green marketing over the years. This paper analyses the adaptation of green marketing strategies by different companies and its impact on customers' buying behaviour. The paper also focuses on the challenges and opportunities for going green way.

INTRODUCTION

With the globalization in full swing across the world, the society has becomes more concerned with the natural environment. Businesses have begun to modify their business strategies to suit to address society's "new" concerns. Companies have also started to form their marketing strategies so as to appeal increasing awareness of this environment-friendliness. These marketing strategies, named as green marketing, have caused companies to adopt green policies in their pricing, promotion, product features and distribution activities. Some businesses have been quick to accept concepts like environmental management systems and waste minimization, and have integrated environmental issues into all organizational activities. All such things are taking shape because the fast ongoing globalisation process has also brought some



problems with it. Leading one of these problems is environmental problems that affect all living beings negatively. These environmental problems have started to come to the agenda more and more in the recent years and people have started to talk these negativities. Consumers now have worries about the future of the world and as results of this mostly prefer environment friendly products.

OBJECTIVES:

The objectives of the paper include spreading awareness regarding green marketing. Even today people don't really know about green marketing while environmental degradation, pollution, ecological imbalance, etc. are serious cause of concern. The paper also aims to look into the challenges involved therein and the relevance of the same. The paper, in course of time, may also be a guiding objective to the corporate houses especially engaged in manufacturing process.

METHODOLOGY:

The research methodology adapted, for constructing the learning into black and white in the shape of a research paper, is exploratory research based on secondary data, sourced from various newspapers, text books, and some significant researches of the past, government publications and also some relevant websites. The paper, wherever necessary, has been enriched by primary data, sourced through conversation, email chatting, etc.

Since, the primary objective of the paper is to spread awareness among the general public and look into the current scenario of green marketing practices in the companies, the data taken for construction of the paper has not been subjected to advanced statistical tools and techniques.

LITERATURE REVIEW:

Meaning of Green Marketing:

While green marketing came into prominence in the late 1980s and early 1990s, it was first discussed much earlier. The term, 'Green marketing' term was first discussed in a seminar on "ecological marketing" organized by American Marketing Association (AMA) in 1975 and took its place in the literature. The proceedings of this workshop resulted in one of the first books on green marketing entitled "Ecological Marketing" (Henion and Kinnear 1976). Since that time a number of other books on the topic have been published (Charter 1992, Coddington 1993, Ottman 1993). In this seminar where the impact of



marketing on natural environment was analyzed with the contribution of academicians, bureaucrats and other participants, ecological marketing concept was defined as follows: Studies regarding adverse or positive impacts on environmental pollution, energy consumption and consumption of other resources as result of marketing (Cevreorman, 2010).

At this workshop ecological marketing was defined as:

"the study of the positive and negative aspects of marketing activities on pollution, energy depletion and non energy resource depletion." (Henion and Kinnear 1976)

Consumers encounter with terms such as ozone-friendly, environment-friendly and recyclable products in green marketing. However, green marketing is not limited to these terms but is a much wider concept of marketing activity which can be applied to consumer goods, industrial goods and even to services (Erbaslar, 2010).

Unfortunately, a majority of people believe that green marketing refers solely to the promotion or advertising of products with environmental characteristics. Terms like Phosphate Free, Recyclable, Refillable, Ozone Friendly, and Environmentally Friendly are some of the things consumers most often associate with green marketing. While these terms are green marketing claims, in general green marketing is a much broader concept, one that can be applied to consumer goods, industrial goods and even services. For example, around the world there are resorts that are beginning to promote themselves as "ecotourist" facilities, i.e., facilities that "specialize" in experiencing nature or operating in a fashion that minimizes their environmental impact.

Thus green marketing incorporates a broad range of activities, including product modification, changes to the production process, packaging changes, as well as modifying advertising. Yet defining green marketing is not a simple task. No one definition or terminology has been universally accepted. This lack of consistency is a large part of the problem, for how can an issue be evaluated if all researchers have a different perception of what they are researching. The following definition is much broader than those of other researchers and it encompasses all major components of other definitions.



"Green or Environmental Marketing consists of all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants, such that the satisfaction of these needs and wants occurs, with minimal detrimental impact on the natural environment." (Polonsky 1994)

This definition incorporates much of the traditional components of the marketing definition i.e., "All activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants" (Stanton and Futrell 1987). Therefore it ensures that the interests of the organization and all its consumers are protected, as voluntary exchange will not take place unless both the buyer and seller mutually benefit.

Thus "Green Marketing" refers to holistic marketing concept wherein the production, marketing consumption and disposal of products and services happen in a manner that is less detrimental to the environment with growing awareness about the implications of global warming, non-biodegradable solid waste, harmful impact of pollutants etc. Both marketers and consumers are becoming increasingly sensitive to the need for switch in to green products and services. While the shift to "green" may appear to be expensive in the short term, it will definitely prove to be indispensable and advantageous, cost-wise too, in the long run.

Green marketing-mix:

A model green marketing mix contains four "P's":

- **Product:** A producer should offer ecological products which not only must not contaminate the environment but should protect it and even liquidate existing environmental damages.
- **Price:** Prices for such products may be a little higher than conventional alternatives. But target groups are generally found to be willing to pay extra for green products.
- **Place:** A distribution logistics is of crucial importance; main focus is on ecological packaging. Marketing local and seasonal products e.g. vegetables from regional farms is easier to be marketed "green" than products imported.
- **Promotion:** A communication with the market should put stress on environmental aspects, for example that the company possesses a CP certificate or is ISO 14000 certified. This may be publicized to improve a firm's image. Furthermore, the fact that a company spends expenditures on environmental protection should be advertised.



EVOLUTION OF GREEN MARKETING

The green marketing has evolved over a period of time. According to Peattie (2001), the evolution of green marketing has three phases.

First phase was termed as "Ecological" green marketing, and during this period all marketing activities were concerned to help environment problems and provide remedies for environmental problems.

Second phase was "Environmental" green marketing and the focus shifted on clean technology that involved designing of innovative new products, which take care of pollution and waste issues.

Third phase was "Sustainable" green marketing. It came into prominence in the late 1990s and early 2000. During 1990s, the concern for environment increased and resulted in to increasing challenges for the companies.

THE NEED FOR GOING GREEN

In the present scenario, challenge is to keep the customers as well as consumers in fold and even keep our natural environment safe – which is the biggest need of the time. Companies may loose many loyal and profitable customers and consumers due to absence of green management.

In today's innovative business world of high technology due to growing community and consumer interests in green and socially responsible products, increased community pressure on companies to internalize externalities, such as health issues, neighbourhood amenity, climate change; environmental and governmental legalizations and initiatives; innovative technologies and approaches of dealing with pollution, improved resource and energy efficiency, and to retain old (loyal and profitable) customers and consumers, it is very much urgent to implement green marketing.

Further green management produces new environment friendly customers which lead to increase in sales and profits of an organization that leads to growth and development of business; it also leads to good public image of the organization.



In the present times when the government regulations around the globe are very strict and the whole world is talking about global warming, climate change and environment protection the companies would be left with no option but to adopt green marketing otherwise it might be too late to survive in the greener world.

The consumer's world over in general and India in particular are increasingly buying energy efficient products. In a nutshell most of the companies are venturing into green marketing. Many companies also take up green marketing to maintain their competitive edge.

Various regulations recently framed by the government to protect consumers and the society at large led to the adoption of Green marketing as a compulsion rather than a choice. For example, the ban of plastic bags in many parts of the country, and prohibition of smoking in public areas, etc.

GOING GREEN INITIATIVES AND PRACTICES BY FMCG COMPANIES

Many firms and customers are beginning to realize that they are members of the wider community and therefore must behave in an environmentally responsible fashion. This translates into firms that believe they must achieve environmental objectives as well as profit related objectives. This results in environmental issues being integrated into the firm's corporate culture.

It appears that all types of consumers, both individual and industrial are becoming more concerned and aware about the natural environment. In a 1992 study of 16 countries, more than 50% of consumers in each country, other than Singapore, indicated they were concerned about the environment (Ottman 1993).

A 1994 study in Australia found that 84.6% of the sample believed all individuals had a responsibility to care for the environment. A further 80% of this sample indicated that they had modified their behaviour, including their purchasing behaviour, due to environmental reasons. As demands change, many firms see these changes as an opportunity to be exploited.

Given these figures, it can be assumed that firms marketing goods with environmental characteristics will have a competitive advantage over firms marketing non-environmentally responsible alternatives. Corporations such as McDonald's, Wal-Mart, Procter & Gamble, and Du Pont acknowledge that the environment must be protected and enhanced for economic growth to take place, and have taken action



towards that goal. There are numerous examples of firms who have strived to become more environmentally responsible, in an attempt to better satisfy their consumer needs.

1. McDonald's replaced its clam shell packaging with waxed paper because of increased consumer concern relating to polystyrene production and Ozone depletion (Gifford 1991, Hume 1991). McDonald's has made a \$100 million commitment to its consumers for recycling purposes.
2. Tuna manufacturers modified their fishing techniques because of the increased concern over driftnet fishing, and the resulting death of dolphins (Advertising Age 1991).
3. Wall-Mart encourages the purchase of environmentally friendly products and reports that the green labeling program that they initiated in 1989 contributed to an overall 25% increase in sales for the year.
4. Xerox introduced a "high quality" recycled photocopier paper in an attempt to satisfy the demands of firms for less environmentally harmful products.
5. Organizations like the Body Shop heavily promote the fact that they are environmentally responsible. While this behaviour is a competitive advantage, the firm was established specifically to offer consumers environmentally responsible alternatives to conventional cosmetic products. This philosophy is directly tied to the overall corporate culture, rather than simply being a competitive tool.
6. ITC Limited which previously stood for Imperial Tobacco Company of India Limited is an Indian conglomerate with a turnover of US \$ 4.75 billion, has always been ahead when it comes to green marketing. ITC has been 'Carbon Positive' three years in a row (storing twice the amount of CO₂ than the Company emits). 'Water Positive' six years in a row (creating three times more Rainwater Harvesting potential than ITC's net consumption). ITC has close to 100% solid waste recycling. ITC's Watershed Development Initiative brings precious water to nearly 35,000 hectares of dry lands and moisture stressed areas. All Environment, Health and Safety Management Systems in ITC conform to the best international standards.
7. While manufacturers of hand wash have been trying to "teach" consumers how to wash hands, in practice, consumers spend about 6-7 seconds washing hands on an average and never more than 15 seconds. Kids are usually in even more of a hurry to finish this 'chore'. Instead of



lecturing them on the need to change their hand washing habits, the new Lifebuoy Colour Changing Hand wash makes washing hands fun. Hindustan Unilever Limited (HUL) the largest Indian consumer goods company based in Mumbai, Maharashtra. Through its product, Lifebuoy the company has launched colour changing hand wash. Lifebuoy's liquid hand wash has a special formulation that protects the user by removing 99.9% germs within 10 seconds. The Colour Changing Hand wash turns green to signal this! It contains tiny bead particles that release green colour when squished. When you've scrubbed your hands for about 10 seconds, the unique formula of the hand wash changes its colour to green, signaling that it is ok to rinse. This launch is yet another step towards achieving Lifebuoy's aim to change the hand washing behaviour of 1 billion people by 2015. Hindustan Unilever's 'Save Water' Campaign is yet another, with the company deciding to launch products that consume less water.

8. Procter & Gamble, the world's largest consumer goods manufacturer, is usually heralded as a role model amongst Fortune 500 companies. "Going green" is a central part of its corporate culture. It has now brands like *Tide* detergent, *Pampers* nappies and *Duracell* batteries, and aims to educate shoppers on how to "save water, waste and energy at home". Tide Coldwater is a line extension of Tide that is helping it build brand equity and staying fresh in the marketplace. A "Life Cycle Assessment" commissioned by Procter and Gamble found that 80%-85% of the energy used to wash clothes comes from heating the water. P&G calculated that U.S. consumers could therefore save \$63 per year by washing in cold water rather than warm. So, with the proviso that they could persuade consumers that cold water washing was efficacious, they positioned the product as a way to save on energy bills.
9. AMUL has been rated as the Top Indian Green Brand by Global Green Brands survey. The International Dairy federation has also awarded AMUL Green movement as the best Environment Initiative in the —Sustainability Category in 2010. It also has been awarded Srishti's good green Governance award for four consecutive years since 2011.

GOING GREEN: CHALLENGES & OPPORTUNITIES

Although a large number of firms are practicing green marketing, it is not an easy job as there are a number of problems which need to be addressed while implementing Green marketing. At the same time it



must also be kept in mind that where there are challenges, there are opportunities. The major challenges and the inherent opportunities in going green are as follows:

1. Indian literate and urban consumer is getting more aware about the merits of Green products. But it is still a new concept for the masses. The consumer needs to be educated and made aware of the environmental threats. The new green movements need to reach the masses and that will take a lot of time and effort this also shows that that there is enormous opportunities.
2. Green marketing involves marketing of green products/services, green technology, green power/energy for which a lot of money has to be spent on R&D programmes for their development and subsequent promotional programs which ultimately may lead to increased costs.
3. It may be felt that going green costs lot, but at the same time we must not forget that such investments are short term investments, the fruits of which can be reaped in long run.
4. The customers may not believe in the firm's strategy of Green marketing, the firm therefore should ensure that they undertake all possible measures to convince the customer about their green product, the best possible option is by implementing Eco-labeling schemes. Eco-labeling schemes offer its —approval to —environmentally less harmless || products. In fact the first eco-label program was initiated by Germany in 1978. Sometimes the customers may also not be willing to pay the extra price for the products. The consumers are also becoming environment friendly and are favouring those products which cause no or least damage to environment.
5. Initially the profits are very low since renewable and recyclable products and green technologies are more expensive. Green marketing will be successful only in long run. Hence the business needs to plan for long term rather than short term strategy and prepare for the same, at the same time it should avoid falling into lure of unethical practices to make profits in short term.
6. The firms practicing Green marketing have to strive hard in convincing the stakeholders and many a times it may fail to convince them about the long term benefits of Green marketing as compared to short term expenses.
7. Green marketing must satisfy two objectives: improved environmental quality and customer satisfaction. Misjudging either or overemphasizing the former at the expense of the latter can be termed —green marketing myopia.



The green marketing claims of a firm must do the following in order to overcome the challenges:

1. Clearly state environmental benefits;
2. Explain environmental characteristics;
3. Explain how benefits are achieved;
4. Ensure comparative differences are justified;
5. Ensure negative factors are taken into consideration; and
6. Only use meaningful terms and pictures.

CONCLUSION

Going green is like an uphill task. The firm has to plan and then carry out research to find out how feasible it is going to be. Green marketing has to evolve since it is still at its infancy stage. Adoption of Green marketing may not be easy in the short run, but in the long run it will definitely have a positive impact on the firm. Green Marketing is still in the stage of childhood in the Indian companies. The lots of opportunities are available in Indian market. Green marketing is driving a lot of corporate social responsibilities themes today. Some firms are going green for short term benefits while others are looking at it as a long term responsibility and incorporating 'green' as a part of their corporate DNA. This involves developing and marketing environment-friendly products that use sustainable methods and include green packaging and labels. Consumers worldwide are showing more concern about the environment by preferring environment-friendly products and services.

Many firms are beginning to realize that they are members of the wider community and therefore must behave in an environmentally responsible fashion. This translates into firms that believe they must achieve environmental objectives as well as profit related objectives. This results in environmental issues being integrated into the firm's corporate culture. Firms in this situation can take two perspectives; 1) they can use the fact that they are environmentally responsible as a marketing tool; or 2) they can become responsible without promoting this fact.

A clever marketer is one who not only convinces the consumer, but also involves the consumer in marketing his product. Green marketing should not be considered as just one more approach to marketing, but has to be pursued with much greater vigor, as it has an environmental and social dimension to it.



References:

1. Kotler, Philip. *Marketing Management – The Millennium Edition* Prentice Hall of India Private Limited, New Delhi.
2. Green Marketing” (2010, March 29). Journal: Business Practices.
3. J.A. Ottman, "Avoiding Green Marketing Myopia", *Environment*, Vol-48, June-2006
4. Mathur, L.K., Mathur, I. (2000) An Analysis of the wealth effect of green marketing strategies, *Journal of Business Research*, 50(2), 193-200.
5. J. M. Ginsberg and P. N. Bloom, —*Choosing the Right Green Marketing Strategy*, □ MIT Sloan Management Journal, fall 2004: 79–84.
6. *Sustainable Green Marketing the New Imperative*. Dutta, B. (2009, January). Marketing Mastermind. Pg 23-26. Hyderabad: The ICFA University Press.
7. Anderson, W.T. Jr, Henion, K.E. II, and Cox, E.P. (1974), “Socially vs. ecologically concerned consumers”, *American Marketing Association Combined Conference Proceedings*, Vol. 36 (Spring and Fall), pp. 304-11.
8. Coddington, W. (1993), *Environmental Marketing: Positive Strategies for Reaching the Green Consumer*, McGraw-Hill, New York, NY
9. Henion, K.E., Kinnear, T.C. (Jan 1976). "Ecological Marketing", *Ecological Marketing: 168, American Marketing Association*
10. Kinnear, T.C., Taylor, J.R. and Ahmed, S.A. (1974), “Ecologically concerned consumers: who are they?”, *Journal of Marketing*, Vol. 38, April, pp. 20-24.
11. Ottman, J.A. (1993), *Green Marketing: Challenges and Opportunities for the New Marketing Age*, NTC Business Books, Lincolnwood, IL.
12. Polonsky, M.J. and Mintu-Wimsatt, A.T. (Eds) (1995), *Environmental Marketing: Strategies, Practice, Theory and Research*, The Haworth Press, New York, NY.
13. Advertising Age. 1991. "Spurts and Starts: Corporate Role in '90s Environmentalism Hardly Consistent." *Advertising Age* 62 (46): GR14-GR16.
14. Ottman, Jacquelyn. 1993. *Green Marketing: Challenges and Opportunities for the New Marketing Age*. Lincolnwood, Illinois: NTC Business Books.
15. *The New Rules of Green Marketing: Strategies, Tools and Inspiration for Sustainable Branding* (Berrett-Koehler, 2011)
16. <http://www.greenmarketing.com/files/articles/The5SimpleRules.pdf>
17. <http://www.paradoks.org>, ISSN 1305-7979 – Sayı:1, Accessed 25.11.2010
18. <http://www.theglobaljournals.com/>
19. <http://www.warc.com/LatestNews/News/ArchiveNews.news?ID=26450>
20. <http://www.hindustantimes.com/business-news/columnsbusiness/green-marketing/article1-744451.aspx>



STUDY OF JOB SATISFACTION LEVEL OF EMPLOYEES IN IT AND INSURANCE SECTOR OF INDIA

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ABSTRACT

One of the leading objective in management is effective implementation of human development strategies to enhance organizational performance and accountability. Researchers have emphasized on human resource strategies to enhance performance of individuals. It can be achieved through job satisfaction, strategic planning, participative management and team empowerment. The fact that employees are becoming the key assets of the organization seems reasonably indisputable even in insurance sector. In today's scenario, one of the major problem faced by IT and insurance sector is job dissatisfaction amongst its employees therefore a research on "Job Satisfaction Of Front Line Sales Employees In IT and Insurance Sector Of India" was essential, to understand the factors that affect the job satisfaction of an employee in these sectors. The major objective of my research is to understand the factors that influence job satisfaction of employees. It also identifies the major factors that cause dissatisfaction among the employees so that Human Resource Department can take steps to rectify its lacunae.

INTRODUCTION

In India, IT and insurance sectors are few amongst the booming sectors. There is immense growth potential for IT and insurance sector in India. Indian life insurance industry is expected to rise at 5.3% annually which is more than 3.6 percent annual growth over the past two decades. Privatization of insurance sector has brought fierce competition which has forced organizations to focus on their business generation. Similarly, as per the report of Nasscom, Make in India TechSciResearch, India is the world's largest sourcing destination for the information technology (IT) industry, accounting for approximately 67 per cent of the US\$ 124-130 billion market. The industry employs about 10 million workforces. The contribution of the IT sector to India's GDP rose to approximately 9.5 per cent in FY15 from 1.2 per cent in FY98. This in turn increases the work pressure on employees and reduces their job satisfaction level.



Retention of employees has become the biggest challenge for the HR managers. Due to job dissatisfaction employee retention is very low. Hence Human Resource managers are trying to identify the grey areas which are responsible for job dissatisfaction so as to reduce the retention rate and enhance the productivity and effectiveness of the employees. Measurement of Job satisfaction can be used as a tool for applying front line sales employee retention techniques. Increased job satisfaction leads to higher rate of employee retention. Stability and commitment in the workforce ensures success for the organization. It is a key to continuous improvement in the organization and a total customer satisfaction

The success of any organization depends on customer satisfaction. A high level of customer satisfaction leads to customer retention, thereby offering profit and growth opportunities to the organization. There is a direct connect between customer satisfaction and job satisfaction. Satisfied employees are more likely to stay with the company for a long tenure and are more likely to render high level of customer service. Job satisfaction leads to improved employee retention and high employee stability ensures continuous improvement and better customer satisfaction. Customer satisfaction will no doubt lead to the organizational success and greater job security of employees. It will further enhance job satisfaction.

The research aims to analyse the factors that are responsible for increasing or decreasing the job satisfaction of employees in IT and insurance sector so that the organizations can derive benefit from the conclusion drawn. This study emphasizes on the fact that job satisfaction is an important indicator of how the employee perceives his organization & job and also a predictor of their work behaviours such as absenteeism, productivity, organizational commitment, motivational level, stress levels and turnover rate.

LITERATURE REVIEW

Defining Job satisfaction

According to Spector (1997), Job satisfaction is an attitudinal variable. It is simply how people feel about their jobs and different aspects of their jobs. It reflects the extent to which the people like (satisfaction) or dislike (dissatisfaction) their jobs. But Sousa-Poza (2000) has a different approach. In his views job satisfaction is based on the assumption that there are basic and universal human needs. If an individual's needs are satisfied in their current situation, then those individuals will be happy. This framework reinforces that job satisfaction depends on the balance between work-role inputs-Such as working time, effort, education and work role outputs- working conditions, wages, status, fringe benefits, intrinsic aspects of the job. If work-role outputs ('pleasures') are greater to work-role inputs, then job satisfaction



will increase. Locke (1976) described job satisfaction as a pleasurable and positive emotional state of an employee resulting from one's job or job experience. In his words. It is a gap between what an employee values and what the situation provides. Smith et al. (1969) suggested that job satisfaction is a feeling or affective response to facet of the situation. Dawis and Lofquist (1984) identified job satisfaction as a result of the worker's appraisal towards his work environment that fulfils the individual's needs. Lease (1998) pointed out job satisfaction is the degree of an employee's affective orientation toward the work role occupied in the organization.

Rose (2001) has identified job satisfaction as a bi-dimensional concept consisting of intrinsic and extrinsic satisfaction dimensions. Rose has argued that intrinsic sources of satisfaction depend on the individual characteristics of the person which includes his relations with supervisors, ability to use initiative or the work that the person actually performs. Extrinsic sources of satisfaction depend on the situation and largely depend on the environment, such as pay, promotion, or job security. Basically they are financial and other material rewards or advantages of a job. Both extrinsic and intrinsic job facets should be represented equally

Why Job Satisfaction?

As investigated by several disciplines such as sociology, psychology, economics and management sciences, job satisfaction is an important and frequently studied subject in work and organizational literature. This is simply due to the fact that experts believe that job satisfaction trends can affect employee's behaviour and influence work effort, work productivity, employee absenteeism and staff turnover. Moreover, Diaz-Serrano and Cabral Vieira (2005) consider job satisfaction as a strong predictor of overall individual well-being. Job satisfaction has always been an important concern for organizations. According to J. Michael Syptak, MD, David W. Marsland, MD, and Deborah Ulmer few organizations consider job satisfaction as a top priority. The reason is that satisfied employees tend to be more creative, productive and committed to their employers.

In the views of Spector (1997), job satisfaction is also important in everyday life. Organizations have significant impact on the people who work for them and it reflects in how people feel about their work. This indicates job satisfaction as an issue of substantial importance for both employers and employees. Nguyen, Taylor and Bradley(2003) suggests that employers are benefited from satisfied employees. Satisfied employees tend to render benefit as they are more likely to profit from low rate of retention of



employees. Employees should 'be happy in their work, given the amount of time employees devote to their working lives.

In words of Clark, (1998), Job satisfaction is a right of an employee as a part of social welfare. In addition to this, measures of job quality seem to be a predictor of future employee's behaviour. Employee's decision about whether to work or not, whether to continue in the job or not and how hard to perform, are all likely to depend upon employee's satisfaction in the job.

Research Methodology

The study is descriptive and exploratory in nature. The research was conducted with major focus on Delhi, NCR.

In the study, top players of IT and Insurance sector were considered. The companies under study were Reliance Life Insurance, HDFC Standard Life Insurance, ICICI Prudential Life Insurance, Tata AIG Life Insurance, Max New York Life Insurance, ING Vysya, TCS, WIPRO Limited, Infosys Limited, HCL Technologies Limited. A sample size was 150 respondents from IT and insurance companies of Delhi, NCR with 15 respondents each from the above mentioned organizations under study.

The respondents mainly consisted of Front Line employees because according to the literature review at hand, this category of employees have major amount of job dissatisfaction in them. A structured Likert scale Questionnaire including 29 statements was used. It was supported by personal interviews to collect primary data in this study. In order to know the satisfaction level, the respondents were asked to rate their satisfaction on a scale of 5. (1 being strongly agree and 5 being strongly disagree).

ANALYSIS AND DISCUSSION

Frequency distribution for job satisfaction level

Table 1. Are you satisfied with your work in the organization?

	Frequency	Percent	Valid Percent
Strongly Agree	30	20.0	20.0
Agree	59	39.3	39.3
Neutral	22	14.7	14.7
Disagree	34	22.7	22.7
Strongly disagree	5	3.3	3.3
	120	100.0	100.0



It was observed that 20% of the total population strongly agreed that they were satisfied with their work in the organization, 39.3% of them agreed that they were satisfied with their work in the organization while 22.7% disagreed and 3.3% strongly disagreed and 14.7% were neutral towards the statement. It showed that 59.3% of the population were satisfied while only 26% were dissatisfied with their work in the organization. It reflects that there is a high level of job satisfaction in IT and insurance sector.

Factor analysis was applied to know the factors that have impact on job satisfaction in the considered sectors. To test the data appropriateness for factor analysis “KMO and Bartlett’s Test” was applied. A high value of KMO (between 0.5 and 1.0) suggests that the data is adequate for factor analysis. In our study, the value was 0.839 which is closer to 1.0 and hence the data is fit for Factor analysis.

H0: There is no significant relationship between the variables in the population.

H1: There is a significant relationship between the variables in the population.

In order to test the null hypothesis Bartlett’s Test of Sphericity was applied. It was found that the significant value was 0.000. Since the value is less than the 0.05, the null hypothesis (H0) was rejected. Approx chi- square value is 3311.623 which is also very large and hence it can be concluded that there is a significant relationship between the variables in the population. In other words, the variables are highly correlated with each other. KMO value is .839. This testified that the sample was appropriate for factor analysis.

Table 2: KMO and Bartlett’s Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.839
Bartlett's Test of Sphericity	Approx. Chi-Square	3311.623
	Df	351
	Sig	.000

Principal component method was applied. The primary concern of this analysis was to determine the minimum number of factors that will account for maximum variance in the data.

**Table 3: Communalities**

Job satisfaction in insurance sector: an empirical investigation

	Initial	Extraction
I Know what is expected from me	1.000	.489
Clear understanding of goals	1.000	.740
Realistic targets	1.000	.796
Opportunities for individual growth	1.000	.483
Opportunities for challenging work	1.000	.561
Receive frequent training for skill enhancement	1.000	.643
Adequate freedom to do job efficiently	1.000	.958
Salary is in compliance with my ability and competence	1.000	.759
Salary is equitable with competitors in the industry	1.000	.917
Fringe benefits	1.000	.915
Working environment is friendly	1.000	.789
Treated with respect by the management and peers	1.000	.724
Goodworking relationship with peers	1.000	.428
Team spirit amongst co-workers	1.000	.640
Performance is fairly appraised by my superiors	1.000	.755
Work is periodically reviewed	1.000	.603
Receive recognition and incentives for personal accomplishments/initiatives	1.000	.768 .526
Transparency in the system	1.000	.684
Superiors communicate freely and frequently	1.000	.652



Participation in decision making	1.000	.963
Superior encourages my career development	1.000	.724
Manager does not seem to care about me	1.000	.721
Can go to my supervisor for help on having work related problems	1.000	.688
Good internal co-ordination between various departments	1.000	.611
Job security does not exist within the company	1.000	.619
Company does not provide work flexibility	1.000	.594
My company makes me feel that my job is important	1.000	.495

Extraction Method: Principal Component Analysis.

Table 4. Total Variance Explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	8.310	30.777	30.777
2	3.051	11.300	42.077
3	2.241	8.300	50.377
4	1.557	5.767	56.143
5	1.437	5.322	61.465
6	1.129	4.181	65.646
7	1.093	4.050	69.695
8	.985	3.647	73.342
9	.867	3.211	76.553
10	.726	2.690	79.243
11	.690	2.557	81.799
12	.649	2.403	84.203
13	.601	2.226	86.429
14	.547	2.025	88.454
15	.498	1.846	90.300
16	.438	1.623	91.924
17	.350	1.297	93.221
18	.334	1.238	94.458
19	.317	1.172	95.631
20	.281	1.040	96.670
21	.247	.914	97.584
22	.237	.876	98.461
23	.150	.557	99.017
24	.145	.535	99.553
25	.113	.418	99.971
26	.006	.023	99.994
27	.002	.006	100.000

**Table 5 Rotated Component Matrix**

	Component
I Know what is expected from me	.080 -.165-.021 -.004.667-.014 .102
Clear understanding of goals	.071 -.032 -.084.189 .828 -.036 -.073
Targets are realistic -	.671 .462.209-.015 -.268 .080 .097
Opportunities for individual growth	.192 -.392 .058 .134 .488 .020 -.182
Opportunities for challenging work	.067 -.442 .459 .136 .343 -.119 -.029
Receive frequent training for skill enhancement -	.067 -.139 .627 -.216 -.127 .072 .398
Adequate freedom to do job efficiently -	.020 -.099 .128 .953 .128 .049 .062
Salary is in compliance with my ability and competence	.476 -.702 -.111.126 .060 -.004 -.085
Salary is equitable with competitors in the industry -	.602 .694 .152 -.155 -.089 .095 .092
Fringe benefits -	.607 .690 .150 -.154 -.082 .097 .096
Working environment is friendly -	.756 .390 .097 -.060 -.090 .197 .077
Treated with respect by the management and peers-	.777 -.176 -.175 .141 .114 -.159 -.038
Good working relationship with peers -	.256 .168 .219 .029 .057 .703 .010
Team spirit amongst co-workers -	.313 .028 .045 .073 -.122 .796.024
Performance is fairly appraised by my superiors -	.014 .200 .717 .197 .095 .002 -.033
Work is periodically reviewed -	.167 -.127 .808 .083 -.236 .020 .091
Receive recognition and incentives for personal accomplishments/initiatives -	.005 .092 .661 .070 .034 .249 -.114
Transparency in the system	.275 .084 .015 -.080 .037 .275 -.719
Superiors communicate freely and frequently -	.691 .227 .180 -.046 -.210 .118 .177
Supervisor invites ideas/inputs for decision making	.032 .092 -.121-.957 -.122 -.053 -.075
Superior encourages my career development	.806 -.223 -.049 .033 .145 .005 -.003
Manager does not seem to care about me	.099 .118 .052 .093 .021 .232 .795
Can go to my supervisor for help on having work related problems	.797 .057 .172 .015 -.073 -.115 -.005
Good internal co-ordination between various departments	.682 -.164 .097 -.166 .011 -.225 -.177
Job security does not exist within the company	.771 .050 .074 -.102 .030 -.055 .050
Company doesnot provide work flexibility	.750 .075 -.118 -.084 -.012 -.035 .057
Purpose of my company makes me feel that my job is important	.079 .639 -.112 .040 -.191 .105 -.137

After the Factor analysis it was found that total of seven (7) factors that affect the job satisfaction level of employees in the IT and insurance sector. The Factors were named according to the variables that



correlated with them. The Table 6 shows the various factors that affect the job satisfaction level in insurance sector along with the variables that correlate high with them, their factor loading and the eigenvalues including the % of variance covered by each factor.

Table 6: Factor Matrix

Factor Number	Factor Name	Total % of Variance	% of Variance	Items	Item Loading
1	Work culture	6.309	23.367	Superior encourages my career development Can go to my supervisor for help on having work related problems Treated with respect by the management and peers Job security does not exist within the company Company does not provide work flexibility Good internal co-ordination between various departments .	.806 .797 .777 .771 .750 .682
2	Pay for Performance	2.923	10.825	Salary is equitable with competitors in the industry Fringe benefits Purpose of my company makes me feel that my job is important.	.694 .690 .639
3	Growth and recognition	2.548	9.438	Work is periodically reviewed Performance is fairly appraised by my superiors	.808 .717 .661

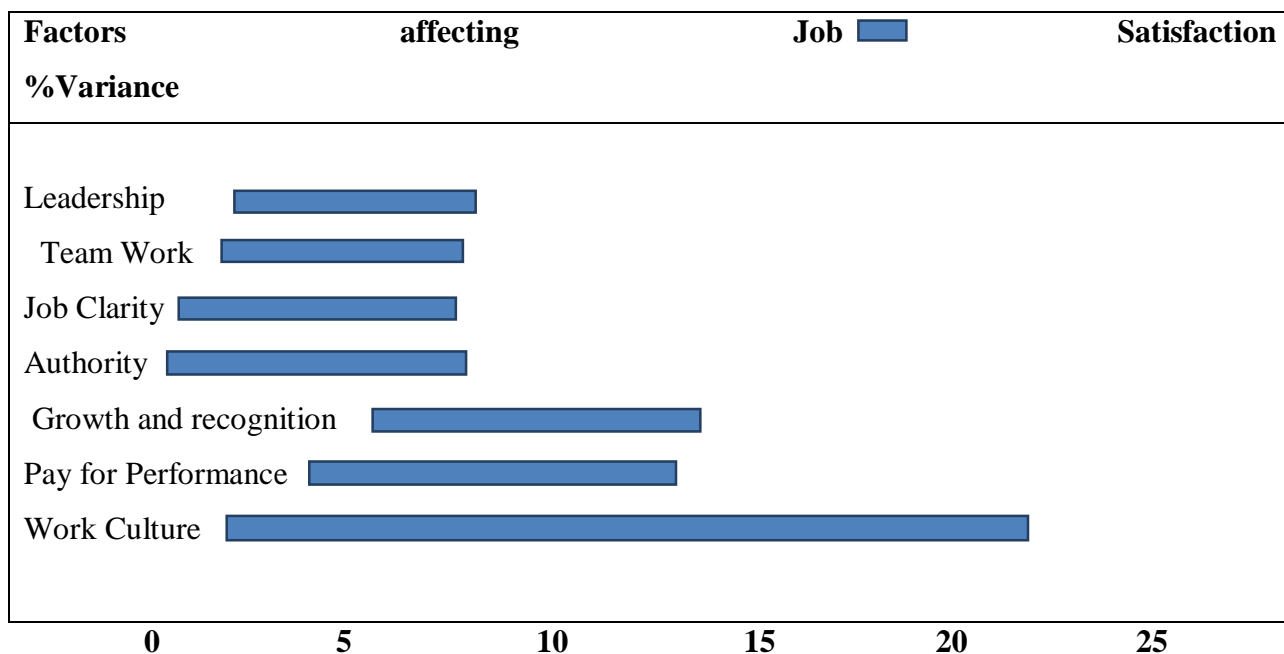


				Receive recognition and incentives	.627
				Receive frequent training for skill enhancement	
4	Authority	2.152	7.972	Adequate freedom to do job efficiently	.953
5	Job Clarity	1.837	6.805	Clear understanding of goals	.828
				Know what is expected from me	.667
6	Team work	1.529	5.662	Team spirit exists amongst co workers	.796
7	Leadership	1.519	5.626	Good working relationship with peers	.703
				Manager does not seems to care about me	.795
	Total	18.817	69.695		

Figure 1 explains the major factors that affect the job satisfaction in IT & insurance sector along with the % of variance covered by each factor which reveals their relative importance in terms of job satisfaction.

As observed from the figure 6, that employees give maximum importance to the work culture that an organization has, following which is pay for performance, growth and recognition, authority, job clarity, with almost equal emphasis on team work and leadership.

Figure 1 Factors affecting job satisfaction





Work culture

Work Culture emerged out to be the most important factor for job satisfaction in IT and insurance sector. Nine variables were observed which correlated very high with work culture. It accounted for a total variance of 23.367. The study highlights the company must have good work culture to ensure job satisfaction. Work culture comprises of the following variables in order of their importance: Superiors encouragement of career development, Helpful superiors, Respectful treatment by management and peers, Job security, Open and friendly work atmosphere, Work flexibility with respect to family responsibilities, Good internal co-ordination between various departments and Realistic targets.

Pay for performance

Pay for performance is the second most important factor which results in job satisfaction. This factor accounted for a total variance of 10.825. There are four variables that correlate high with this factor. In order of the importance, the variables include Salary according to competency of an employee, Equitable salary when compared to competitors, Availability of fringe benefits and job importance.

Equitable salary structure and fringe benefits act as a buffer for employees who feel that they are being valued by the company. But contrary to this, major dissatisfaction was in terms of salary when compared to the competence and ability of employees. Employees expressed that their salary was not in compliance to their abilities and competencies. They felt that work load was quite high but their pay was not according to the work load that they had to handle. So it can be concluded that though employees appreciate fringe benefits provided to them by the organization yet there is dissatisfaction in terms of salary structure. It is not equitable in comparison to competitors so the entire insurance sector is facing problems associated with low salary package.

Growth and recognition

The third important factor that determines job satisfaction level in the IT & insurance sector is the growth opportunities that are available to the employees and the level of recognition that they receive for their efforts. The variables that correlate highly with growth and recognition in terms of their importance are as follows: Periodical review of work for improvement, Fair performance appraisal system, Recognition and incentives (bonus) for personal accomplishments. Frequent training for skill enhancement and opportunities to learn and grow. So it can be concluded that insurance sector provides ample individual growth and learning opportunities to its employees which attracts job seekers towards this industry.



Authority

Authority is also an important element in defining job satisfaction level. It ranked at fourth number in the analysis and accounted for 7.972% of variance. The variables that determine job authority in order of their role in determining job satisfaction are as follows: Participation in decision making and Freedom to do job efficiently. But on the darker side, it was observed that in IT & insurance sector decision making is still the prerogative of higher authorities. Though the employees are given freedom to do their jobs effectively but when it comes to decision making they are secluded from it.

Job clarity

Job Clarity is the fourth factor that determines job satisfaction. This factor accounted for 6.805% variance and it has three variables under it as per the relevance i.e. Clear understanding of goals and strategies, Clarity about expectations from job and organization and Availability of opportunities to undertake interesting and challenging projects. It was noticed that if the employees have a clear understanding of their job roles and goals, they tend to be satisfied with their jobs.

Team work

Team work is a factor that is the second last factor which has its say on job satisfaction in IT & insurance sector. This factor accounted for 5.662% variance and it has two variables that highly correlate with it. The variables in order of their loading are: Team spirit among co-workers and Good working relationship with peers. In the study, it was found that employees in IT & insurance sector had relatively high team spirit among themselves and they also had good working relations between their co-workers.

Leadership

The last but not the least, the factor that affects job satisfaction in IT & insurance sector is leadership. Leadership accounts for total of 5.626% variance and its two variables in order of their importance are as following: Caring manager and Competent manager. In IT & insurance sector, Leadership is determined by the attitude of superiors towards their subordinates. A good leader is one who is competent enough to lead his people and at the same time he cares about his subordinates. It was observed that the leaders in insurance sector needs to pay attention on their front line sales employees.

CONCLUSION

The study intended to find those lacunae in IT & insurance sector that aggravated worker's dissatisfaction for their jobs and also to understand the positives of the both sectors. Measurement of job satisfaction is a



very helpful tool for the management to understand the psychology of the employees and how they feel about their jobs. It is also an important predictor of work behaviours such as organizational citizenship, attrition rate, non-performance, absenteeism, motivation, stress and turnover of employees. Employees prefer to work for organizations which can provide them an excellent work culture and an attractive performance based pay package. Employees also look for growth opportunities They prefer job positions which provide them with authority to take decisions pertaining to their job roles. They want to undertake challenging projects rather than the conventional ones. Employees understand the importance of team work. Last but not the least they want to work under the leader who is competent enough to care of them and treat them as human beings, not as machines. Thus, the study conclude that Job Satisfaction is a vital factor for the development of the organization.

REFERENCES

- Clark, A.E., (1998), Measures of job satisfaction - What makes a good job? Evidence from OECD countries, Labour Market and Social Policy - Occasional Paper No. 34, OECD, Paris.
- Dawis, R.V. and Lofquist, L.H. (1984), A Psychological theory of Work Adjustment. Minneapolis: University of Minnesota Press.
- Diaz-Serrano, L. and Cabriel Vieira, J.A. (2005), Low pay, higher pay and jobsatisfaction within the European Union: Empirical evidence from fourteen countries, IZA, Discussion papers No.1558. Institute for the study of labour (IZA), Retrieved at <http://ideas.repec.org/p/iza/izadps/dp1588.html>.
- Gazioglu, S. and Tansel, A., (2002), Job satisfaction in Britain: Individual and job-related factors, Economic Research Centre Working Papers in Economics 03/03, Ankara, available at: <http://ideas.repec.org/p/met/wpaper/0303.html>
- Lease, S. Annual review, (1998), 1993-1997: Work attitudes and outcomes. J. Vocational Behaviour, 53(2):154-183
- Nguyen, A.N., Taylor, J. and Bradley, S., (2003a), Relative pay and job satisfaction: Some new evidence, Working Paper 045, Department of Economics, Lancaster University Management School, available at: <http://www.lums.lancs.ac.uk/publications/viewpdf/000187/>



- Rose, M., Disparate measures in the workplace...Quantifying overall job satisfaction, Paper presented at the 2001 BHPS Research Conference, Colchester, available at:
<http://www.iser.essex.ac.uk/bhps/2001/docs/pdf/papers/rose.pdf>
- Smith, P.C., Kendall, L.M., and Hulin. (1969). The measurement of satisfaction in work and retirement: Chicago: Rand McNally.
- Sousa-Poza, A. and Sousa-Poza, A.A., (2000), 'Wellbeing at work: a cross-national analysis of the levels and determinants of job satisfaction', Journal of SocioEconomics, Vol. 29, No. 6, pp. 517-538.
- Spector, P.E., (1997) Job satisfaction: Application, assessment, causes, and consequences, Sage, London,
- Syptak, J.M., Marsland, D.W. and Ulmer, (1999), D., Job satisfaction: Putting theory into practice, American Academy of Family Physicians, available at:
<http://www.aafp.org/fpm/991000fm/26.html>



E-COMMERCE- CHANGING LANDSCAPE

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ABSTRACT

This article states the importance of SEM (Search Engine Marketing) and the role of e-commerce in changing the scenario of entrepreneurs and business start ups creating the innovation in current and future aspects in India. The impact of e-commerce on markets where established full-service firms offering a broad range of goods and services face competition from Web-based entrants with narrower product offerings. It makes a large change in the economic, social and cultural aspects in economic relation between individuals, corporations and government. This paper discuss about the benefits and importance of e-commerce.

Keywords:

E-commerce, SEM, EDI, BPR, VANs

Introduction

E-Commerce is associated with the buying and selling of information, products and services via computer network today. Consumer desires are very hard to predict pin point or decipher in electronic markets whose shape, structure and population are still in early stage

Electronic commerce, commonly known as E-commerce, is trading in products or services using computer networks, such as the Internet. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems. Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle, although it may also use other technologies such as e-mail

E-commerce based on data processing, including text, sound, image. The business includes various activities such as the electronic exchange of goods and services, instant delivery of digital content, business plans, collaborative design and engineering, electronic stock exchange, government procurement, direct marketing, services after the sales. E-commerce is the buying and selling of goods and services, or the transmitting of funds or data, over an electronic network, primarily the Internet. These business transactions occurs business-to-business, business-to-consumer, consumer-to-consumer or consumer-to-business. The terms e-commerce and e-business are often used interchangeably. The term e-tail is also



sometimes used in reference to transactional processes around online retail. E-commerce is conducted using a variety of applications, such as email, fax, online catalogs and shopping carts, Electronic Data Interchange (EDI), File Transfer Protocol, and Web services. Most of this is business-to business, with some companies attempting to use email and fax for unsolicited ads (usually viewed as spam) to consumers and other business prospects, as well as to send out e-newsletters to subscribers

Types of E-Commerce

Waghmare G.T. (2012) has defined the following types of e-commerce:

- (i) **B2B E-Commerce:** Business-to-business (B2B) is commerce transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer. Pricing is based on quantity of order and is often negotiable. Companies doing business with each other such as manufacturers selling to distributors and wholesalers selling to retailers.
- (ii) **B2C E-Commerce:** Business or transactions conducted directly between a company and consumers who are the end users of its products or services. Business to consumer as a business model differs significantly from the business to business model, which refers to commerce between two or more businesses. Businesses selling to the general public typically through catalogues utilizing shopping cart software. By dollar volume, B2B takes the prize, however B2C is really what the average Joe has in mind with regards to ecommerce as a whole for example indiatimes.com.
- (iii) **C2C E-Commerce:** Customer to Customer (C2C) markets are innovative ways to allow customers to interact with each other. While traditional markets require business to customer relationships, in which a customer goes to the business in order to purchase a product or service. In customer to customer markets the business facilitates an environment where customers can sell these goods and or services to each other. There are many sites offering free classifieds, auctions, and forums where individuals can buy and sell thanks to online payment systems like PayPal where people can send and receive money online with ease. EBay's auction service is a great example of where customer-to customer transactions take place every day.
- (iv) **C2B (CONSUMER-TO-BUSINESS)** - Consumer-to-business (C2B) is a business model in which consumers individuals create value and businesses consume that value. C2B model, also called a reverse auction or demand collection model, enables buyers to name or demand their own price, which is often binding, for a specific good or service. The website collects the demand bids then offers the bids to participating sellers.
- (v) **Others:** G2G (Government-to-Government), G2E (Government-to-Employee), G2B (Government-to-Business), B2G (Business-to-Government).



BENEFITS OF E-COMMERCE FOR BUSINESS ORGANIZATION

E-commerce has many advantages for organizations which some of them are as follows: Expands the marketplace to national and international markets, Decreases the cost of creating, processing, distributing, storing and retrieving paper-based information, allows reduced inventories and overhead by facilitating “pull” type supply chain management , the pull type processing allows for customization of products and services which provides competitive advantage to its implementers, Reduces the time between the outlay of capital and the receipt of products and services, Supports business processes reengineering (BPR) efforts, Lowers telecommunications cost the Internet is much cheaper than value added networks (VANs)

BENEFIT OF E-COMMERCE TO CUSTOMERS

E-Commerce makes some of the benefits of customer which are enables customers to shop or do other transactions 24 hours a day, all year round from almost any location, provides customers with more choices, provides customers with less expensive products and services by allowing them to shop in many places and conduct quick comparisons, allows quick delivery of products and services in some cases, especially with digitized products, customers can receive relevant and detailed information in seconds, rather than in days or weeks, makes it possible to participate in virtual auctions, allows customers to interact with other customers in electronic communities and exchange ideas as well as compare experiences, electronic commerce facilitates competition, which results in substantial discounts.

BENEFITS OF E-COMMERCE TO SOCIETY

Finally, e-commerce can have good effects on society which are enables more individuals to work at home, and to do less traveling for shopping, resulting in less traffic on the roads, and lower air pollution, allows some merchandise to be sold at lower prices benefiting the poor ones, enables people in Third World countries and rural areas to enjoy products and services which otherwise are not available to them, facilitates delivery of public services at a reduced cost, increases effectiveness, and/or improves quality.

NEEDS AND OBJECTIVES OF E-COMMERCE





- **High reachability** - The main objective and at the same time need is traction on your web store. Of, course if you are selling products online what you require are customers. If you are getting good reachability then your business will definitely grow. Therefore one of the objective is high reachability.
- **High Conversions-** if people are coming on your web store and purchasing something then it will calculate as conversions and from the number of people who are buying stuff from your web store we can calculate the conversion rate.
- **Customer satisfaction** - Customer is the main part of any E-commerce business so its very important to make your customer happy and satisfied. By providing quality and desirable products, on time delivery, 24*7 customer support, and timely sale & best deal offers you can make your customer happy. It is one of the main objectives of E-commerce.
- **Social popularity** - Unless and until you are not famous and popular among people you cannot establish your brand. social presence with Omni channel & Digital marketing is essential for any E-commerce business

Major Search Engines in the Market

By distinct search engines, means that search engines, portals, and websites who have alliances and who solicit bids for paid placements from a single source are treated as one search engine. For instance, by successfully bidding for a paid link with Overture exposes a seller to traffic from several websites, including MSN, Yahoo!, AltaVista, Info Space, Allthe Web and NetZero. There are various search engines by content/topic such as Baidu (Chinese, Japanese), Bing, Blekko, Google, Sogou (Chinese), Soso.com (Chinese), Volunia, WireDoo, Yahoo!, Yandex (Russian), Yebol, and Yodao (Chinese). Among PPC providers, Google AdWords, Yahoo! Search Marketing, and Microsoft adCenter are the three largest network operators, and all three operate under a bid-based model.

The Advantages and Disadvantages of Internet Marketing

Melody and Robert (2001) remarked that the Internet can provide timely information to customers because of its ability for instant communication, and its availability 24 hours a day, 7 days a week [Lane, 1996]. On-line marketing offers more choices and flexibility [Lamoure, 1997] and, at the same time, eliminates huge inventories, storage costs, utilities, space rental, etc., [Avery, 1997]. People tend to associate Internet marketing with direct marketing because companies participating in online marketing usually shortened the supply chain [Edwards, et al., 1998] and reduced commission and operating costs. The ability to serve as both a transaction medium and a physical distribution medium for certain goods is a unique feature of Internet marketing. Such advantages can be best realized by companies that provide digital products/services such as software, music, news, consulting services, online ticketing and reservations, telemedicine, insurance, banking, stock brokerage, tax, and other financial service industries. Using the Internet as the distribution channel can reduce not only the delivery cost substantially, but also ensures instant delivery of products/services. Moreover,



Ruckman (2012) suggested that Internet research becomes an increasingly important tool during the purchasing process; more marketers are seeing the advantages too. It's a win-win situation. Marketing departments are investing more into online marketing today because it's:

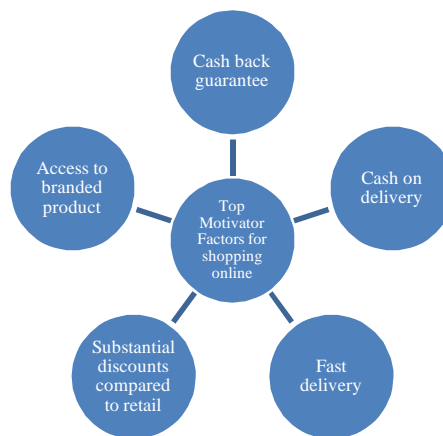
- Attractive to a significant segment of the demographics for most customer profiles. It can effectively reach the target customer.
- Faster and less expensive to conduct direct marketing campaigns
- Measurable, which means that successes are identifiable and repeatable
- Open 24-hours a day
- Cost-effective, in the long run.

Disadvantages:

There is no actual face-to-face contact involved in the Internet communication. For the types of products that rely heavily on building personal relationship between buyers and sellers such as the selling of life insurance, and the type of products that requires physical examination, Internet marketing maybe less appropriate. While internet marketing cannot allow prospective buyers to touch, or smell or taste or 'try on' the products, However a survey of consumers of cosmetics products shows that email marketing can be used to interest a consumer to visit a store to try a product or to speak with sales representatives [Martin at el (2003)]. Some of the disadvantages of e-Marketing are dependability on technology, Security, privacy issues, Maintenance costs due to a constantly evolving environment, Higher transparency of pricing and increased price competition, and worldwide competition through globalization.

Top Motivators for Shopping Online:

Times of India (February 12, 2017) has published that top motivators for shopping online which include cash back guarantee, cash on delivery, fast delivery, substantial discounts compared to retail, and access to branded products, while barriers include inability to touch and try products before purchase, fear of faulty products, apprehension of posting personal and financial details online and inability to bargain.



Top Motivator Factors for Shopping Online



SUMMARY AND FUTURE RESEARCH

This paper developed a model of competition between an incumbent full-service broker offering a bundled product and an online entrant offer trade execution only. The results of the model show that under certain conditions the full-service broker finds it optimal to unbundle its offering, and the online entrant chooses to compete with lower quality execution. Our empirical study found that online brokers offer lower quality trade execution, but that the higher commission costs of full-service brokers are not offset by these quality differences. Securities trading involves observable and hidden costs; future research might look at the impact of electronic markets on such information asymmetries in other sectors. Conventional wisdom suggests that electronic markets increase efficiency by promoting price transparency; however the same is not necessarily true of quality transparency. Will e-commerce lead to greater overall transparency or will its impact be limited to advertised prices?

Online intermediaries, by reducing the information asymmetries and removing the inefficiencies of the traditional value chain, play an important role in the evolving competitive landscape in a variety of markets. The results of our study highlight the need for a careful examination of these intermediated markets to understand the direct as well as indirect impacts of emerging technologies, and more importantly, to identify implicit costs that are difficult or impossible for consumers to predict.

The impact of online brokers on the securities industry should be a harbinger of the impact that electronic commerce will have on other industries, especially those which feature tollgate intermediaries, information asymmetries and associated products and services bundled with core products. One extension of this work is to look at e-commerce across other industries to evaluate its impact. Are industries with certain types of intermediaries more likely to face restructuring than others? Is there a difference in how e-commerce affect services like brokerage compared to the distribution of physical products like books? While we cannot generalize from one study, our analytical derivations as well as empirical results suggest that online brokers destabilized the market for trading by expanding the self-directed market segment, and forced new marketing and pricing strategies on traditional brokerages. We believe that e-commerce has the potential to bring about dramatic changes in other industries as well.

REFERENCES:

- Adams, W.J., J. L. Yellen. 1976. Commodity bundling and the burden of monopoly. *Quarterly Journal of Economics* 90, 475-498.
- Altschuler, S., D. Batavia, J. Bennett, R. Labe, B. Liao, R. Nigam, J. Oh. 2002. Pricing analysis for Merrill Lynch integrated choice. *Interfaces*, 32 (1) 5-19.



- Bakos, Y., E. Brynjolfsson. 1999. Bundling information goods: pricing, profits, and efficiency. *Management Science*, 45 (12) 1613-1630.
- Gunasekaran, A., et al. "E-commerce and its impact on operations management." *International journal of production economics* 75.1 (2002): 185-197.
- Subramani, Mani, and Eric Walden. "The impact of e-commerce announcements on the market value of firms." *Information Systems Research* 12.2 (2001): 135-154.
- Schafer, J. Ben, Joseph A. Konstan, and John Riedl. "E-commerce recommendation applications." *Applications of Data Mining to Electronic Commerce*. Springer US, 2001. 115-153.
- Daniel, Elizabeth, and Hugh Wilson. "Adoption intentions and benefits realized: a study of e-commerce in UK SMEs." *Journal of Small Business and Enterprise Development* 9.4 (2002): 331-348.
- Eastin, Matthew S. "Diffusion of e-commerce: an analysis of the adoption of four ecommerce activities." *Telematics and informatics* 19.3 (2002): 251-267.
- Zwass, V., (1996). "Electronic commerce: Structure and issues." *International Journal of Electronic Commerce*, 1(1), 3-23



POVERTY ELEVATION AND MICRO-FINANCE

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ABSTRACT

India falls under low income class according to World Bank. It is second populated country in the world and around 72 % of its population lives in rural area. 60% of people depend on agriculture, as a result there is chronic underemployment and per capita income is low. This is not enough to provide food to more than one individual. The obvious result is poverty, low rate of education, low sex ratio, and exploitation. The major factor account for high incidence of rural poverty is the low asset base. According to Reserve Bank of India, about 51 % of people house possess only 10% of the total asset of India .This has resulted low production capacity both in agriculture (which contribute around 22-25% of GDP) and Manufacturing sector. Rural people have very low access to institutionalized credit (from commercial bank).

Need of the study

- The need of microfinance arises because the rural India requires sources of finance for poverty alleviation, procurement of agricultural and farms input.
- Micro finance is a programme to support the poor rural people to pay its debt and maintain social and economic status in the villages.
- As we know that India is agriculture based economy so microfinance may be a tools to empower the farmers and rural peoples to make agriculture profitable.
- So the researchers are interested to find out the scopes of microfinance in rural India. This research paper is highlighting a picture rural India as a profitable segment for microfinance institutions.

Objective of the study

- To analyze the growth of microfinance sector developed in India and see potential for the microfinance institutions, NGOs, SHGs in the market.
- To analyze the structure and pattern of microfinance programme in rural Indian by the MFIs, NBFCs.



- To understand the marketing of microfinance products in rural market.
- To study the importance and role of microfinance in poverty alleviation and profitable agriculture activities.

Research Methodology

This is a descriptive research paper based on secondary data. Data have been found out by searching in different websites, research papers, and magazines.

Introduction

Micro-finance economically disadvantaged segments of society, for enabling them to raise their income levels largest in term of population after China. India's GDP ranks among the top 15 economies of the world. However, around 300 million people or about 80 million households are living below the poverty line, i.e. less than \$2 per day according to the World Bank and the poorest are which earns \$1 per day. It is further estimated that of these households, only about 20% have access to credit from the formal sector. Out of these 80 million households, 80% takes credit from the informal sources i.e. local Zamindars, Chit Funds etc. With about 80 million households below MFIs include non-governmental organizations (NGOs), credit unions, non-bank financial intermediaries, and even a few commercial banks.

A Profile of Rural India

- 350 million Below Poverty Line
- 95 % have no access to microfinance.
- 56 % people still borrow from informal sources.
- 70 % don't have any deposit account.
- 87 % no access to credit from formal sources.
- Annual credit demand is about Rs.70,000 crores.
- 95 % of the households are without any kind of insurance.
- Informally Microfinance has been in practice for ages.

Rural India and Microfinance



Micro financing has become important since the possibility of a sub-Rs 1,000 mobile handset has been ruled out in the near future. Rural India can generally afford handsets in the price range of Rs 1,500-2,000. To succeed in India, agribusiness must empower the farmer by making agriculture profitable, not by expropriating him for this particular purpose the farmer should be funded for their basic and small needs. Micro finance is expected to play a significant role in poverty alleviation and development. The need, therefore, is to share experiences and materials which will help not only in understanding successes and failures but also provide knowledge and guidelines to strengthen and expand micro finance programmes. The development process through a typical micro-finance intervention can be understood with the help of the following Chart The ultimate aim is to attain social and economic empowerment. Successful intervention is therefore, dependent on how each of these stages has been carefully dealt with and also the capabilities of the implementing organizations in achieving the final goal, e.g., if credit delivery takes place without consolidation of SHGs, it may have problems of self-sustainability and recovery. A number of schemes under banks, central and state governments offer direct credit to potential individuals without forcing them to join SHGs. Compilation and classification of the communication materials in the directory is done based on this development process.

Success Factors of Micro-Finance in Rural India

Over the last ten years, successful experiences in providing finance to small entrepreneur and producers demonstrate that poor people, when given access to responsive and timely financial services at market rates, repay their loans and use the proceeds to increase their income and assets. This is not surprising since the only realistic alternative for them is to borrow from informal market at an interest much higher than market rates. Community banks, NGOs and grass root savings and credit groups around the world have shown that these micro enterprise loans can be profitable for borrowers and for the lenders, making microfinance one of the most effective poverty reducing strategies.

A. For NGOs

- The field of development itself expands and shifts emphasis with the pull of ideas, and NGOs perhaps more readily adopt new ideas, especially if the resources required are small, entry and exit are easy, tasks are (perceived to be) simple and people's acceptance is high – all characteristics (real or presumed) of microfinance.



- Canvassing by various agencies, including the National Bank for Agriculture and Rural Development (NABARD), Small Industries Development Bank of India (SIDBI), Friends of Women's World Banking (FWWB), Rashtriya Mahila Kosh (RMK), Council for Advancement of People's Action and Rural Technologies (CAPART), Rashtriya Gramin Vikas Nidhi (RGVN), various donor funded programmes especially by the International Fund for Agricultural Development (IFAD), United Nations Development Programme (UNDP), World Bank and Department for International Development, UK (DFID)], and lately commercial banks, has greatly added to the idea pull. Induced by the worldwide focus on microfinance, donor NGOs too have been funding microfinance projects. One might call it the supply push.
- All kinds of things from khadi spinning to Nadep compost to balwadis do not produce such concrete results and sustained interest among beneficiaries as microfinance. Most NGO-led microfinance is with poor women, for whom access to small loans to meet dire emergencies is a valued outcome. Thus, quick and high 'customer satisfaction' is the USP that has attracted NGOs to this trade.

B. For Financial Institutions and banks

• Microfinance has been attractive to the lending agencies because of demonstrated sustainability and of low costs of operation. Institutions like SIDBI and NABARD are hard nosed bankers and would not work with the idea if they did not see a long term engagement – which only comes out of sustainability (that is economic attractiveness). On the supply side, it is also true that it has all the trappings of a business enterprise, its output is tangible and it is easily understood by the mainstream. This also seems to sound nice to the government, which in the post liberalisation era is trying to explain the logic of every rupee spent. That is the reason why microfinance has attracted mainstream institutions like no other developmental project. Perhaps the most important factor that got banks involved is what one might call the policy push. Given that most of our banks are in the public sector, public policy does have some influence on what they will or will not do. In this case, policy was followed by diligent, if meandering, promotional work by NABARD. The policy change about a decade ago by RBI to allow banks to lend to SHGs was initially followed by a seven-page memo by NABARD to all bank chairmen, and later by sensitisation and training programmes for bank staff across the country. Several hundred such programmes were conducted by NGOs alone, each involving 15 to 20 bank staff, all paid for by NABARD. The policy push was sweetened by the NABARD refinance scheme that offers much more



favourable terms (100% refinance, wider spread) than for other rural lending by banks. NABARD also did some system setting work and banks lately have been given targets. The canvassing, training, refinance and close follow up by NABARD has resulted in widespread bank involvement

Marketing of Microfinance Products

Contract Farming and Credit Bundling

- Banks and financial institutions have been partners in contract farming schemes, set up to enhance credit. Basically, this is a doable model. Under such an arrangement, crop loans can be extended under tie-up arrangements with corporate for production of high quality produce with stable marketing arrangements provided – and only, provided – the price setting mechanism for the farmer is appropriate and fair.

Non Traditional Markets

Similarly, Mother Dairy Foods Processing, a wholly owned subsidiary of National Dairy Development Board (NDDB) has established auction markets for horticulture producers in Bangalore. The operations and maintenance of the market is done by NDDB. The project, with an outlay of Rs.15 lakh, covers 200 horticultural farmers associations with 50,000 grower members for wholesale marketing. Their produce is planned with production and supply assurance and provides both growers and buyers a common platform to negotiate better rates.

Apni Mandi

Another innovation is that of The Punjab Mandi Board, which has experimented with a ‘farmers’ market’ to provide small farmers located in proximity to urban areas, direct access to consumers by elimination of middlemen. This experiment known as "Apni Mandi" belongs to both farmers and consumers, who mutually help each other. Under this arrangement a sum of Rs. 5.2 lakh is spent for providing plastic crates to 1000 farmers. Each farmer gets 5 crates at a subsidized rate. At the mandi site, the Board provides basic infrastructure facilities. At the farm level, extension services of different agencies are pooled in. These include inputs subsidies, better quality seeds and loans from Banks. Apni Mandi scheme provides self-employment to producers and has eliminated social inhibitions among them regarding the retail sale of their produce.

Findings

- Considerable gap between demand and supply for all financial services.



- Majority of poor are excluded from financial services. This is due to the following reasons:
- Bankers feel that it is risky to finance poor people because of their creditworthiness, High transaction costs

Conclusion

The potential for growing micro finance institutions in India is very high. Major cross-section can have benefit if this sector will grow in its fastest pace. Annual growth rate of about 20% during the next five year. The loan outstanding will consequently grow from the present level of about 1600 crores to about 42000 crores Annual growth rate of about 20 % can be achieved during the next five years.

References

- [1] www.ifmr.ac.in
- [2] www.google.com
- [3] www.microfinanceinsight.com
- [4] www.investopedia.com
- [5] www.books.google.com
- [6] www.seepnetwork.org
- [7] www.forbes.com
- [8] www.nationmaster.com
- [9] www.thaindian.com
- [10] www.authorstream.com
- [11] www.knowledge.allianz.com
- [12] www.familiesinbusiness.net
- [13] www.indiamicrofinance.com
- [14] www.gdrc.org
- [15] www.accion.org
- [16] Research paper by Prabhu Ghate
- [17] Research paper by Vishal Sehgal
- [18] Presentation by N. Srinivasan



REFORMATION OF CAPITAL MARKET & REVIEW OF CAPITAL FORMATION- AN ANALYTICAL APPROACH

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ABSTRACT

The capital market provides funds for long term purpose. Indian Stock markets contribute to the generation of funds through the IPO's. It has undergone rapid transformation and attracted a large number of investors. The foreign Institutional Investors (FII's) participate in the stock market. The capital market is reformed after the establishment of National Clearing & Settlement Corporation. The Badla market is been replaced by Options Market. Derivatives are freely traded. Thus there is a refinement and transparency in the functioning of stock exchanges. The number of investors has increased but also there is a requirement to make changes in the management of stock exchanges. The Indian Capital Market has a great future, provided, there is a steady economic growth.

Keywords: Economic growth, Capital formation.

INTRODUCTION

There is a steady growth in the Indian Capital Market from 1951 to year 2010. The fiscal year 2010-2011 saw a steady economic growth. It was predicted that there will be 10% economic growth in the year 2011-12 and the government aimed to have 4% agricultural growth per annum. The industrial growth rate predicted was around 8% and service sector growth at 10%. Thus the projection was, with the improvement in power, transport and road sector, the mobilization of savings rate would be over 35%. The government would bring in new issues in public Sector Undertakings. The technological progress would open doors to more Foreign Direct Investment (FDI).



Objectives

- To review the present scene of capital formation due to IPO's.
- To see the impact on capital formation due to reformation of capital market during the period of fiscal years 2012-2016.
- To suggest remedies in strategic management.

There will be technological tie-ups, joint ventures & collaborations with foreign companies. There will be joint ventures in off-shore oil exploration. The New Industrial Policy having positive and realistic approach will meet the growing funds demand of industrial sector. The economic conditions being buoyant will help capital market to boost up savings of the communities. It will help to generate funds needed by industrial sector. But to the contrary; following situation prevailed during 2011-12 till date. The major seven industries showed a downward growth rate as per table1.

Table -1

Combined Industrial Growth Rate

Month	Growth Rate
July 2015	7.8%
August 2015	3.7%
September 2015	2.3%
October 2015	0.3%
November 2015	6.8%

Source: Ministry of Commerce & Industry

The table 1 shows a sharp decline in overall growth rate from July to October 2015. There is a revival in the month of November 2015. The annual sectorial comparison of seven major industries and industrial growth is as per table 2



Table -2
Comparison of Sector wise Annual Growth

Sector	Year ending November 2015 in %	Year ending November 2016 in %
Coal	0.70	4.90
Crude oil	17.00	-5.60
Natural gas	5.50	-10.10
Fertilizer	0.00	-2.40
Steel	7.60	5.10
Cement	-4.30	16.60
Electricity	3.50	14.10

Source:Ministry of Commerce & Industry

Similarly there is an improvement in cement & electricity sector, but crude oil, natural gas , fertilizer and steel show The table -2 shows that coal sector has shown improvement which is a positive sign and a downward trend. The main growth rate for the year ending November 2015 is 4.28 (approx) whereas that for the year ending November 2016 is 3.23(approx).

The Capital Formation

As a result of this, there was shyness in major companies who had been already granted permission to raise capital through IPOs. According to SMC Global Securities Ltd, at least 28 companies were ready to bring their IPOs which would have brought at least 32000 crores into the market. The major companies who were granted permission are as follows:

**Table-3**

Name of the Company	Date of sanction	Date of expiry of sanction	Approximate estimate of capital generation through IPO (Rs. in Crore)
Jindal power	28.05.14	27.05.15	7200
Reliance Infratel	11.01.14	11.01.15	5000
Gujarat State Petroleum	10.05.14	09.05.15	3067.16
Starlight Energy	05.04.14	04.04.15	3000
Lodha Developers	21.01.14	20.01.15	2500
Lavasa Corporation	11.11.14	10.11.15	1663.31
BPTP	03.05.14	02.05.15	1500
Ambience	04.02.14	03.02.15	1293
Ananta power and infra	06.08.14	05.08.15	1250
In-Bharat power infra	11.10.14	10.10.15	1140

Source: SMC Global Securities Ltd

Naturally, the decline of industrial sector to introduce their IPOs in the market has adversely affected the expectations of capital formation during this period.

Findings

If past trend is reviewed, the capital formation by different types of institutions (at constant prices) with 2011-2015 as a base year is:

Table-4
Capital Formation by Different Types of Institutions

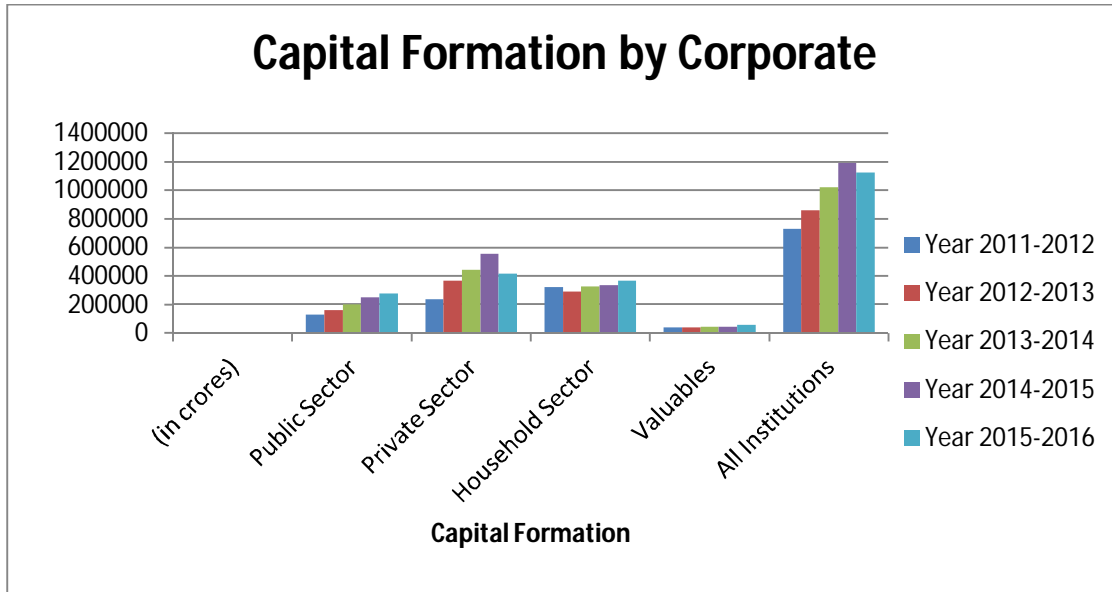
Net Capital Formation (in crores)	Year 2011-2012	Year 2012-2013	Year 2013-2014	Year 2014-2015	Year 2015-2016
Public Sector	130143	163173	201671	251275	279082
Private Sector	235852	367335	445447	553976	417577
Household Sector	323698	290590	326999	337341	368332



Valuables	41054	40160	46182	47456	58673
All Institutions	730747	861258	1020299	1190048	1123664

Source: CSO, MoSPI, GoI

The capital formation by private corporate sector alone from the fiscal year 2011-2012 to 2014-2015 showed an upward trend but there was a decline in the fiscal year 2012-2013 due to the then global recession.



However, there was a positive impact after the reformation of capital markets through stock markets which was due to:

- Fair dealings
- Translation of short-term and medium term investments into long term funds for companies
- Flow of capital towards most profitable channels
- Corporate companies raising their standard of performance
- Guidance received on cost of capital

The Future-Recommendations to change strategy

Forecasting future of capital market is impossible. But if overall 10% economic growth is attained, the future can be bright. The Government should aim at 4% agricultural growth per annum 8% industrial growth and 10% growth in service sector. If power sector road and transport improve, the Indian capital market will be able help in mobilizing saving rate up to 35% in future. The Government can plan new



issues in Public Sector Undertakings. The Foreign Direct Investment should be directed towards higher technological tie-ups.

Conclusion

The Government needs to take major strategic decisions to improve the capital formation through capital markets. The immense potentialities of human skills and entrepreneurship will boost capital market by mobilizing larger savings. A dual strategy approach is to be adopted by giving more incentives to the investors for deploying their additional savings in tax-free infrastructure bonds. On the other hand the dual strategy approach should have private and public partnership in floating and investing in infrastructure development companies such as power, telecom, roads, railways and energy development. This all will lead to capital formation.

References & Bibliography

- Acharya, B.K Govekar , P.B ; Business Policy & Strategic Management Himalaya Publishing House, 1998 First Edition
- Glueck, William .F : Business Policy & Strategic Management , Mcgraw-Hill Book Com., Third Edition
- Jauch ; Lawrence R.; Glueck; William F: Business Policy And Strategic Management ; Mcgraw Hill International Editions : International Edition
- KachruUpendra; Strategic Management; Excel Books First Edition 2006
- Pearce , John A ; Robinson Jr. , Richard B; Mittal Anita , Strategic Management , Tata Mcgraw Hill Education Pvt Ltd , Tenth Edition
- Prasad ,L.M, Business Policy: Strategic Management, Sultan Chand & Sons New Delhi, 2007 Forth Edition
- Census Bureau Sources of Statistics
- Current 5 year plan, planning commission, Government of India
- Guidelines to industries, Ministry of Industries, Government of India
- RBI annual company's report
- State agency publications
- BSE official directory
- ICICI portfolio services



A STUDY ON EFFECT OF MAKE IN INDIA ON EMPLOYABILITY OF ENGINEERING STUDENTS OF DR APJAKTU

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ABSTRACT

Employability is a major concern with all the students across the board. It's our 15th Prime Minister Mr Modi who gave the economic mantra – 'Make in India' aiming to project India as the manufacturing centre which will fuel the performance of India's trade and industry. Such a growth oriented scheme has led to the extent for research to find out its execution, implication and sustainability. Thus, for the study of this paper, I reviewed few research papers. After reviewing different papers, it's found that manufacturing in India by foreign & domestic Industries in various sectors can create employment prospects. So, it becomes important for the Indian labour and prospective employees to acquire skill and knowledge to achieve employability. Thus, this paper tried to find out the effect of 'Make in India' on employability and scope for skill development specifically with respect to the technical and management students of Dr APJAKTU. We need to focus on the development of the skills of Indian labour force to suit the eligibility criteria laid by the Industry. So, as reviewed, it is found that only 10% of the workforce receives formal training to acquire skill requirement. However, out of the actual industrial training requirement of the 22 million workforces, only 4.3 million of workforces are actually getting formal training. Interestingly, 'Make in India' project will lead to an increase in the demand of skilled engineers as well as managers too. Though, there exists a huge skill gap in India. In the process, it was noticed that for the successful implementation of 'Make in India' initiative, it is also imperative to execute different skill development initiatives to minimise the skill gap between the available skill sets and desired skill sets.

Key Words: *Employability, Make in India, Skill Gap, Skill Development, Labour force, Work force.*



INTRODUCTION

‘To be employed is to be at risk, to be employable is to be secure’ - Peter Hawkins India is sure to majorly dominate the global workforce in the years to come. It shall be the biggest provider of skilled labour to the world. Boston Consulting Group, in its study discussed the workforce demand and supply challenges faced in the world. It stated that by 2020 the world may expect a shortage of 47 million people. The MAKE IN INDIA programme laid the basis of India's most recent strategy to bring an economic revolution by making India a global manufacturing centre and welcoming both domestic and international industrialists to invest in India that will generate employment and overall development of India. Manufacturing sector is the strength of an economy as it fuels employment generation, improved quality of goods and services at cheaper rate, economic growth & development along with helping the expansion of other sectors also. The main purpose of MAKE IN INDIA is to focus on employment creation and skill augmentation in 25 sectors of the economy. The initiative also emphasises on high quality standards and lowering the affect on the surroundings. It also focusses on economic, infrastructure and technical development which will lead to expansion of other Industries and sectors giving a global recognition to Indian Industry. MAKE IN INDIA projects aim to give higher employment, better standard of living and high per capita GDP of Indian Economy. Manufacturing sector needs enormous investment to obtain latest modern technology, development and establishment of desired infrastructure, skill development of its labour force to make best quality products and continue globally. If India wants to attract the investors to invest in India and transform into a global manufacturing destination, its labour force should acquire the desired Skill requirement with Skill development and enhancement along with accrual of financial requirement. Practically speaking, it has been also observed that there is huge skill gap of Industrial demand for skilled labour and available skilled labour force. There are a large number of challenges in attaining government's target of 10% sustainable growth in manufacturing sector to make MAKE IN INDIA project successful. This paper aims to study the employability of Indian workforce to fulfill the Industrial skill requirement generated by MAKE IN INDIA project.

This paper reviews the existing state of education, skills development, and employment for Indian youth, and considers the challenges faced by India's skills development system. The data available (in the reviewed papers) for reference reflects the experience of a couple of states including even Karnataka, one of India's most industrially developed states.



The present paper discusses initiatives required to facilitate technical students from Dr APJAKTU's transition to the workplace. The Indian youth who will soon be entering the workforce constitute the major section of the demographic constitution. The majority of young people have limited access to education and training, and the majority finds work in the informal sector. In recent years, India has swiftly expanded the capacity of educational institutions and enrollments, but dropout rates remain high, and educational success remains low. Different countries at different levels of development face different challenges. In the perspective of developing economies like India, the situation is that though it has a well-institutionalised arrangement of technical and vocational training, it still lacks in preparing its youth adequately as industry ready. Thus, to speed its economic growth and take advantage of its 'demographic dividend', the country has recently embarked on sweeping policy reforms to hasten skills development. These reforms have led to significant changes, both in the national institutional framework and at the institutional level.

OBJECTIVES OF THE STUDY

- i. To study the level/extent of employability skills among the Engineering students of Dr APJAKTU University
- ii. To identify the attributes looked upon by the IT and other core companies in fresh/ amateur Engineering Graduates
- iii. To study the level of differences in the skills expected and actual observed among Engineering students
- iv. To identify the specific steps taken by the institutes affiliated to Dr APJAKTU to inculcate employability skills among the students
To suggest specific steps to be taken by the institutes affiliated to Dr APJAKTU to ensure employability skills among the students

LITERATURE REVIEW

To understand the Skill Development system, the Skill Development Model of India has been studied and even theoretically compared to that of China, Brazil and Singapore in order to gain an international outlook to skill development. China and Brazil along with India have been selected for the study as they are a part of BRICS countries and are the budding economies of the world. In the year 2015-16, Singapore



has been ranked as the second highly skilled nation of the world. So, for understanding the model of a highly skilled country, Singapore's Vocational and Technical Education model is being studied.

After assessing the high demand for the skilled employees in the world, the Ministry of Skill Development and Entrepreneurship was created. The ministry was announced in June 2014. The Prime Minister of India, Shri Narendra Modi felt the need to focus on skill development in view of the changes happening in the labour market and thus the ministry was established. It focussed on working in close collaboration with other ministries to meet the huge demand for establishments in the private and the public sector to train the students. The Industry has to provide on the job training to the students hence giving them a real world experience to skills and processes and making them employable. The National Policy on Skill Development was framed in 2009 with an aim to reinforce the skill development initiatives of the country. It is a Public Private Partnership model which comes under the Ministry of Skill Development and Entrepreneurship which was established in order to encourage skill development by creating large and exceptional quality vocational institution with the appropriate training infrastructure. India is full of aspirants but it doesn't have appropriate infrastructure to meet the requirements of vocational education and training and hence the government involved more of such partnership to ensure the model is successful in imparting the vocational training. The National Skills Qualifications Framework (NSQF) was enacted on 27th December 2013. The structure is built on the most recent concept of competencies which analyses the knowledge, skills and aptitude needed at each qualification. The levels are graded from one to ten and are defined in terms of learning outcomes for each level.

India has a large, diverse and highly complex model of skill development. On the other hand, China is known for having a reasonably good number of trained manpower. The Technical and Vocational Education and Training System (TVET) of China is a very broad and effective method of providing technical and vocational training to the people. The TVET of China is classified into two institutional settings. One of it focusses on education in schools while the other aims at providing vocational training. The school education falls under the Ministry of Education (MOE) and whereas the vocational training falls under the purview of Ministry of Human Resources and Social Security (MOHRSS). The curriculum of vocational training of the school is designed in line with the theoretical concepts and knowledge of the diverse theoretical frameworks for a particular trade. The other section that falls under the MOHRSS



focuses on post-school and pre-employment training of people. Its main emphasis is on practical and realistic learning through workplace training initiatives and also training and re-training of school dropouts and unemployed people. The institutional setting of vocational education broadly provides for pre-employment, post-school, and on-the-job-practical training besides training for school drop outs and a substantial scale of vocational training for different levels of employees through Technical/Skilled Worker Schools. Coming to Brazil's Vocational Educational Training Model VET, it is divided into three different levels, namely, Continued Formation Courses (FIC courses), Technical Courses and Technological courses. FIC Courses Initial or Continued Formation courses (FIC courses) are the ones with the broadest targeted population in which anyone can enroll. There are no requirements regarding educational degree or age. Their goal is to provide an initial qualification to those whose level of educational achievement is low or have no practical training or experience. Technical Courses provide professional training to students enrolled in secondary school and secondary school graduates.

As far as the Singapore Vocational and Technical Education (VTE) model is concerned, it lays a lot of importance to the skill development and invests heavily in the Vocational training and Technical Education. The government supports the VTE model of the country. Singapore is a preferred destination in terms of the skilled workforce as compared to India. The model is comparable with that of India and focuses on the sturdiness in the technical training given to the aspirants. It also lays emphasis on industry relevant curriculum and is pocket friendly so that more aspirants can opt for the technical education. It has various schemes like the traineeship, approved training centres and certified on-the-job training centres.

The major advantage of the TVET model is the curriculum which involved industry professionals in the design and hence ensured that the pertinent skills are transferred to workforce. The VTE has centres of excellence and it collaborates with other agencies that help in the exchange of training resources, expertise of members and technological initiatives focusing on skill development. The government through the VTE model funds the training of not only the school graduates but places equal importance on the drop outs so that the people continue to train themselves.



1. RESEARCH METHODOLOGY

The study is the result of information collected from Secondary sources. Research papers, News journals, Interviews and various websites on Engineering and AICTE (the Governing Body of Technical Institutes in India) formed the source of Secondary Data.

2. LIMITATIONS OF THE STUDY

The study is confined to the technical and management colleges affiliated to Dr APJAKTU only, which is the hub of many industrial activities and is also the hub for one of the largest number of educational institutes affiliated.

3. FINDINGS

The higher education system in India includes both private and public universities. India has 785 universities. Apart from these, other institutions are granted the permission to affiliate colleges and autonomously award degrees. However, they neither can affiliate colleges nor can they be officially called 'universities'. These include IITs, IITs, NITs and the various branches of the AIIMS, the IIMs and other autonomous institutes. Undoubtedly, the Higher Education sector in India is witnessing exponential expansion both in terms of number of institutions and the rate of enrollment. Dr APJAKTU, formerly Uttar Pradesh Technical University, has a total of 663 institutes affiliated to it as per the 2013 annual report.

With over 21.4 million enrollments in 2012, India has become the third largest education system in the world, after China and U.S.A. However, ensuring quality in higher education is amongst the foremost challenges being faced in India today with few institutes having achieved global recognition for excellence. As a result, there is an increase in awareness among the higher educational institutions to assess and suitably enhance their educational system to meet the needs of the society. Also, it was found that the company's perception on the employability skills of industry trained students is relatively positive and this is shown in the analysis and findings of the study. It was opined that industrial training does not only offer professional 'feel' of the actual engineering profession but also contribute in developing the Generic Student Attributes (GSA) thereby escalating students' job marketability. The study has also highlighted unawareness among the young engineers regarding the



expectations of the industry resulting in complete mismatch between the knowledge gained by the students and the practice followed in corporate. Finally, this study addresses the changing educational and industry situation based demands. It even suggested few feasible approaches at all three levels viz., the Universities and higher educational institutions, the corporate house and students as individuals to enhance employment opportunities.

4. RECOMMENDATIONS

‘Employability’ is an intricate and subjective matter and something of a slowly moving construct. The present paper is a sincere attempt to address the employability dearth among the engineering students, especially from the colleges affiliated to Dr APJAKTU. Although it would not be appropriate from this limited study to suggest comprehensive changes to higher education system, predominantly one that necessarily recommends more emphasis on employment skills, especially in such an aggressive job market. Nonetheless in order to capitalise on the intellect asset of the nation and to control skills- shortage it is essential to gear up the system through innovative initiatives.

Following are the few measures which can be taken at Academic, Industry and at Student level in order to make the human capital an asset to the nation.

At education level, institutes along with the University should take initiatives to build employable engineering talent pool by:-

- Ensuring teachers training under ‘train the trainer’ programmes thereby focussing on new and probably, improved teaching methods/pedagogy mandatory for engineering college and university teachers.
- Revising and updating the curriculum with respect to industry demands
- Inviting Guest faculty/trainers from corporate and other renowned institutes
- Improving the assessment and accreditation system to ensure quality in the Higher education programmes
- Introducing and inculcating entrepreneurial skills in students
- Signing MoUs with Entrepreneurship skills training agencies
- Incubation Cells need to become mandatory for all the engineering colleges across the board



- Research and Development needs to become integral to the final year project of every passing out student

At industry level, corporate house is expected to share their needs to the educational world by:-

- Sharing their expectations from the would -be engineering graduates during Pre placement talks
- Ensuring continuous communication between employers and training providers so that training meets the needs and aspirations of workers and enterprises
- Collaborating with educational institutes and sharing their expert service with institutes through seminars and workshops on curriculum designing too
- Providing more opportunities to students in the form of internship and short term Courses
- Separate Entrepreneurship Cells could be established which promote MAKE IN INDIA in a big way

At student level, one is expected-

- To learn and thorough one's basics
- To develop soft skills
- To gain experiences of real life challenges
- To be career oriented which can be one of the driving forces to develop employability skills.
- To attend as many workshops/seminars/ etc. as possible
- To update and upgrade one's skills

5. CONCLUSION

In the present scenario of higher education and increased competition, graduates are forced to equip themselves with more than just the academic skills.

The study reveals that employability skills like personal attributes; decision making skills etc. are not a mere outcome of the grade or level of the educational institute. Conceivably, these are the skills developed by the student on his/her own through the situations one encounters and experience(s) s/he gains out of it. On the other hand, the study lays bare the fact that some skills like technical knowledge and high order skills are majorly inculcated and developed by academics towards which the educational institutes have a chief role to play.



6. FUTURE SCOPE OF RESEARCH

The present study which is limited to the institutes affiliated to Dr APJAKTU only, can be further taken to PAN India level where the employability of the Indian graduates can be studied on a larger scale. The undergraduate courses other than mere engineering courses can also be studied.

REFERENCES

1. Ashton, D. & Green, F. (1996). *Education, Training and the Global Economy*. Cheltenham: Edward Elgar.
2. Das, A. K. (2015). *Skill Development for SMEs: Mapping of Key Initiative in India*. *Institutions and Economies*, 7 (2), 120-143.
3. Deodhar, S. Y. (2015, February). *Make in India: Rechanting the mantra with a Difference*. pp. 1-21.
4. Desai, S.B., Dubai, A., Joshi, B.L., Sen., M.Sharif, A. & Vann man, R. (2010). *Human Development in India: Challenges for a Society in Transition*. New Delhi: Oxford University Press.
5. FICCI, Ernst &Young. (September 2012). *Knowledge Paper on Skill Development Learner First*.
6. Government of India (GOI). (2011b). *Census of India 2011: Provisional Population Totals, Paper 2, Volume 1 of 2011. Rural-Urban Distribution*. Delhi: Office of the Registrar General & Census Commissioner, Ministry of Home Affairs, GOI.
7. ____ (2011d). *National Manufacturing Policy*.
8. [http://commerce.nic.in/whatsnew/National_Manufacturing_Policy2011.pdf]
9. ____ (2008a). *Educational Statistics at a Glance 2005/06*. Delhi: Ministry of Human Resource Development, Department of Higher Education, GOI.
10. Goyal, S., Kaur, P., & Singh, K. (2015). *Role of HR and Financial Services in Making "Make in India" Campaign a Success*. *IOSR Journal of Business and Management (IOSR-JBM)*, 17 (Issue 2.Ver. IV), 20-24.
11. Green, R. A. (December 15, 2014). *CAN "MAKE IN INDIA" MAKE JOBS? THE CHALLENGES OF MANUFACTURING GROWTH*. INSTITUTE FOR PUBLIC POLICY OF RICE UNIVERSITY, International Economics.



12. Jain, P. (2013). Globalization and Developing Employability Skills: Challenges and their Solution with Reference to NPSD & Government's Action Plan and Role of Life Long Learning and Extension Departments. *Journal of Business Management & Social Sciences Research (JBM &SSR)*, 2, 1-4.
13. Kapooria, D. P., & Sambria, S. (2015). Employability & skill gap : An overview of Literature Review. *International Journal of Marketing, Financial Service and Management Research*, 4(2), 1-6.
14. Kuruvilla, S., Erickson, C.L. & Hwang, A. (2002). "An Assessment of the Singapore Skills Development System: Does it Constitute a Viable Model for Other Developing Countries?" *World Development*, 30 (8). pp. 1461-1476.
15. Middleton, J., Ziderman, A. & Van Adams, A. (1993). *Skills for Productivity: Vocational Education and Training in Developing Countries*. New York: Oxford University Press.
16. Okada, A. (2012). Skill Development for Youth in India: Challenges & Opportunities. *Journal of International Cooperation*, 15 (2), 169-193.
17. Palit, D. A. (2009). Skill Development in India: Challenges and Strategies. ISAS Working Paper (89).
18. Punjani, P. K. (n.d.). A STUDY ON THE REQUIREMENT OF SKILLS DEVELOPMENT FOR THE SUCCESS OF MAKE IN INDIA" PROJECT. *Tactful Management Research Journal*, 65-69.
19. www.wikipedia.com
20. www.google.com
21. <http://mhrd.gov.in/>



SOME THEOREMS ON THE GENERAL SUMMABILITY METHODS

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ABSTRACT

On Generalizing the theorems of SULAIMAN for $|N, p_n, q_n; \delta|_k$ summability, we shall prove the following theorem in this paper.

Keyboard : Nörlund summability, Infinite series, $|\bar{N}, p_n|_k$ -summability.
AMS Classification: 40D25, 40F05, 40G99.

1. INTRODUCTION

Let $\sum a_n$ be an infinite series with partial sums s_n . Let σ_n^δ and η_n^δ denote the n^{th} Cesáro means of order $\delta (\delta > -1)$ of the sequence $\{s_n\}$ and $\{na_n\}$, respectively. The series $\sum a_n$ is said to be summable (C, δ) with index k , or simply summable $|C, \delta|_k, k \geq 1$, if

$$\sum_{n=1}^{\infty} n^{k-1} |\sigma_n^\delta - \sigma_{n-1}^\delta|^k < \infty,$$

or equivalently

$$\sum_{n=1}^{\infty} n^{-1} |\eta_n^\delta|^k < \infty.$$

Let $\{p_n\}$ be a sequence of real or complex constants with

$$P_n = p_0 + p_1 + p_2 + \dots + p_n, p_{-r} = P_{-r} = 0, r = 1, 2, \dots$$

The series $\sum a_n$ is said to be summable $|N, p_n|$, if

$$\sum_{n=1}^{\infty} |t_n - t_{n-1}| < \infty,$$

where

$$t_n = P_n^{-1} \sum_{v=0}^n p_{n-v} s_v \quad (t_{-1} = 0). \tag{1.1}$$



We write $p = \{p_n\}$ and

$$M = \left\{ p : p_n > 0 \text{ and } \frac{p_{n+1}}{p_n} \leq \frac{p_{n+2}}{p_{n+1}} \leq 1, n = 0, 1, \dots \right\}$$

It is known that for $p \in M$, (1.1) holds if and only if (DAS [2])

$$\sum_{n=1}^{\infty} \frac{1}{nP_n} \left| \sum_{v=1}^n p_{n-v} v a_v \right| < \infty.$$

For $p \in M$, we say that $\sum a_n$ is summable $|N, p_n|_k, k \geq 1$, if (SULAIMAN [3])

$$\sum_{n=1}^{\infty} \frac{1}{nP_n^k} \left| \sum_{v=1}^n p_{n-v} v a_v \right|^k < \infty.$$

In the special case in which $p_n = A_n^{r-1}, r > -1$, where A_n^r is the coefficient of x^n in the power series expansion of $(1-x)^{-r-1}$ for $|x| < 1, |N, p_n|_k$ summability reduces to $|C, r|_k$ summability.

The series $\sum a_n$ is said to be summable $|N, p_n|_k, k \geq 1$ if

$$\sum_{n=1}^{\infty} \left(\frac{P_n}{P_n} \right)^{k-1} |T_n - T_{n-1}|^k < \infty \text{ (BOR [1])}$$

where

$$T_n = P_n^{-1} \sum_{v=0}^n p_v s_v.$$

If we take $p_n = 1$, then $|\bar{N}, p_n|_k$ summability is equivalent to $|C, 1|_k$ summability. In general, these two summabilities are not comparable.

We set

$$\Delta f_n = f_n - f_{n+1}$$

$$Q_n = q_0 + q_1 + \dots + q_n, q_{n-1} = Q_{-1} = 0$$

$$U_n = u_0 + u_1 + \dots + u_n, u_{-1} = U_{-1} = 0$$

$$V_n = v_0 + v_1 + \dots + v_n, v_{-1} = V_{-1} = 0$$

$$R_n = p_0 q_n + p_1 q_{n-1} + \dots + p_n q_0$$

$$W_n = u_0 v_n + u_1 v_{n-1} + \dots + u_n v_0$$

and assume that P_n, U_n, R_n and W_n all tend to ∞ .

Let $\{p_n\}, \{q_n\}$ be sequences of positive real constant such that $q \in M$. We say that $\sum a_n$ is summable $|N, p_n, q_n|_k, k \geq 1$, if (SULAIMAN [4])



$$\sum_{n=1}^{\infty} \frac{P_n}{P_n R_{n-1}^k} \left| \sum_{v=1}^n p_{v-1} q_{n-v} a_v \right|^k < \infty.$$

Clearly $|N, p_n, 1|_k$ and $|N, 1, q_n|_k$ are equivalent to $|\bar{N}, p_n|_k$ and $|N_n, q_n|_k$ respectively, and it is said to be $|N, p_n, q_n; \delta|_k, k \geq 1; \delta \geq 0$ summable, if

$$\sum_{n=1}^{\infty} \frac{P_n}{P_n R_{n-1}^{\delta k + k}} \left| \sum_{v=1}^n p_{v-1} q_{n-v} a_v \right|^k < \infty.$$

For $\delta = 0$, above definition reduces to $|N, p_n, q_n|_k$ summability.

2. Main Result

Generalizing the theorem of SULAIMAN [5] for $|N, p_n; \delta|_k$ summability, we shall prove the following theorem.

Theorem 2.1

Let $\{p_n\}, \{q_n\}, \{u_n\}$ and $\{v_n\}$ be sequences of positive real constant such that $q, v \in M, q_n = O(v_n), \{p_n / P_n R_{n-1}^k v_n^k\}$ nonincreasing and that $a_n \geq 0$ if $v_n \neq c$. suppose $\{\varepsilon_n\}$ is a sequence of constants and write $W_{n-1} G_n = \sum_{r=1}^n U_{r-1} v_{n-r} a_r$. If

$$\sum_{n=r+1}^{\infty} \frac{p_r}{P_r R_{r-1}} \frac{q_{n-r-1}}{v_{n-r-1}^k} = O\left(\frac{1}{P_r v_r^k}\right), \quad (2.1)$$

$$\sum_{n=1}^{\infty} \frac{p_n}{P_n} \left(\frac{W_{n-1}}{v_n U_{n-1}}\right)^k \frac{1}{R_{n-1}^{\delta k}} |\varepsilon_n|^k |G_n|^k < \infty, \quad (2.2)$$

$$\sum_{n=1}^{\infty} \left(\frac{P_n}{p_n}\right)^{k-1} \left(\frac{u_n}{U_n}\right)^k \left(\frac{W_{n-1}}{v_n U_{n-1}}\right)^k \frac{1}{R_{n-1}^{\delta k}} |\varepsilon_n|^k |G_n|^k < \infty, \quad (2.3)$$

$$\sum_{n=1}^{\infty} \left(\frac{P_n}{p_n}\right)^{k-1} \left(\frac{W_{n-1}}{v_n U_{n-1}}\right)^k \frac{1}{R_{n-1}^{\delta k}} |\Delta \varepsilon_n|^k |G_n|^k < \infty, \quad (2.4)$$

$$\sum_{n=1}^{\infty} \frac{p_r}{P_r} \left(\frac{P_{r-1}}{R_{r-1}}\right)^k \left(\frac{W_{r-1}}{v_r U_{r-1}}\right)^k \frac{1}{R_{r-1}^{\delta k}} |\varepsilon_r|^k |G_r|^k < \infty, \quad (2.5)$$

then the series $\sum a_n \varepsilon_n$ is summable $|N, p_n, q_n; \delta|_k, k \geq 1$ and $\delta \geq 0$.



3. Lemmas

For the proof of our theorem, we require the following lemmas.

Lemma 1: (SULAIMAN [4]). Let $q \in M$, then for $0 < \nu \leq 1$,

$$\sum_{n=r}^{\infty} \frac{q_{n-r}}{n^{\nu} Q_r} = O(r^{-\nu}).$$

Lemma 2: (sulaiman [5]). $\left\{ \frac{P_n}{P_n R_{n-1}^k v_n^k} \right\}$ nonincreasing implies

$$\sum_{n=r+1}^m \frac{P_n}{P_n R_{n-1}^k} \frac{|\Delta_r q_{n-r}|}{v_{n-r}^k} = O \left\{ \frac{P_r}{P_r R_{r-1}^k v_r^k} \sum_{n=1}^m |\Delta q_n| \right\}.$$

4 Proof of the Theorem:

Write $F_n = \sum_{r=1}^n P_{r-1} q_{n-r} a_r \varepsilon_r$, then, by Abel's transformation

$$\begin{aligned} F_n &= \sum_{r=1}^n U_{r-1} v_{n-r} a_r \left(\frac{P_{r-1} q_{n-r}}{U_{r-1} v_{n-r}} \varepsilon_r \right) \\ &= \sum_{r=1}^{n-1} \left(\sum_{s=1}^r U_{s-1} v_{n-s} a_s \right) \Delta_r \left(\frac{P_{r-1} q_{n-r}}{U_{r-1} v_{n-r}} \varepsilon_r \right) + W_{n-1} G_n \frac{P_{n-1} q_0 \varepsilon_n}{U_{n-1} v_0} \\ &\leq \sum_{r=1}^{n-1} W_{r-1} |G_r| \left\{ \frac{|\Delta_r q_{n-r}|}{v_{n-r}} \frac{P_{r-1}}{U_{r-1}} |\varepsilon_r| + q_{n-r-1} \left| \Delta_r \left(\frac{1}{v_{n-r}} \right) \right| \frac{P_{r-1}}{U_{r-1}} |\varepsilon_r| + \right. \\ &\quad \left. + \frac{q_{n-r-1}}{v_{n-r-1}} \frac{P_r}{U_{r-1}} |\varepsilon_r| + \frac{q_{n-r-1}}{v_{n-r-1}} \frac{u_r P_r}{U_r U_{r-1}} |\varepsilon_r| + \frac{q_{n-r-1}}{v_{n-r-1}} \frac{P_r}{U_r} |\Delta \varepsilon_r| \right\} + \\ &\quad + W_{n-1} |G_n| \frac{P_{n-1} q_0}{U_{n-1} v_0} |\varepsilon_n| \\ &= F_{n,1} + F_{n,2} + F_{n,3} + F_{n,4} + F_{n,5} + F_{n,6} \text{ (say)}. \end{aligned}$$

In order to prove the theorem, by Minkowski's inequality, it is therefore sufficient to show that

$$\sum_{n=1}^{\infty} \frac{P_n}{P_n R_{n-1}^{\delta k+k}} F_{n,r}^k < \infty, \quad r = 1, 2, 3, 4, 5, 6,$$

where $k > 1$. Applying Hölder's inequality,



$$\begin{aligned} \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}^{\delta k+k}} F_{n,1}^k &= \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}^{\delta k+k}} \left\{ \sum_{r=1}^{n-1} \frac{|\Delta_r q_{n-r}|}{v_{n-r}} \frac{P_{r-1}}{U_{r-1}} W_{r-1} |\varepsilon_r| |G_r| \right\}^k \\ &= \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}^{\delta k+k}} \sum_{r=1}^{n-1} \frac{|\Delta_r q_{n-r}|}{v_{n-r}^k} \frac{P_{r-1}^k}{U_{r-1}^k} W_{r-1}^k |\varepsilon_r|^k |G_r|^k \left\{ \sum_{r=1}^{n-1} |\Delta_r q_{n-r}| \right\}^{k-1} \\ &= O(1) \sum_{r=1}^m \frac{P_{r-1}^k}{U_{r-1}^k} \frac{1}{R_{r-1}^{\delta k}} W_{r-1}^k |\varepsilon_r|^k |G_r|^k \sum_{n=r+1}^{m+1} \frac{P_n}{P_n R_{n-1}^k} \frac{|\Delta_r q_{n-r}|}{v_{n-r}^k} \\ &= \sum_{r=1}^m \frac{P_r}{P_r} \left(\frac{P_{r-1}}{R_{r-1}} \right)^k \left(\frac{W_{r-1}}{v_r U_{r-1}} \right)^k \frac{1}{R_{r-1}^{\delta k}} |\varepsilon_r|^k |G_r|^k \\ &= O(1). \end{aligned}$$

$$\begin{aligned} \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}^{\delta k+k}} F_{n,2}^k &= \\ &\leq \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}^{\delta k+k}} \sum_{r=1}^{n-1} \frac{q_{n-r-1}^k}{v_{n-r-1}^k} \frac{|\Delta_r q_{n-r}|}{v_{n-r}^k} \frac{P_{r-1}^k}{U_{r-1}^k} W_{r-1}^k |\varepsilon_r|^k |G_r|^k \left\{ \sum_{r=1}^{n-1} |\Delta_r q_{n-r}| \right\}^{k-1} \\ &= O(1) \sum_{r=1}^m \left(\frac{P_{r-1}}{U_{r-1}} \right)^k W_{r-1}^k |\varepsilon_r|^k |G_r|^k \frac{1}{R_{r-1}^{\delta k}} \sum_{n=r+1}^{m+1} \frac{P_n}{P_n R_{n-1}^k} \frac{|\Delta_r v_{n-r}|}{v_{n-r}^k} \\ &= \sum_{r=1}^m \frac{P_r}{P_r} \left(\frac{P_{r-1}}{R_{r-1}} \right)^k \left(\frac{W_{r-1}}{v_r U_{r-1}} \right)^k \frac{1}{R_{r-1}^{\delta k}} |\varepsilon_r|^k |G_r|^k \\ &= O(1). \end{aligned}$$

$$\begin{aligned} \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}^{\delta k+k}} F_{n,3}^k &= \\ &\leq \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}^{\delta k+k}} \sum_{r=1}^{n-1} \frac{q_{n-r-1}}{v_{n-r-1}^k} \frac{P_r W_{r-1}^k}{U_{r-1}^k} |\varepsilon_r|^k |G_r|^k \left\{ \sum_{r=1}^{n-1} \frac{P_r q_{n-r-1}}{R_{n-1}} \right\}^{k-1} \\ &= O(1) \sum_{r=1}^m \frac{P_r}{U_{r-1}^k} W_{r-1}^k |\varepsilon_r|^k |G_r|^k \frac{1}{R_{r-1}^{\delta k}} \sum_{n=r+1}^{m+1} \frac{P_n}{P_n R_{n-1}^k} \frac{q_{n-r-1}}{v_{n-r-1}^k} \\ &= O(1) \sum_{r=1}^m \frac{P_r}{P_r} \left(\frac{W_{r-1}}{v_r U_{r-1}} \right)^k \frac{1}{R_{r-1}^{\delta k}} |\varepsilon_r|^k |G_r|^k \\ &= O(1). \end{aligned}$$



$$\begin{aligned}
& \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}} F_{n,4}^k = \\
& \leq \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}} \sum_{r=1}^{n-1} \frac{q_{n-r-1}}{v_{n-r-1}^k} \frac{P_r^k}{P_r^k} \frac{u_r^k}{U_r^k} W_{r-1}^k |\varepsilon_r|^k |G_r|^k \left\{ \sum_{r=1}^{n-1} \frac{P_r q_{n-r-1}}{R_{n-1}} \right\}^{k-1} \\
& = O(1) \sum_{r=1}^m P_r \frac{P_r^k}{P_r^k} \frac{u_r^k}{U_r^k} W_{r-1}^k |\varepsilon_r|^k |G_r|^k \frac{1}{R_{r-1}^{\delta k}} \sum_{n=r+1}^{m+1} \frac{P_n}{P_n R_{n-1}} \frac{q_{n-r-1}}{v_{n-r-1}^k} \\
& = O(1) \sum_{r=1}^m \left(\frac{P_r}{P_r} \right)^{k-1} \left(\frac{u_r}{U_r} \right)^k \left(\frac{W_{r-1}}{v_r U_{r-1}} \right) \frac{1}{R_{r-1}^{\delta k}} |\varepsilon_r|^k |G_r|^k \\
& = O(1).
\end{aligned}$$

$$\begin{aligned}
& \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}} F_{n,5}^k = \\
& \leq \sum_{n=2}^{m+1} \frac{P_n}{P_n R_{n-1}} \sum_{r=1}^{n-1} P_r \frac{q_{n-r-1}}{v_{n-r-1}^k} \frac{P_r^k}{P_r^k} \frac{W_{r-1}^k}{U_r^k} |\Delta \varepsilon_r|^k |G_r|^k \left\{ \sum_{r=1}^{n-1} \frac{P_r q_{n-r-1}}{R_{n-1}} \right\}^{k-1} \\
& = O(1) \sum_{r=1}^m P_r \left(\frac{P_r}{P_r} \right)^k \left(\frac{W_{r-1}}{U_r} \right)^k |\Delta \varepsilon_r|^k |G_r|^k \frac{1}{R_{r-1}^{\delta k}} \sum_{n=r+1}^{m+1} \frac{P_n}{P_n R_{n-1}} \frac{q_{n-r-1}}{v_{n-r-1}^k} \\
& = O(1) \sum_{r=1}^m \left(\frac{P_r}{P_r} \right)^{k-1} \left(\frac{W_{r-1}}{v_r U_{r-1}} \right)^k \frac{1}{R_{r-1}^{\delta k}} |\Delta \varepsilon_r|^k |G_r|^k \\
& = O(1).
\end{aligned}$$

$$\begin{aligned}
& \sum_{n=1}^m \frac{P_n}{P_n R_{n-1}} F_{n,6}^k = \\
& \leq \sum_{n=1}^m \frac{P_n}{P_n R_{n-1}} \left(\frac{q_0}{v_0} \right)^k P_{n-1}^k \left(\frac{W_{n-1}}{U_{n-1}} \right)^k |\varepsilon_n|^k |G_n|^k \\
& = O(1) \sum_{r=1}^m \frac{P_n}{P_n} \left(\frac{P_{n-1}}{R_{n-1}} \right)^k \left(\frac{W_{n-1}}{v_n U_{n-1}} \right)^k |\varepsilon_n|^k |G_n|^k \\
& = O(1).
\end{aligned}$$

This completes the proof of the theorem.



5 Corollary

Our theorem have the following result as a corollary

Corollary 5.1

If $\delta = 0$ then our theorem reduces to SULAIMAN [5].

References

- [1] BOR, H. : On two summability methods; Math. Proc. Comb. P. Soc.; 97 (1985), 147-149.
- [2] DAS, G. : A Tauberian theorem for absolute Nörlund summability; Proc. London Math. Soc. 19, (1969), 357-384.
- [3] SULAIMAN, W.T. : Notes on two summability methods; Pure. Appl. Math. Sci. 31, (1990), 59-68.
- [4] SULAIMAN, W.T. : Relations on some summability methods; Proc. Am. Math. Soc. (to appear).
- [5] SULAIMAN, W.T. : Some theorems on the general summability methods; Proc. Indian Acad. Sci. (Math. Sci.), Vol. 105, No.1 (1995), 53-58.



A NOTE ON $|V, \lambda|_k$ SUMMABILITY METHOD

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ABSTRACT

In this paper we have proved a theorem on $|V, \lambda|_k$ -summability. Which gives some new results and previous known results as a corollary.

Ams Classification: 40F05, 40G05, 40G99.

Keywords: de la Vallee Poussin means, Convex sequence, Abel's-transformation.

1. Introduction

Let $\sum a_n$ be a given infinite series with the sequence of partial sum $\{s_n\}$ and let $\lambda = \{\lambda_n\}$ be a monotonic non-decreasing sequence of natural numbers with, $\lambda_{n+1} - \lambda_n \leq 1$ and $\lambda_n = 1$.

The sequence-to-sequence transformation

$$V_n(\lambda) = \frac{1}{\lambda_n} \sum_{v=n-\lambda_n+1}^n S_v \quad (1.1)$$

defines generalized de la Vallee Poussin means of the sequence $\{s_n\}$ generated by the sequence $\{\lambda_n\}$.

The series $\sum a_n$ is said to be summable $|V, \lambda|$ if the sequence $V_n(\lambda)$ is of bounded variation, that is to say

$$\sum_{n=1}^{\infty} |V_{n+1}(\lambda) - V_n(\lambda)| < \infty, \quad (1.2)$$

The series $\sum a_n$ will be said to summable $|V, \lambda|_k$ $k \geq 1$, if

$$\sum_{n=1}^{\infty} \lambda_n^{k-1} |V_{n+1}(\lambda) - V_n(\lambda)|^k < \infty \quad (1.3)$$

For $\lambda_n = n$, it reduces to $|C, 1|_k$ -sumambility.

Given a sequence $\{a_n\}$, we write $\Delta a_n = a_n - a_{n+1}$, $\Delta^m a_n = \Delta(\Delta^{m-1} a_n)$ with $\Delta^0 a_n = a_n$, where m is a positive integer. The sequence $\{a_n\}$ is said to be convex if, $\Delta^2 a_n \geq 0$. It is well known that if $\{a_n\}$ is bounded and convex, then



$$a_n \downarrow, n\Delta a_n \rightarrow O, n \rightarrow \infty \quad \text{and} \quad \sum_l^\infty (n+1)\Delta^2 a_n < \infty.$$

A sequence $\{a_n\}$ is said to be quasi-convex, if

$$\sum_l^\infty (n+1)|\Delta^2 a_n| < \infty. \quad (1.4)$$

It is clear from the above result that every bounded convex sequence is quasi convex. Fowever, the converse need not be true. Contrary to what we have for convex sequences, a null quasi-convex sequence, $\{a_n\}$ need not be monotonic decreasing. It is, however, of bounded variatio and it satisfies the condition

$$n\Delta a_n \rightarrow O, n \rightarrow \infty$$

The concept of quasi sequence was generalized by TELYAKOVSKII [5]. According to him a sequence $\{a_n\}$ is said belong to class S if,

$$a_n \rightarrow O, n \rightarrow \infty \quad (1.5)$$

there exists a sequence of numbers $\{A_k\}$ such that $A_k \downarrow O$ and

$$\sum_l^\infty A_k < \infty, \quad (1.6)$$

$$|\Delta a_k| \leq A_k, \text{ for all } k \quad (1.7)$$

Taking $A_k = \sum_{m=k}^\infty |\Delta^2 a_m|$ it follows that a null quasi convex sequence $\{a_n\}$ belongs to the class S .

The converse is obviously not true. In view of the conditions (1.6) and (1.7), it follows that every sequence $\{a_n\}$ of class S is of bounded variation and that $n\Delta a_n \rightarrow O$, as $n \rightarrow \infty$.

2. Known result

On generalizing the theorem of MAZHAR [3], SINHA and GERA [4] have proved the following theorem.

2.1 Theorem

Let

$$\lambda_m = O(1), \quad (2.1)$$

Suppose that there exists a sequence of numbers $\{A_k\}$ such that it is δ -quasi monotone with

$$\sum_l^\infty n \log n \delta_n = O(1) \quad (2.2)$$



$$\sum_l^{\infty} A_k \log k = O(1) \quad (2.3)$$

$$|\Delta \lambda_k| \leq |A_k| \text{ for all } k \quad (2.4)$$

$$\text{and if } \sum_l^m \frac{|t_n^{(1)}|^k}{n} = O(\log m \mu_m), \quad m \rightarrow \infty \quad (2.5)$$

where $\{\mu_m\}$ is positive non-decreasing sequence such that $m \log m \mu_m \Delta \left(\frac{1}{\mu_m} \right) = O(1)$, as $m \rightarrow \infty$,

then $\sum \frac{a_m \lambda_m}{\mu_m}$ is summable $|C, 1|_k$.

3. Main Result

The object of this paper is to be prove a more genral theorem for $|V, \lambda|_k$ summability. However, we shall prove the following theorem.

Theorem 3.1

$$\text{Let } \lambda_m = O(1), \quad (3.1)$$

Suppose that there exists a sequence of numbers $\{\delta_n\}$ such that it is δ -quasi monotone with

$$\sum_l^{\infty} n \log n \delta_n = O(1) \quad (3.2)$$

$$\sum_l^{\infty} A_k \log k = O(1) \quad (3.3)$$

$$|\Delta \lambda_k| \leq A_k \text{ for all } k \quad (3.4)$$

$$\sum_l^m \frac{|t_n^{(1)}|^k}{\lambda_n} = O(\log m \mu_m), \quad m \rightarrow \infty \quad (3.5)$$

where $\{\mu_m\}$ is positive non-decreasing sequence, such that,

$$m \log m \mu_m \Delta \left(\frac{1}{\mu_m} \right) = O(1), \text{ as } m \rightarrow \infty, \quad (3.6)$$

then $\sum \frac{a_m \lambda_m}{\mu_m}$ is summable $|V, \lambda|_k$.



4. Lemmas

We have needed the following lemma for the proof of the theorem.

Lemma 4.1 [1]

If $\{b_n\}$ is δ -quasi-monotone with $\sum n \log n \delta_n < \infty$ and $\sum b_n \log n$ is convergent, then $mb_m \log m \rightarrow 0, \quad m \rightarrow \infty$ (4.1)

$$\sum n \log n |\Delta b_n| < \infty \quad (4.2)$$

5. Proof of the Theorem

Let

$$T_n = V_{n+1}(\lambda_{n+1}(\lambda_n; \epsilon_n) - V_n(\lambda; \epsilon_n))$$

where $V_n(\lambda; \epsilon_n)$ is the n -th de la Vallée Poussin means of the series $\sum a_n \epsilon_n$.

Then to prove this theorem it is sufficient to prove that

$$\sum_{n=1}^{\infty} \lambda_n^{k-1} |T_n|^k < \infty.$$

Let \sum' be the summation over all n satisfying $\lambda_{n+1} = \lambda_n$ and \sum'' the summation over all n where $\lambda_{n+1} > \lambda_n$. We have

$$T_n = \frac{1}{\lambda_n \lambda_{n+1}} \sum_{v=n-\lambda_n+2}^{n+1} [(\lambda_{n+1} - \lambda_n)(v - n - 1) + \lambda_n] a_v \epsilon_v$$

Where $\lambda_{n+1} = \lambda_n$, we have

$$T_n = \frac{1}{\lambda_{n+1}} \sum_{v=n-\lambda_n+2}^{n+1} v a_v \frac{\epsilon_v}{v}$$

Applying Abel's transformation, we have

$$\begin{aligned} T_n &= \frac{1}{\lambda_{n+1}} \left[\sum_{v=n-\lambda_n+2}^n \Delta \left(\frac{\epsilon_v}{v} \right) \sum_{r=0}^v r a_r + \frac{\epsilon_{n+1}}{n+1} \sum_{r=0}^{n+1} r a_r - \frac{\epsilon_{n-\lambda_n+2}}{n-\lambda_n+2} \sum_{r=0}^{n-\lambda_n-1} r a_r \right] \\ &= \frac{1}{\lambda_n} \sum_{v=n-\lambda_n+2}^n \Delta \epsilon_v t_v^1 + \frac{1}{\lambda_n} \sum_{v=n-\lambda_n+2}^n \frac{\Delta \epsilon_v t_v^1}{v} + \\ &+ \frac{1}{\lambda_n} \sum_{v=n-\lambda_n+2}^n \frac{\epsilon_{v+1} t_v^1}{v} + \frac{\epsilon_{n+1} t_{n+1}^1}{\lambda_{n+1}} + \frac{\epsilon_{n-\lambda_n+2} t_{n-\lambda_n+1}^1}{\lambda_{n-\lambda_n+1}} \\ &= L_1^{(n)} + L_2^{(n)} + L_3^{(n)} + L_4^{(n)} + L_5^{(n)}. \end{aligned}$$

By Minkowski's inequality, it is therefore, sufficient to prove that



$$\sum' \lambda_n^{k-1} |L_1^{(n)}|^k < \infty, \text{ for } r = 1, 2, 3, 4, 5.$$

Now,

$$\begin{aligned} \sum' \lambda_n^{k-1} |L_r^{(n)}|^k &= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n |\Delta \epsilon_v| |t_v^1|^k \right\} \right] \\ &= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n |\Delta \epsilon_v| |t_v^1|^k \right\} \left\{ \sum_{v=n-\lambda_n+2}^n |\Delta \epsilon_v| \right\}^{k-1} \right] \\ &= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n |A_v| |t_v^1|^k \right\} \left\{ \sum_{v=n-\lambda_n+2}^n |A_v| \right\}^{k-1} \right] \\ &= O(1) \left[\sum' \frac{1}{\lambda_n} \sum_{v=n-\lambda_n+2}^n |A_v| |t_v^1|^k \right] \\ &= O(1) \left[\sum_{v=1}^{\infty} |t_v^1|^k |A_v| \sum_{n=v}^{v+\lambda_r-1} \frac{1}{\lambda_n} \right] \\ &= O(1) \left[\sum_{v=1}^n |t_v^1| |A_v| \right]. \end{aligned}$$

Now,

$$\begin{aligned} \sum_{v=1}^m \frac{|t_v^1|}{\lambda_v} |A_v| \lambda_v &= \sum_{v=1}^{m-1} \Delta \{ |A_v| \lambda_v \} \sum_{r=1}^v \frac{|t_r^1|^k}{\lambda_r} + \lambda_m |A_m| \sum_{v=1}^m \frac{|t_v^1|}{\lambda_v} \\ O(1) &\left[\sum_{v=1}^{m-1} |\Delta A_v| \lambda_v \log v \mu_v + \sum_{v=1}^{m-1} |A_v| \Delta \lambda_v \log v \mu_v + \lambda_m |A_m| |\log m \mu_m| \right] \\ &= O(1) [O(1) + O(1) + O(1)] \\ &= O(1), \quad m \rightarrow \infty \end{aligned}$$

by virtue of conditions and lemma.

$$\text{Hence, } \sum' \lambda_n^{k-1} |L_1^{(n)}|^k < \infty.$$

Again,

$$\sum' \lambda_n^{k-1} |L_2^{(n)}|^k = O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|\Delta \epsilon_v| |t_v^1|^k}{v} \right\} \right]$$



$$\begin{aligned}
&= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|\Delta \epsilon_v| |t_v^1|^k}{v} \right\} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|\Delta \epsilon_v|}{v} \right\}^{k-1} \right] \\
&= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|A_v| |t_v^1|^k}{v} \right\} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|A_v|}{v} \right\}^{k-1} \right] \\
&= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|A_v| |t_v^1|^k}{v} \right\} \right] \\
&= O(1) \left[\sum_{v=1}^{\infty} \frac{|t_v^1|^k |A_v|}{v} \sum_{n=v}^{\lambda_n-1} \frac{1}{\lambda_n} \right] \\
&= O(1) \left[\sum_{v=1}^{\infty} \frac{|t_v^1|^k |A_v|}{v} \right].
\end{aligned}$$

Now

$$\begin{aligned}
\sum_{v=1}^m \frac{|A_v| \lambda_v |t_v^1|^k}{v \lambda_v} &= \sum_{v=1}^{m-1} \Delta \left\{ \frac{|A_v| \lambda_v}{v} \right\} \sum_{r=1}^v \frac{|t_r^1|^k}{\lambda_r} + \frac{|A_m| \lambda_m}{m} \sum_{r=1}^m \frac{|t_r^1|^k}{\lambda_r} \\
&= O(1) \left[\sum_{v=1}^{m-1} \left\{ \frac{\Delta |A_v| \lambda_v}{v} - \frac{A_{v+1}}{v} + \frac{|A_{v+1}| \lambda_{v+1}}{v(v+1)} \right\} \log v \mu_v + \frac{|A_m| \lambda_m}{m} \log m \mu_m \right] \\
&= O(1) \left[\sum_{v=1}^{m-1} \frac{\Delta |A_v| \lambda_v}{v} \log v \mu_v - \sum_{v=1}^{m-1} \frac{|A_{v+1}|}{v} \log v \mu_v + \sum_{v=1}^{m-1} \frac{|A_{v+1}| \lambda_{v+1}}{v(v+1)} \log v \mu_v + \frac{|A_m| \lambda_m}{m} \log m \mu_m \right] \\
&= O(1) [O(1) - O(1) + O(1) + O(1)] \\
&= O(1), \text{ as } m \rightarrow \infty
\end{aligned}$$

by virtue of the conditions and lemma.

$$\text{Hence } \sum' \lambda_n^{k-1} |L_2^{(n)}|^k < \infty.$$

$$\text{Again } \sum' \lambda_n^{k-1} |L_3^{(n)}|^k = O(1) \sum' \frac{1}{\lambda_n} \left[\sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_v| |t_v^1|}{v} \right]^k$$



$$\begin{aligned}
&= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_v| |t_v^1|^k}{v} \right\} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_v|}{v} \right\}^{k-1} \right] \\
&= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_v| |t_v^1|^k}{v} \right\} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{1}{v} \sum_{n=v}^{\infty} |\Delta \epsilon_n| \right\}^{k-1} \right] \\
&= O(1) \left[\sum' \frac{1}{\lambda_n} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_v| |t_v^1|^k}{v} \right\} \left\{ \sum_{v=n-\lambda_n+2}^n \frac{1}{v} A_v \right\}^{k-1} \right] \\
&= O(1) \left[\sum' \frac{1}{\lambda_n} \sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_v| |t_v^1|^k}{v} \right] \\
&= O(1) \left[\sum_{v=1}^{\infty} \frac{|\epsilon_v| |t_v^1|^k}{v} \sum_{n=v}^{n-\lambda_n-1} \frac{1}{\lambda_n} \right] \\
&= O(1) \left[\sum_{v=1}^{\infty} \frac{|\epsilon_v| |t_v^1|^k}{v} \right].
\end{aligned}$$

Now,

$$\begin{aligned}
\sum_{v=1}^m \frac{|\epsilon_v| |t_v^1|^k}{v} &= \sum_{v=1}^n \frac{|\epsilon_v| \lambda_v |t_v^1|^k}{v \lambda_v} \\
&= O(1) \left[\sum_{v=1}^{m-1} \Delta \left\{ \frac{|\epsilon_v| \lambda_v}{v} \right\} \sum_{r=1}^v \frac{|t_r^1|^k}{\lambda_r} + \frac{|\epsilon_m| \lambda_m}{m} \sum_{r=1}^m \frac{|t_r^1|^k}{\lambda_r} \right] \\
&= O(1) \left[\sum_{v=1}^{m-1} \Delta \left\{ \frac{|\epsilon_v| \lambda_v}{v} - \frac{|\epsilon_{v+1}|}{v} + \frac{|\epsilon_{v+1}| \lambda_{v+1}}{v(v+1)} \right\} \log v \mu_v + \frac{|\epsilon_v| \lambda_m \log m \mu_m}{m} \right] \\
&= O(1) \left[\sum_{v=1}^{m-1} \frac{|A_v| \log v \mu_v \lambda_v}{v} - \sum_{v=1}^{m-1} \frac{|\epsilon_v| \log v \mu_v}{v} + \right.
\end{aligned}$$



$$\begin{aligned}
& \left[\sum_{v=1}^{m-1} \frac{|\epsilon_{v+1}| \mu_v \log v \lambda_{v+1}}{v(v+1)} + \frac{|\epsilon_m| \lambda_m \log m \mu_m}{m} \right] \\
= & O(1) \left[\sum_{v=1}^{m-1} \frac{|A_v| \log v \mu_v \lambda_v}{v} - \sum_{v=1}^{m-1} \frac{\log v \mu_v}{v} \sum_{n=v}^{\infty} |\Delta \epsilon_n| + \right. \\
& \left. + \sum_{v=1}^{m-1} \frac{\mu_v \log v \lambda_{v+1}}{v(v+1)} \sum_{n=v+1}^{\infty} |\Delta \epsilon_n| + \frac{\lambda_m \log m \mu_m}{m} \sum_{n=m}^{\infty} |\Delta \epsilon_n| \right] \\
= & O(1) [O(1) - O(1) + O(1) + O(1)] \\
= & O(1), \text{ as } m \rightarrow \infty
\end{aligned}$$

by virtue of the conditions and lemma.

Now,

$$\begin{aligned}
& \sum' \lambda_n^{k-1} |L_4^{(n)}| + \sum' \lambda_n^{k-1} |L_5^{(n)}| \\
= & O(1) \left[\sum' \frac{|\epsilon_n|^k |t_n^1|^k}{\lambda_n} \right] \\
= & O(1) \left[\sum' \frac{|\epsilon_n| |t_n^1|^k}{\lambda_n} \right].
\end{aligned}$$

Therefore,

$$\begin{aligned}
\sum_l \frac{|\epsilon_m| |t_n^1|^k}{\lambda_n} &= \sum_l^{m-1} |\Delta \epsilon_m| \sum_{r=1}^n \frac{|t_r^1|^k}{\lambda_r} + |\epsilon_m| \sum_{r=1}^m \frac{|t_r^1|^k}{\lambda_r} \\
= & O(1) \left[\sum_l^{m-1} |A_m| \log m \mu_m + \log m \mu_m \sum_{v=m}^{\infty} |\Delta \epsilon_v| \right] \\
= & O(1) \left[\sum_l^{m-1} |A_m| \log m \mu_m + \log m \mu_m \sum_{v=m}^{\infty} |A_v| \right] \\
= & O(1) [O(1) + O(1)] \\
= & O(1), \text{ as } m \rightarrow \infty
\end{aligned}$$

by virtue of the conditions.

Hence

$$\sum' \lambda_n^{k-1} |T_n|^k < \infty.$$

When $\lambda_{n+1} > \lambda_n$, we have



$$\begin{aligned}
T_n &= \frac{1}{\lambda_n \lambda_{n+1}} \left\{ \sum_{v=n-\lambda_n+2}^n (\lambda_v + v - n - 1) a_v \in_v \right\} \\
&= \frac{1}{\lambda_n \lambda_{n+1}} \left\{ \sum_{v=n-\lambda_n+2}^n (\lambda_v + v - n - 1) v a_v \frac{\in_v}{v} \right\} \\
&= \frac{1}{\lambda_n \lambda_{n+1}} \left[\sum_{v=n-\lambda_n+2}^n \Delta \left\{ (\lambda_v + v - n - 1) v a_v \frac{\in_v}{v} \right\} \sum_{r=1}^v r a_r + \right. \\
&\quad \left. \frac{\lambda_n \in_{n+1}}{n+1} \sum_{r=1}^{n-1} r a_r - \frac{\in_{n-\lambda_n+2}}{n-\lambda_n+2} \sum_{r=1}^{n-\lambda_n+1} r a_r \right] \\
&\leq \frac{1}{\lambda_n^2} \left[\sum_{v=n-\lambda_n+2}^{n+1} \Delta \left\{ (\lambda_n + v - n - 1) \frac{\in_v}{v} \right\} v t_v^1 + \frac{\in_{n+1} t_{n+1}^1}{\lambda_{n+1}} + \frac{\in_{n-\lambda_n+2} t_{n-\lambda_n+1}^1}{\lambda_n \lambda_{n-\lambda_n+1}} \right] \\
&= M_1^{(n)} + M_2^{(n)} + M_3^{(n)} \text{ (say).}
\end{aligned}$$

It is, therefore, sufficient to show that

$$\sum'' \lambda_n^{k-1} |M_r^{(n)}|^k < \infty, \text{ for } r = 1, 2, 3.$$

We have

$$\begin{aligned}
\sum'' \lambda_n^{k-1} |M_1^{(n)}|^k &= \sum'' \frac{1}{\lambda^{k+1}} \left| \sum_{n-\lambda_n+2}^n \Delta \left\{ (\lambda_n + v - n - 1) \frac{\in_v}{v} \right\} v t_v^1 \right|^k \\
&\leq \sum'' \frac{1}{\lambda^{k+1}} \left\{ \sum_{n=n-\lambda_n+2}^n \left| \Delta \left\{ (\lambda_v + v - n - 1) \frac{\in_v}{v} \right\} \right| v |t_v^1|^k \right\}.
\end{aligned}$$

Since

$$\left| \Delta \left\{ (\lambda_n + v - n - 1) \frac{\in_v}{v} \right\} \right| \leq \lambda_v \Delta \left(\frac{|\in_v|}{v} \right) + \frac{|\in_v|}{v}.$$

Therefore

$$\begin{aligned}
\sum'' \lambda_n^{k-1} |M_1^{(n)}|^k &= O(1) \left[\sum'' \frac{1}{\lambda^{k+1}} \left\{ \sum_{n-\lambda_n+2}^n \lambda_v \Delta \frac{|\in_v|}{v} v |t_v^1|^k \right\} + \right. \\
&\quad \left. + \sum'' \frac{1}{\lambda^{k+1}} \left\{ \sum_{v=n-\lambda_n+2}^n |\in_v| |t_v^1|^k \right\} \right]
\end{aligned}$$



$$\begin{aligned}
&= \sum_1'' + \sum_2'' \\
\sum_1'' &= \sum'' \frac{1}{\lambda_n^{k+1}} \left[\sum_{v=n-\lambda_n+2}^n \lambda_v \left\{ \frac{|\Delta \epsilon_v|}{v} + \frac{|\epsilon_{v+1}|}{v(v+1)} \right\} v |t_v^1|^k \right] \\
&= \sum_1'' \frac{1}{\lambda_n^{k+1}} \sum_{v=n-\lambda_n+2}^n \lambda_v |\Delta \epsilon_v| |t_v^1|^k + \sum_1'' \frac{1}{\lambda_n^{k+1}} \sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_{v+1}| |t_v^1|^k \lambda_v}{v+1} \\
&= \sum_{11}'' + \sum_{12}'' \\
\sum_{11}'' &= \sum'' \frac{1}{\lambda_m^{k+1}} \left\{ \sum_{v=n-\lambda_n+2}^n \lambda_v |\Delta \epsilon_v| |t_v^1|^k \right\} \\
&= \sum_{v=1}^{\infty} |t_v^1|^k \lambda_v |\Delta \epsilon_v| \sum_{m \geq v}'' \frac{1}{\lambda_m^{k+1}} \\
&= O(1) \sum_{v=1}^{\infty} |t_v^1|^k |\Delta \epsilon_v| = O(1) \sum_{v=1}^{\infty} |t_v^1|^k |A_v| \\
&= O(1) \text{ as proved earlier.} \\
\sum_{12}'' &= \sum'' \frac{1}{\lambda_n^{k+1}} \sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_{v+1}| |t_v^1|^k \lambda_v}{(v+1)} \\
&= O(1) \sum'' \frac{1}{\lambda_n^{k+1}} \sum_{v=n-\lambda_n+2}^n \frac{|\epsilon_v| |t_v^1|^k \lambda_v}{v} \\
&= O(1) \sum_{v=1}^{\infty} \frac{|\epsilon_v| |t_v^1|^k \lambda_v}{v} \sum_{n \geq 2}'' \frac{1}{\lambda_n^{k+1}} \\
&= O(1) \sum_{v=1}^{\infty} \left\{ \frac{|t_v^1|^k}{v} \sum_{r=v}^{\infty} |\Delta \epsilon_r| \right\} \\
&= O(1) \sum_{v=1}^{\infty} \left\{ \frac{|t_v^1|^k}{v} \sum_{r=v}^{\infty} |A_r| \right\} \\
&= O(1), \text{ as proved earlier.}
\end{aligned}$$



$$\begin{aligned} \text{Hence } \sum_1'' &= O(1) \left| \sum_{11}'' + \sum_{12}'' \right| \\ &= O(1) \end{aligned}$$

$$\sum_2'' = O(1) \sum'' \frac{1}{\lambda^{k+1}} \sum_{v=n-\lambda_n+2}^n |\epsilon_v| |t_v^1|^k$$

$$= O(1) \sum_{v=1}^{\infty} |\epsilon_v| |t_v^1|^k \sum_{n \geq v}'' \frac{1}{\lambda_n^{k+1}}$$

$$= O(1) \sum_{v=1}^{\infty} \left\{ \frac{|t_v^1|^k}{\lambda_v} \sum_{r=v}^{\infty} |\Delta \epsilon_r| \right\}$$

$$= O(1) \sum_{v=1}^{\infty} \left\{ \frac{|t_v^1|^k}{\lambda_v} \sum_{r=v}^{\infty} |A_r| \right\}$$

$= O(1)$, as proved earlier.

$$\text{Therefore, } \sum'' \lambda_n^{k-1} |M_1^{(n)}|^k < \infty.$$

$$\text{Also } \sum'' \lambda_n^{k-1} |M_2^{(n)}|^k = O(1), \text{ as the proved earlier.}$$

$$\text{Similarly } \sum'' \lambda_n^{k-1} |M_3^{(n)}|^k = O(1).$$

This completes the proof of the theorem

6. Corollary

Our theorem have the following result as a corollary.

Corollary 6.1 A

If we take $\lambda_n = n$ then our theorem reduces to the theorem of SINHA and GERA [4].

Corollary 6.2 B

If we put $\lambda_n = n$ and $\mu_n = 1$ in our theorem then this is same as the theorem of MAZHAR [3].

References

1. BOASS, R.P. : Quasi-positive sequences and trigonometric series. Proc. Lond. Math. Soc., 14A, (1965), 38-46.



2. MAZHAR, S.M. : On generalized quasi-convex sequence and its applications, Indian J. pure and appl. Math, Vol. 8 No. 7, (1977), 784-790.
3. SINHA, R. AND GERA, P. : On $|C, 1|_k$ summability of δ -quasi convex sequence (Communicated).
4. TELYAKOVSKII, S.A. : Concerning a sufficient condition of Sidon for the integrability of trigonometric series, Math. Zametki, 14, (1973), 317-28.



TO STUDY THE EFFECT OF PROCESS PARAMETERS ON DIMENSIONAL ACCURACY IN 3D PRINTING PROCESS FOR PLA PARTS

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Abstract:

3D Printing is a layered manufacturing process that builds prototypes by depositing material in layered form using heaters. Prototypes made by 3D Printing are widely used in product development as they can be used for product testing. Dimensional accuracy is a major requirement in 3D printing for application. The material gets solidified during the layer deposition and this change from semi solid-to-solid leads to shrinkage, resulting in shape inaccuracy. This paper attempts to study the effect of process parameters, namely Layer Thickness, Nozzle Diameter, Length, and Part Bed Temperature, on dimensional accuracy. Single variable experiments have been performed to understand the significance of process variables affecting dimensional accuracy. Second order quadric model of response surface methodology was used to reduce the no of experiments. Main effect plots have been drawn for length, width and height to study the effect of process parameters. It has been observed that for shrinkage along the length, length of part, layer thickness and nozzle diameter significantly affects the shrinkage. The shrinkage decreases with increase in layer thickness. Shrinkage increases with an increase in length of the parts. Shrinkage increases with increase in nozzle diameter.

Keywords: 3D Printing; Dimensional Accuracy; Layer Thickness; Part Bed Temperature



Introduction:

Diverse customer needs have resulted in a tremendous reduction in the life cycle of a product. For the development of new products, time reduction has become a significant issue. The application of rapid prototyping (RP) technology has greatly reduced design manufacturing cycle time and, hence, reduced the cost of the product in global competition. RP is a layer-by-layer material additive process capable of producing complex objects directly from the computer-aided design (CAD) model. Stereo lithography (SLA), laminated object manufacturing (LOM), fused deposition modelling (FDM), selective laser sintering (SLS) and 3D Printing are the popular RP systems commercially available today. Fused Filament Modelling (FFM) based 3D printing is one of the RP processes, in which it prints a 3-dimensional object by extruding a stream of heated or melted thermoplastic material, which is carefully positioned into layer upon layer, working from the bottom up. By adding layer upon layer, which will almost immediately harden upon leaving the hot print head, you will see the object that you chose to create materialize right in front of you. Currently, prototypes can be used as pattern or tools for different manufacturing processes, design presentation, functional testing and surgical preplanning [1].

In order to fulfil the functional requirements, rapid prototypes should have high accuracy. Dimensional accuracy is a major requirement in 3D printing for application. The material gets solidified during the layer deposition and this change from semi solid-to-solid leads to shrinkage, resulting in shape inaccuracy. To compensate for shrinkage, a shrinkage coefficient is calculated and that coefficient is applied along each axis on to the STL file. The resulting geometry is slightly oversized compared with the actual geometry. There are several attempts made to develop a model for dimensional accuracy of RP parts fabricated by different processes.

Wang *et al.* [2] investigated the relationships between post-cure shrinkage and the various process parameters used in the SL machine. By using an experimental-statistical method, the effects of single and multi-parameter has been studied. Williams and Deckard [3] studied the analytical problem describing the energy delivery, heat transfer and sintering process along with other pertinent phenomena. Physical experiments and implementation of a numerical simulation were conducted using Bisphenol-A polycarbonate. The effects of selected parameters like laser power, laser beam velocity, hatch spacing, laser beam spot size and scan line length on the SLS process have been examined.



Dao *et al.* [4] investigated shrinkage compensation factor for FDM machine with an objective to improve in-plane dimensional accuracy. It was found that an SCF of 1.010 would produce a 53% reduction in mean error of the dimensions. Nosouhi and Rahmati [5] investigated novel method to simulate the shrinkage in stereolithography parts. It has been found that shrinkage mostly occurs while post curing in UV chamber. The FE simulations were performed considering the curing curves caused by laser movement on resin surface with respect to different hatching methods in SLA machines.

Sood *et al.* [6] investigated the relationship between shrinkage and the various process parameters for FDM by using Grey Taguchi method. They found the relationship between the shrinkage and various process parameters namely layer thickness, part orientation, raster angle, air gap and raster width. They adopted to obtain optimum level of process parameters to minimize percentage change in length, width and thickness simultaneously. Wang *et al.* [7] investigated the relationship between the shrinkage and the process parameters namely layer thickness, hatch spacing, laser power, scanning speed, temperature of working environment, interval time and scanning mode of SLS in order to improve dimensional accuracy using neural network model.

Senthilkumaran *et al.* [8] presented new approach for shrinkage compensation in SLS process to improve the accuracy of parts. They developed empirical relation between percentage shrinkage and the dixel length and from this model, scaling factor was calculated.

Literature review presented above shows that, most of the previous work is concentrated towards FDM, SLS and SL processes. There is no literature available on shrinkage of solidified PolyLactic Acid as work material in 3D printing using FDM process. As solidified PLA has high strength, is strong and durable, biodegradable, safe for human exposure and less likely to warp, therefore it has been selected as the work material in this study.

Experimental Procedure:

In present work, our aim is to develop a relationship between input variables and shrinkage along length, width and height of the specimen. Therefore, it is essential to decide a set of variables, which attains distinctive equi-spaced values for the experiments. It was observed from the literature review that layer thickness, nozzle diameter, part bed temperature and length of the part have great influence on shrinkage of the components. Further, these parameters can be controlled on the machine used for fabrication of specimens. The range of process parameters have been defined as per the specification of machine (Protocentre 999 by aha! 3D) given in the machine manual. The ranges of layer thickness, nozzle diameter,



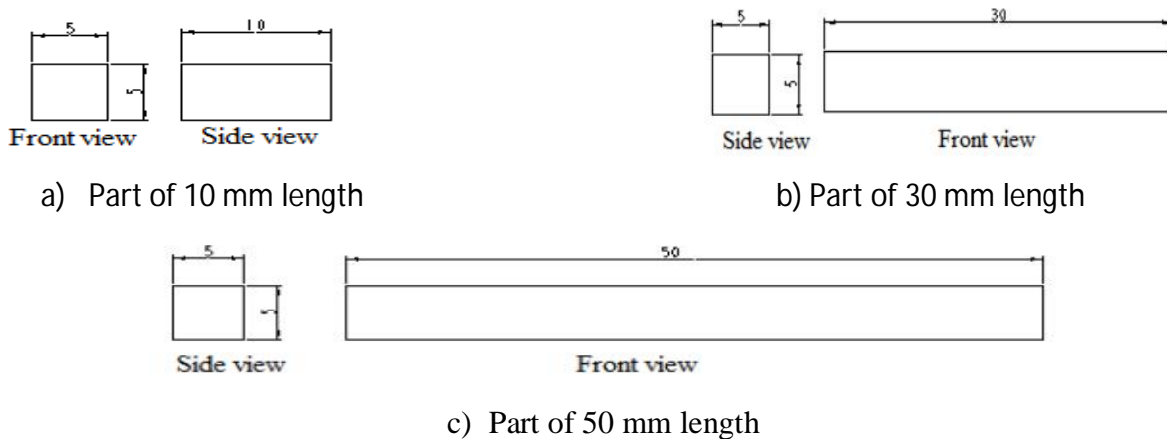
part bed temperature and length of the part have been selected as 0.1 to 0.3 mm, 0.3 to 0.5 mm, 51 to 55⁰ C, 10 to 50 mm.

Table 1: Range of process parameters

Parameters	Range
Layer Thickness (mm)	0.1, 0.2, 0.3
Nozzle Diameter (mm)	0.3, 0.4, 0.5
Part Bed Temperature (°C)	51, 53, 55
Length(mm)	10,30,50

Figure 1 shows the schematic diagram of the parts prepared for study. The parts were fabricated on 3D Printer using Fused Filament Modeling technique (Proto Centre 999, AHA make, India). STL files were then exported and used as input to MakerBot Software. This software is used as to fix the positions and build orientation of specimen. Then STL files were checked for error and repaired. Once the positions and build orientation were fixed, the specimen were sliced into layers using KISSlicerPRO software and then transferred to 3D Printer machine. A photograph of the produced specimens is given in Figure 2

Figure 1: Different Lengths of the Modelled Part



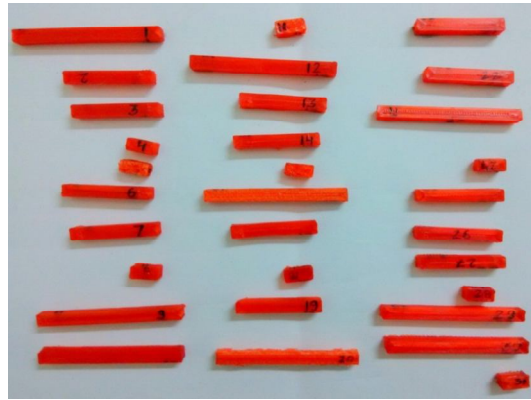


Figure 2: Arrangement of fabricated specimens

In single variable experiment planning, the numbers of experiments are large as we consider the process variables and their levels. For developing the equation of response surfaces, there are many experimental designs which use relatively small number of experiments to approximate it. Fitting of second order quadric model can be done by full factorial design and central composite rotatable design (CCRD). The number of experiments increases exponentially as it depends on 2^N (where N= number of variables) in full factorial design. So it becomes impractical. CCRD is very efficient design technique for second-degree model because it considers extra centre and axial points which improves the parameters of modelling with the help of approximation [9].

Digital Vernier calliper has been used to measure the shrinkage of the component along the length, width and height directions for both x and y direction laying. Figure 3.7 shows the digital vernier calliper used to measure shrinkage. Vernier calliper has a range of 150 mm with the resolution of 0.02 mm. Three readings for each direction have been taken and average of these values was considered as response of each specimen.

Table 2: Mean values corresponding to each trial

S. No.	Layer Thickness (mm)	Nozzle Diameter (mm)	Part Bed Temperature (°C)	Length (mm)	Delta L (mm)	Delta W (mm)	Delta H (mm)
1	0.2	0.4	53	50	0.15	0.03	0.06
2	0.2	0.4	53	30	0.11	0.05	0.05
3	0.2	0.4	53	30	0.11	0.05	0.05
4	0.3	0.3	51	10	0.07	0.03	0.04



5	0.1	0.3	51	10	0.15	0.04	0.03
6	0.3	0.4	53	30	0.08	0.06	0.02
7	0.2	0.4	53	30	0.11	0.04	0.05
8	0.3	0.5	55	10	0.08	0.06	0.04
9	0.3	0.3	51	50	0.12	0.05	0.02
10	0.1	0.5	55	50	0.2	0.11	0.08
11	0.1	0.3	55	10	0.11	0.04	0.06
12	0.1	0.5	51	50	0.22	0.12	0.09
13	0.2	0.4	53	30	0.12	0.05	0.05
14	0.2	0.4	55	30	0.16	0.07	0.05
15	0.3	0.3	55	10	0.07	0.03	0.06
16	0.1	0.3	51	50	0.19	0.06	0.03
17	0.2	0.4	53	30	0.12	0.07	0.06
18	0.1	0.5	51	10	0.18	0.11	0.07
19	0.2	0.3	53	30	0.1	0.04	0.08
20	0.1	0.3	55	50	0.19	0.05	0.07
21	0.2	0.4	53	30	0.1	0.06	0.05
22	0.2	0.4	51	30	0.16	0.07	0.04
23	0.3	0.3	55	50	0.17	0.03	0.06
24	0.2	0.4	53	10	0.08	0.07	0.05
25	0.2	0.4	53	30	0.1	0.04	0.06
26	0.2	0.5	53	30	0.12	0.11	0.09
27	0.1	0.4	53	30	0.14	0.09	0.04
28	0.3	0.5	51	10	0.1	0.08	0.07
29	0.3	0.5	51	50	0.14	0.1	0.06
30	0.3	0.5	55	50	0.17	0.06	0.04
31	0.1	0.5	55	10	0.14	0.09	0.04

Analysis of the experimental data:



A statistical model for the shrinkage along the length was developed, by correlating; the input parameters namely layer thickness, nozzle diameter, part bed temperature and length of part.

Figure 3 shows the main effect plot of shrinkage along the length in x direction laying. These three points are obtained from the experimental data, which are calculated based on average of sum of response containing that particular processing condition. It can be seen that shrinkage decreases with increase in layer thickness. It is also observed that shrinkage increases with increase in length of parts.

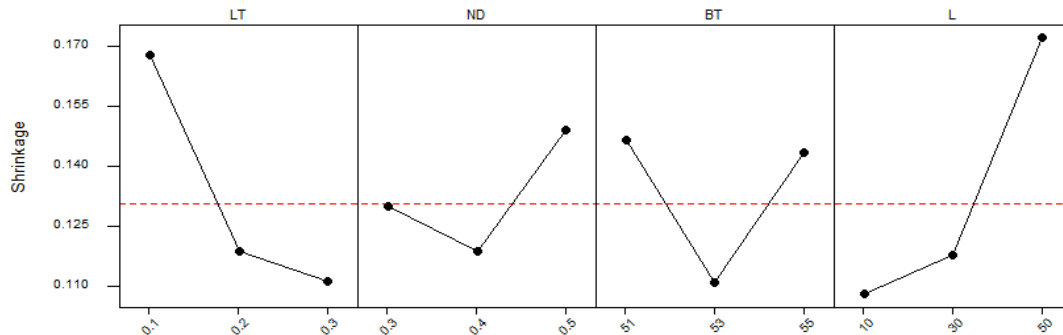


Figure 3: Main effect plot for shrinkage along the length

It can be observed that the shrinkage decreases with increase in layer thickness. In wire based 3D printers, conduction and forced convection are the modes of heat dissipation. These processes reduce the temperature thereby, forcing the material to solidify in less time. It is observed that bonding between the filaments occurs due to re-melting and diffusion of previous layer. This results in uneven temperature fluctuations, thereby developing non uniform temperature gradients. It is observed that shrinkage increases with an increase in length of the parts. The increase in shrinkage can be attributed to development of more internal stresses with increase in length, resulting from the contraction of depositing fibers. It has been reported that the deposited thermoplastic fiber is subjected to contraction when cooled from extrusion temperature to glass transition temperature [10].

Figure 4 shows the main effect plot of shrinkage along the width. It can be seen that shrinkage decrease with increase in layer thickness and part bed temperature. It is also observed that shrinkage increase with increase in nozzle diameter. This may be due to more volume of material being deposited with increase in nozzle diameter results in greater internal stresses and hence more contraction.

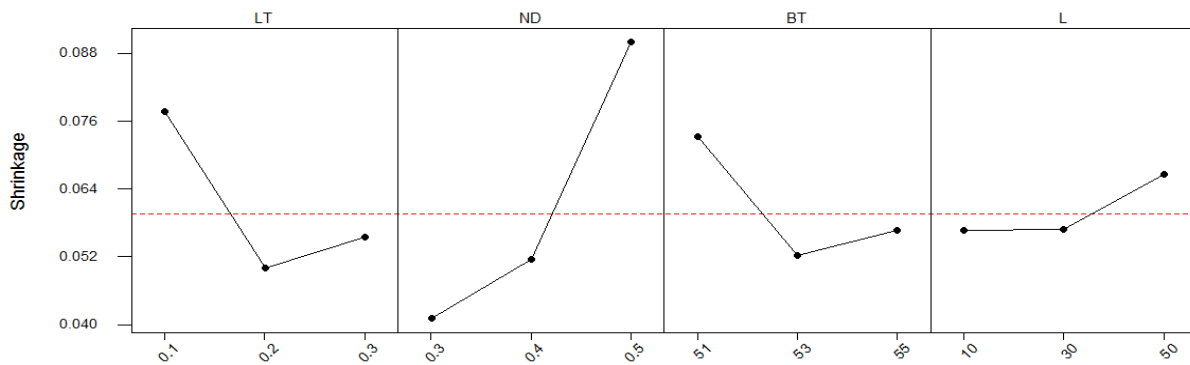


Figure 4: Main effect plot for shrinkage along the width

Further, it was observed that the small nozzle diameter with lesser volume of material would induce lesser heat into the component within a specified time as compared to higher nozzle diameter. As a result, the shrinkage will be more in components made by higher nozzle diameter as compared to components prepared by lower nozzle diameter. It is observed that, as the part bed temperature is decreased shrinkage increases. It was observed that at a temperature range near the glass transition temperature, the deposited fiber acquires a large deformation even with very less force. Further, the capacity to oppose the external force is small. In spite of contraction, there is no accumulation of inner stresses. This cause stresses to build up resulting in increase of shrinkage [11].

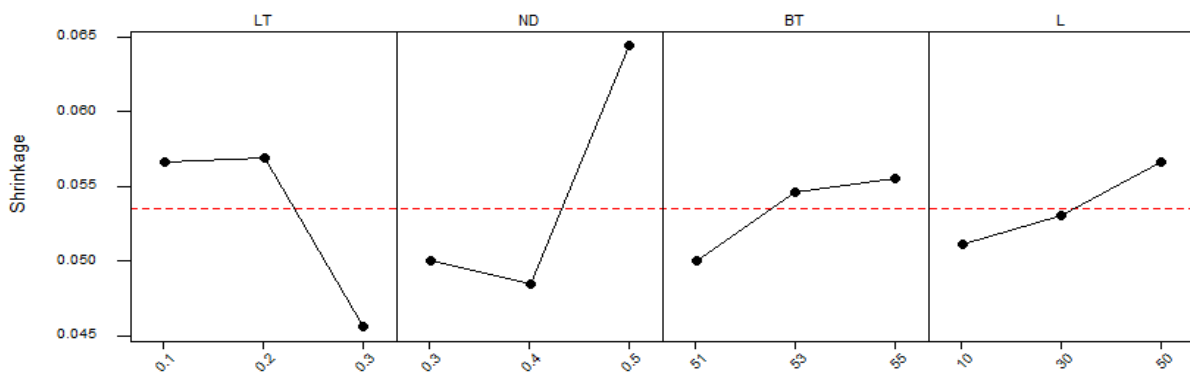


Figure 5: Main effect plot for shrinkage along the height

Figure 5 shows the main effect plot of shrinkage along the height. It can be seen that shrinkage decrease with increase in layer thickness. It shows that the shrinkage slightly decreases initially with increase in nozzle diameter but after a certain value of nozzle diameter shrinkage increases. This may be because small



nozzle diameter deposits lesser material as compared to higher nozzle diameter. This causes inducement of less heat into the component resulting in lesser shrinkage. Less heat results in lesser internal stresses and hence low shrinkage. Further, it was observed at low nozzle diameter the filleting effect is also present which relieves some internal stresses hence the shrinkage is less. Shrinkage decreases with increase of layer thickness[11]. With increase in layer thickness, the component requires fewer layers thereby reducing the heating and the cooling cycles working alternatively during deposition. Further, the nozzle speed becomes non-uniform as it approaches the edges of the component, this result in requirement of more time for deposition of single layer. This phenomenon keeps the already deposited materials above the desired temperature and does not allow it to regain its original shape. In the meantime, another layer will be deposited which will not allow the contraction of previous layer. This complete process results in the observation that increases in layer thickness decreases shrinkage along the height [9].

Conclusions:

Some of the specific conclusions are given below:

- It has been observed that for shrinkage along the length, length of part, part bed temperature and layer thickness significantly affects the shrinkage. The shrinkage decrease with increase in layer thickness. Shrinkage increases with increase in length of parts and part bed temperature.
- For shrinkage along the height, layer thickness and part bed temperature are most significant parameters. Shrinkage decreases with increase in layer thickness. Shrinkage decreases with increase in part bed temperature.
- Shrinkage along the width, layer thickness and nozzle diameter are significant parameters. As the nozzle diameter is increased, shrinkage also increases. Shrinkage decrease with increase in layer thickness.
- It has been observed that for shrinkage along the length, length of part, layer thickness and nozzle diameter significantly affects the shrinkage. The shrinkage decreases with increase in layer thickness. Shrinkage increases with an increase in length of the parts. Shrinkage increases with increase in nozzle diameter.

References



- 1) Chua C.K., Leong K.F., Lim C.S., (2000) Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley and Sons Inc.
- 2) Wang, W. L.; Cheah, C. M.; Fuh, J. Y. H.; Lu., L. (1996) Influence of process parameters on stereolithography part shrinkage. *Materials & Design*, 17, no. 4, 205-213
- 3) Williams, J. D.; Deckard, C. R.; (1998) Advances in modeling the effects of selected parameters on the SLS process. *Rapid Prototyping Journal* 4, no. 2, 90-100.
- 4) Dao, Q.; Frimodig, J. C.; Hung, N. L.; Xiao, Z. L.; Putnam, S. B.; Kelly, G.; Foyos, F.; Noorani, R.; Fritz., B. (1999) Calculation of shrinkage compensation factors for rapid prototyping (FDM 1650) *Computer Applications in Engineering Education* 7, no. 3: 186-195.
- 5) Nosouhi, R.; Rahmati, S. (2010) Finite Element Analysis of Shrinkage Phenomena in Stereolithography and Development of a New Hatching Method. *10th Iranian Conference on Manufacturing Engineering*, ICME.
- 6) Sood, A. K.; Ohdar, R. K.; Mahapatra, S. S. (2009) Improving dimensional accuracy of fused deposition modelling processed part using grey Taguchi method. *Materials & Design* 30, no. 10: 4243-4252
- 7) Wang, R. J.; Wang, L. L.; Zhao, L. H.; Liu, Z. J. (2007) Influence of process parameters on part shrinkage in SLS. *The International Journal of Advanced Manufacturing Technology* 33, no. 5-6: 498-504.
- 8) Senthilkumaran, K.; Pandey, P. M.; Rao, P. V. M. (2008) Shrinkage compensation along single direction dexel space for improving accuracy in selective laser sintering. *IEEE International Conference on Automation Science and Engineering*, pp. 827-832.
- 9) Montgomery, D. C. (2008) *Design and analysis of experiments*. John Wiley & Sons
- 10) Nickel, A. H.; Barnett, D. M.; Prinz, F. B. (2001) Thermal stresses and deposition patterns in layered manufacturing. *Materials science and Engineering: A* 317, no. 1: 59-64
- 11) Wang, T. M.; Xi, J. T.; Jin, Y. (2007) a model research for prototype warp deformation in the FDM process. *The International Journal of Advanced Manufacturing Technology* 33, no. 11-12: 1087-1096.



CENTRIFUGAL PUMP IMPELLER DEFECT IDENTIFICATION BY PROCESSING VIBRATION SIGNAL

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ABSTRACT

In the field of machine diagnosis, the utilization of vibration signals is effective in the detection of fault, because the signals carry dynamic information about the machine state. This paper presents a diagnosis method for a centrifugal pump using features of vibration signals. Monoblock centrifugal pumps are employed in a variety of critical engineering applications. Continuous monitoring of such machine component becomes essential in order to reduce the unnecessary break downs. At the outset, vibration based approaches are widely used to carry out condition monitoring tasks, but not too much in the field of centrifugal pumps.

Aiming at the non-stationary and non-linearity characteristics of the vibration signals of centrifugal pump, a new method based on complexity feature of Wavelet Decomposition Technique (WDT) and envelope is put forward. First of all, raw signal is recorded using the data acquisition card (DAQ) then with the help of LabView programming the raw signal is decomposed using WDT sym5 up to five levels and then the complexity features of each level is extracted. The extracted information is tabulated so that features can be compared with the others levels of the decomposed raw signals. Here kurtosis criterion is employed for further diagnosis. On the basis of the kurtosis criterion envelope is imposed on that level, which is having



the highest kurtosis value. After applying the WDT and envelope the result of the different cases is validated.

Keywords- Pump, Impeller defect, vibration signal, Wavelet Decomposition Technique and kurtosis

INTRODUCTION1

This paper presents fault diagnosis methods used for detection of defect in components of centrifugal pump. Mechanical mechanisms that are in motion such as impeller and bearings are particularly prone to problem from wear, corrosion, erosion, fatigue contamination etc. Many applications have relied on preventive maintenance to minimize unscheduled downtime due to failure of components.

A motor is used to spin a shaft that is connected to a housed impeller, which draws fluid in along a rotating axis. The fluid is accelerated and whirled radially and tangentially outward through the impeller vanes, where it exits through a casing designed to decelerate the fluid velocity and increase fluid pressure. Centrifugal pumps are susceptible to various modes of impeller failure including but not limited to inter-granular corrosion, erosion, cavitation, material defects etc.

An impeller is a rotating component of a centrifugal pump, usually made of iron, steel, bronze, brass, aluminum or plastic, which transfers energy from the motor that drives the pump to the fluid being pumped by accelerating the fluid outwards from the center of rotation. Impellers are usually short cylinders with an open inlet (called an eye) to accept incoming fluid, vanes to push the fluid radially, and a splined, keyed or threaded bore to accept a drive-shaft. Pressure pulsations are detected at discrete frequencies that are multiples of the rotating frequency and the number of blades; these frequencies are also called blade passing frequencies (BPF).

Blade Pass Frequency (BPF) = number of blades (or vanes) \times rpm.

DATA ACQUISITION

In order to diagnose pump problems accurately it is imperative to obtain useful information. Achievement of this goal depends upon various parameters. They include knowing the expected frequencies, proper transducer are critical. If the transducer is not placed at the correct location, placed at the correct location, useful data may not be obtained. Correct transducer placement can vary according to the type and construction of machine. The correct place to take data on centrifugal pump can vary depending on which



component is defective and which side of the bearing is defective. Best signal definition can be obtained by placing the transducer in the load zone as close as possible to the rotatory components. For impeller, best signal definition is obtained from radial position.

SIGNAL PROCESSING OF VIBRATION SIGNALS

- a) Fast Fourier transform (FFT)
- b) Wavelet decomposition technique
- c) Envelope

a) Fast Fourier Transformation

The most preferable signal processing methods are Fourier analysis which resolves the time domain waveform into its sinusoidal components through using block of time-domain data and converting it to the frequency domain. For a continuous-time signal, $x(t)$, the Fourier transform, $X(f)$ can be expressed as:

$$X(f) = \int_{-\infty}^{+\infty} x(t) \cdot e^{-i2\pi ft} dt$$

Where,

f = Global frequency and t = time

The signal can then be analyzed for its frequency content because the value of the transformed function represents the contribution of sine and cosine function at each frequency. The $x(t)$ can be obtained from its Fourier transform in the following way:

$$x(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} X(f) \cdot e^{i2\pi ft} dt$$

Yet Fourier transform contains a capacity to capture signal's frequency content as long as is composed of little stationary components. Though, any sudden change in time for non-stationary signal is extent over

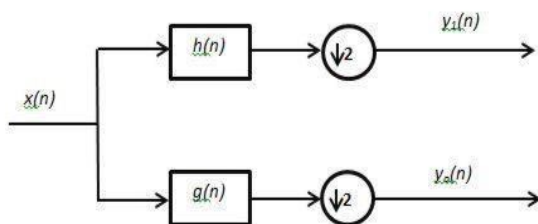


the whole frequency axis. The drawback of Fourier transform is that it cannot offer both time and frequency localization of a signal at the same time.

b) Wavelet decomposition technique

Wavelet decomposition in signal processing is the technique that decomposes an original signal into its primitive or fundamental constituents, and then performs simple operations separately on each component if required. Thus, extremely sophisticated operation can be performed by a combination of individual simple operations.

The discrete wavelet transform (DWT), provides sufficient information both for analysis and synthesis of the original signal, with a significant reduction in the computation time. We can regard the DWT as a filtering operation with representing the filters in different scale. It can be realized that DWT is using filter bands to decompose the signal into different sub bands. These sub bands are having a different resolution in terms of time and frequency as a part of multi resolution analysis (MRA). The decomposition of the signal into different frequency bands can be obtained by successive high-pass and low-pass filtering of the time domain signal. A typical single stage decomposition operation has been described as following :



doubling the scale in its analysis. $y_1(n)$ is a high-pass filtered version of $x(n)$. $y_0(n)$ is a low-pass filtered version. $g(n)$ and $h(n)$ are half-band filters.



$$B(t) = x(t) + iH[x(t)] = b(t)e^{j\phi(t)}$$

c) *Envelope analysis*

Envelope is widely used signal processing technique for the identification of defect in the bearing. Envelope amplitude demodulation by the envelope detection is used to find out the repeated impulse. This envelope detection gives analytic signal whose imaginary part is the Hilbert transform of the real part [Wang, D., et al. 2009]. For a signal $x(t)$, its Hilbert transform $H[x(t)]$ is defined as

$$H[x(t)] = \frac{1}{\pi} \int_{-\infty}^{+\infty} \frac{x(\tau)}{t-\tau} d\tau$$

Where, t and τ are time and translation parameters, respectively. The Hilbert transform is a time-domain convolution that maps one real-valued time-history into another and it is also a 90° phase shifter that is it changes the phase of positive frequency by -90° and negative frequency by $+90^\circ$. In actual application, signal obtained from the machine is amplitude modulated. Hence, in order to find fault related signatures, demodulation is required. This is done by constructing analytic signal, which is given by:

Where,

$$b(t) = \sqrt{x^2(t) + H^2[x(t)]} \quad \text{and}$$

$$\phi(t) = \arctan \frac{H[x(t)]}{x(t)}$$

And $i = \sqrt{-1}$. $b(t)$ is the envelope of $B(t)$.

In the above equations $b(t)$ is the envelope of $B(t)$. The Fourier transform of signal $B(t)$ is denoted by $\hat{B}(i\omega)$ and its properties are given as:

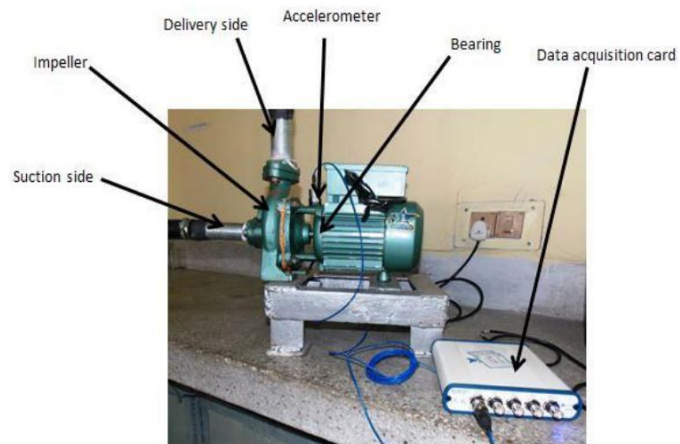
$$\hat{B}(i\omega) = \begin{cases} 2 \hat{x}(i\omega), & \omega \geq 0 \\ 0, & \omega < 0 \end{cases}$$



Where ω denotes the angular frequency of $\hat{B}(\omega)$ and $x(\omega)$ is the Fourier transform of $x(t)$.

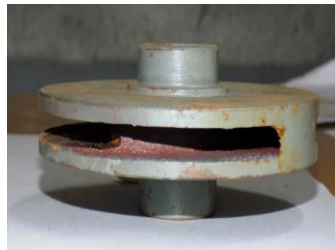
EXPERIMENTAL SETUP

Schematic of experimental set up on which experiments were conducted is shown in Figure below:



Impeller defect

The defect case which is taken under consideration for analysis of vibration produced is: Blade defect

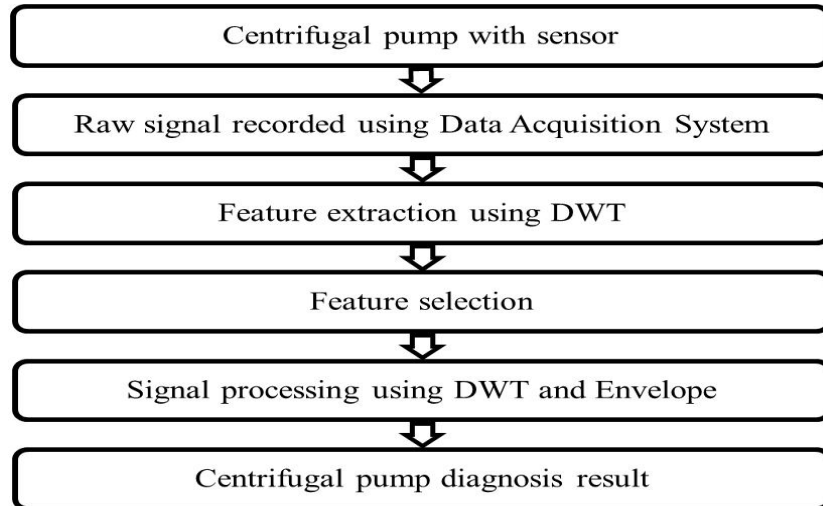


METHODOLOGY

The defect signals are captured with the help of accelerometer. Accelerometer was mounted on the casing of the pump. In the work piezotronic PCB 353B34 accelerometer was used. The condition of impeller was monitored using USB 4431 DAQ card. A program was developed in

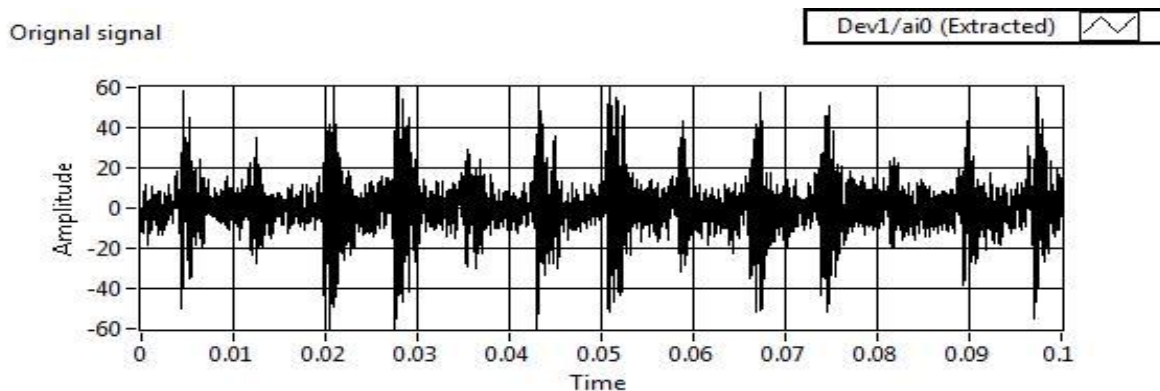


LabView™ environment to acquire and display the signal along with discrete wavelet transformation. Sampling rate was set at 70000 samples per second. There was provision to record /store the signal in the hard disk of computer for further processing and analysis. The flow chart for methodology is given below:



SIGNAL PROCESSING

Initially the raw signal of non-defective condition is recorded for 30 sec which contains information. To handle the data properly signal of 0.1 second was taken. No distinct impulse is observed in the raw signal for non-defective impeller as shown in figure. Vibration signal from the defective impeller has a high amplitude pulses as shown in figure:

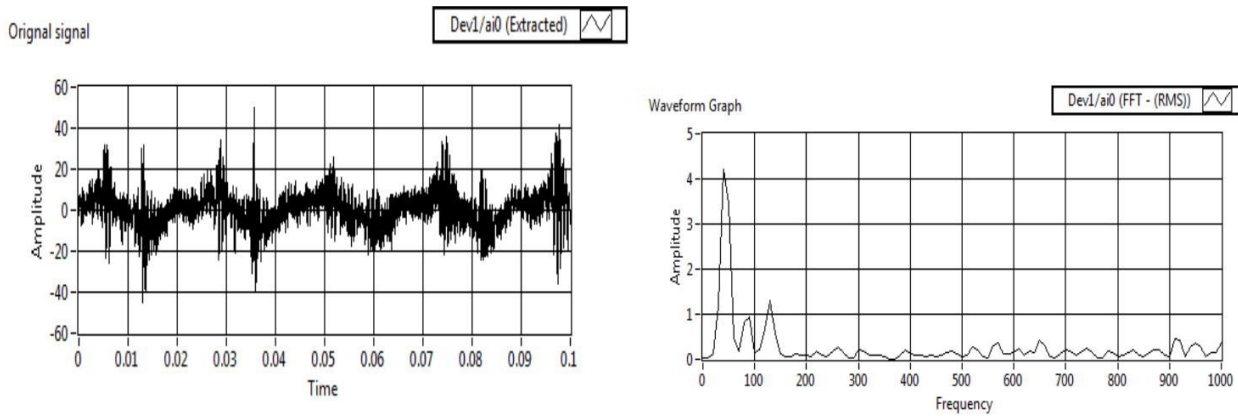


Raw vibration signal of centrifugal pump without defect

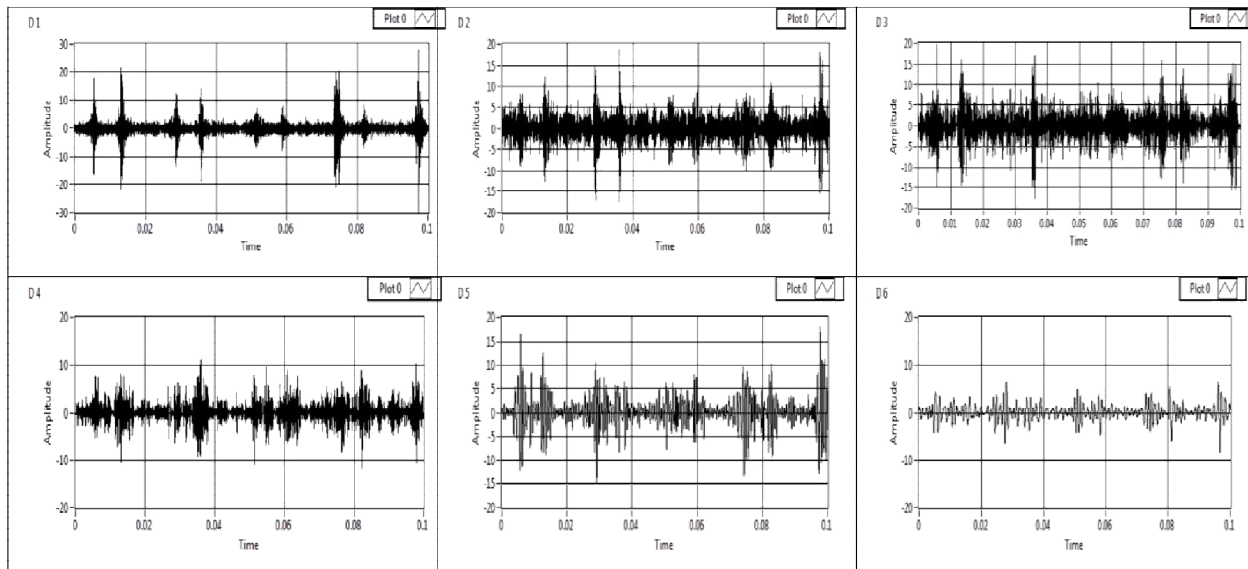


Impeller blade defect

In this case the defect free impeller is replaced by the impeller having blade defect. In case of impeller with blade defect revolves in the impeller housing. This forms case of unbalance. Following fig. shows the raw signal taken from the pump and next fig. shows the FFT of raw signal having impeller blade defect.



Raw vibration signal of impeller having blade defect FFT of impeller blade
defect



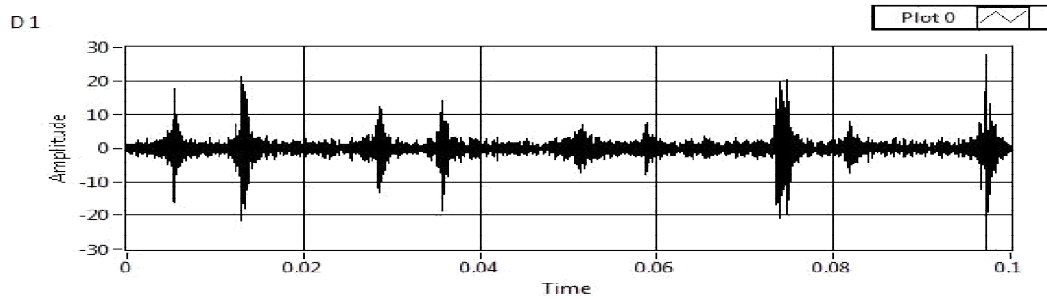
Decomposed signal of blade cut defect (levels-D1, D2, D3, D4, D5, D6,)



Now the raw signal is decomposed using DWT to extract the hidden statistical features. The statistical features are tabulated in table 5.4 for the impeller blade defect. From the features tabulated, on basis of maximum kurtosis criterion it is clear that D1 level have the maximum kurtosis value. So the D1 level is selected for applying envelope to get the defect frequency.

	MEAN	MEDIAN	STANDARD DEVIATION	SKEWNESS	KURTOSIS
ORIGINAL	0.381603	0.800656	8.21785	-0.0671959	4.81312
APPROX (A6)	0.376228	1.75099	4.97279	-0.318907	1.9941
D1	2.40E-05	0.0107258	2.43539	-0.15151	27.3074
D2	0.000385	0.00626146	2.70479	-0.0725268	7.68628
D3	-8.31E-04	0.0193336	3.29135	0.0210465	5.79462
D4	-0.000864	-0.0005562	2.35794	0.00616487	5.4232
D5	0.002445	0.0263634	3.24647	0.0805955	6.67724
D6	0.0042151	0.00572363	1.62032	-0.198802	5.6467

Kurtosis value for D1 level is 27.31 which is maximum so, burst can be easily identified. Fig. , shows the D1 level band of raw signal which was decomposed using DWT.



Decomposed part of raw signal at D1 level for impeller blade defect

Now envelope is applied on D1 level of decomposed signal. After applying the envelop following graph is obtained.

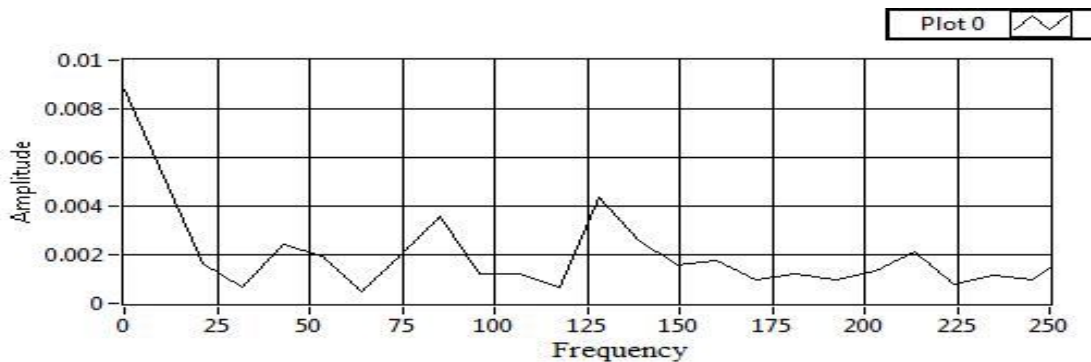


Fig. Shows the signal after applying envelope on D1 level. Which indicate the shaft speed frequency as 42.68 Hz and impeller blade defect frequency peak is at the 128.049 Hz. BPF is given by:

$$\text{Blade Pass Frequency (BPF)} = \text{number of blades (or vanes)} \times \text{rpm}$$

RESULT AND DISCUSSION

When FFT is directly applied to raw signal, it is not able to identify the defects in impeller of centrifugal pump. But using DWT technique the defects in impeller can be identified. So it appears that WDT is a powerful signal processing technique in the fault diagnosis of centrifugal pump. In the present work WDT is used along with the envelope analysis to detect the faults in the components of centrifugal pump. The



maximum kurtosis criterion is the basis of experimental results. The experimental results shows that proposed method can effectively diagnose the faults in the impeller and bearing of centrifugal pump.

CONCLUSIONS

- Discreet Wavelet Transformation (DWT) is method that can be applied to non-linear and non-stationary processes effectively. It improves the traditional method in applying harmonic functions to show all kinds of faulty signals into a sequence of amplitude modulation/frequency modulation.
- Maximum kurtosis criterion for the selection of level gives better result. Higher value of kurtosis reveal the presence of defects in the components of centrifugal pump. For impeller blade defect D1 level has maximum kurtosis value of 27.3074.
- Comparison between the traditional FFT and proposed work. It shows that if FFT is directly applied on raw signal of defects in components are difficult to identify, whereas, the DWT with envelope easily detect the presence of defects in components.

REFERENCES

1. Randall R. B. 2004, State of the Art in Monitoring Rotating machine – Part I. *Sound and vibration* pp. 14-20.
2. Al-Najjar B. 1999, Economic Criteria to Select a Cost-Effective Maintenance Policy, *Journal of Quality in Maintenance* vol. 5 (3): 236-247.
3. Nikhil K. , Yinghui H. , Naresh J. , Ramesh J. 2015, Failure analysis of a polymer centrifugal impeller, *Case Studies in Engineering Failure Analysis* 4: 1–7.
4. Bennekom A. V. , Berndt F. , Rassool M. N. 2001, Pump impeller failures - A compendium of case studies, *Engineering Failure Analysis* 8: 145-156.
5. Ariely S. , Khentov A. 2006, Erosion corrosion of pump impeller of cyclic cooling, *Engineering Failure Analysis* 13: 925–932.
6. Shouq Y. , Jun Y., Jianping Y., Yin L., PEI J. 2012, Experimental Investigation on the Flow-induced Noise under Variable Conditions for Centrifugal Pumps, *Chinese Journal of Mechanical Engineering*, Vol. 25 No. 3.
7. Wang H., Chen P. 2009, Intelligent diagnosis method for a centrifugal pump using features of vibration signals, *Neural Comput & Application*, 18: 397–405.



8. Muralidharan V., Sugumaran V. 2012, A comparative study of a Naïve Bayes classifier and a Bayes net classifier for fault diagnosis of monoblock centrifugal pump using wavelet analysis, *Applied Soft Computing* 12: 2023–2029.
9. Bozchalooi, I. S. and Liang, M. 2008. A joint resonance frequency estimation and in-band noise reduction method for enhancing the delectability of bearing fault signals, *Mechanical Systems and Signal Processing*. 22: 915–933.
10. Wang, D., Miao, Q., Fan X. and Huang, H. Z. 2009. Rolling element bearing fault detection using an improved combination of hilbert and wavelet transforms, *Journal of Mechanical Science and Technology*. 23: 3292-3301.
11. Patel, V. N., Tandon, N. and Pandey, R. K. 2012. Defect detection in deep groove ball bearing in presence of external vibration using envelope analysis and duffing oscillator, *Measurement*. 45: 960–970.
12. Tsao, W. C., Li, Y. F., Le, D. D. and Pan, M. C. 2012. An insight concept to select appropriate IMFs for envelope analysis of bearing fault diagnosis, *Measurement*. 45: 1489–1498.
13. Kumar, R. and Singh, M. 2013. Outer race defect width measurement in taper roller bearing using discrete wavelet transform of vibration signal, *Measurement*. 46: 537–545.
14. Lei, Y., Lin, J., He, Z. and Zue, M. J. 2013. A review on empirical mode decomposition in fault diagnosis of rotating machinery, *Mechanical Systems and Signal Processing*. 35: 108–126.
15. Bloch, H. P. 1933. *Improving machinery reliability*, Third edition. Houston: Gulf Publication Co.
16. Qiu, H. , Lee, J., Lin, J. and Yu, G. 2006. Wavelet filter-based weak signature detection method and its application on rolling element bearing prognostics, *Journal of Sound and Vibration* 289, 1066 – 1090.



A COMPARITIVE OF WIRELESS TECHNOLOGY USAGE FOR REMOTE MOBILE ROBOT CONTROLLER

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ABSTRACT

This paper presented a broad overview of different wireless technology usage for mobile robot controller such as ZigBee, Bluetooth and WiFi or Wireless LAN. In literature review, particularly discuss the flow of the application and transferring data or information to the mobile robot. Comparison of the frequency, data rate and range for each wireless technology used in this application are discussed.. At the end, selection of wireless technologies

depends on the type of application to be developed considering the following; range, frequency and data rate.

Keywords: *ZigBee, Wi-Fi, WLAN, Bluetooth, Mobile Robot Controller.*

INTRODUCTION

In recent years, wireless technology has given rise to a large number of available mobile tools and their emerging applications are becoming more and more sophisticated by years. Therefore, many mobile robot platforms use wireless technology to communicate with off-line computing resources, human machine interfaces or others robots. Many mobile robots have equipped with wireless technology such as Bluetooth, Wi-Fi, Wireless LAN, Zig-Bee etc. Mobile robot is presented with a situation or a different form depending on the area of application usage. This robot can drive, walk, swim or fly. An appropriate sensor is required to design a mobile robot and know how to control it. Therefore, various mechanisms used to control this mobile robot. This paper is organized as follows. The literature review of wireless technology and briefly explain that the technologies used for mobile robot presented in Section 2. We include the



review of recent researches. In Section 3, we discuss advantages and disadvantages for each wireless technology. We summarize the paper in Section 4, ease of Use.

LITERATURE REVIEW

A. Bluetooth

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength radio transmissions in the ISM band from 2400–2480 MHz) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. Created by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

Bluetooth is a radio frequency cable with a short distance to replace the unlicensed technology with 2.4GHz bandwidth in the scientific industry. Typically, Bluetooth devices have a range of approximately 10 meters and it can support both voice and data communications with broadband 1 MB per second [1]. Because of the advantages of Bluetooth, such as low costs and low power and nature can be pointed to different directions, parts of Bluetooth has been integrated into various types of mobile devices such as mobile phones, PDAs and other wireless set. Bluetooth provides a secure way to connect and exchange information between devices such as faxes, mobile phones, telephones, laptops, personal computers, printers, Global Positioning System (GPS) receivers, digital cameras, and video game consoles. It was principally designed as a low-bandwidth technology.

With Bluetooth, mobile robots then can be easily handled with a push of button from our common electronics gadgets such as hand phones or PDA

In a review [2], a Bluetooth device in the server connected to the serial port of the PC. Then, for the mobile robot, a Bluetooth device is connected to the RS232 of the Handy Board. During the navigation of the mobile robot, all the sensor readings can be viewed from server (PC). At the same time, PC can send direction command to the mobile robot.. Fig. 1 shows the architecture for a Bluetooth enabled autonomous mobile robot [2].

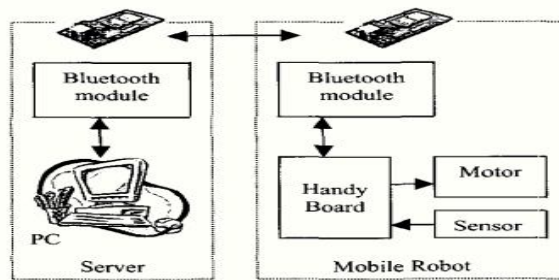


Fig.1. Hardware Architecture [2].

The system aim to control robots using mobiles through Bluetooth connection, give the user full control of the target in an easy way, it allow to use one of the two modes (DDM and MBM) and make it possible to control any machine using mobile through Bluetooth connection.

THE DIRECT DRIVE MODE (DDM):

The DDM is the mode of controlling the robot directly by sending the movements directions to the robot by pressing the arrows on the Smartphone keypad, for example the user wants the robot to move forward, the user press the Up Arrow, the robot will start moving forward, this command is applied by sending order to the robot via the connection, the robot receive the command, analyze it and then apply the corresponding movement.

THE MAP BASED MODE (MBM):

The MBM is the complex mode of controlling the robot, by this mode, the robot can find the shortest path from defined start position to target point by avoiding all obstacles defined by the user or found while moving. In this mode, the system can handle a map of 15x15 (according to the mobile screen size) area elements; the actual space of each block can be defined easily by robot hardware system.

B. Wi-Fi

Wi-Fi is a trademark of the Wi-Fi Alliance that may be used with certified products that belong to a class of wireless local area network (WLAN) devices based on the IEEE 802.11 standards. Wi-Fi or Wireless LAN Wi-Fi or WLAN (Wireless Local Area Networks) is a wireless network based on a series of specifications from the Institute of Electrical and Electronics Engineers (IEEE) called 802.11. Wi-Fi uses unlicensed radio frequency, mostly in the 2.4GHz band. It enables a person with a wireless-enabled computer or PDA to connect to the Internet via a wireless access point. The geographical region covered by



one or several access points is called a hot spot. Wi-Fi was intended to be used for mobile devices and local- area networks, but it is now often used for Internet access outdoors. There are several types of Wi-Fi:

- 802.11a (offering transmission speeds of 24mbps to 54mbps)
- 802.11b (6mbps to 11mbps) and 802.11g (24mbps to 54 mbps)
- 802.11n (50mbps to 100mbps) is a proposed specification that will become a Wi-Fi standard once it's finalized by the IEEE, and the Wi-Fi Alliance completes its interoperability testing.

WLAN has changed the interaction manner through wire line between operators and robots in the past. The work area of robots has not been influenced by the availability of lineate pavement anymore. Reference [3] has shown a development of robot communication system. In this development, antenna used to operate in the control link of a mobile robot. The link will carry control signals for the robot movements and image frames taken from an infrared camera mounted in the robot. The link is set by means of commercial WiFi boards, an Access Point placed on the robot and another PCI board inserted on the desktop computer. Mobile robot moved according to the commands sent through the wireless channel by a desktop computer. Characteristic Wi-Fi systems used in this development are wideband is around 100MHz, with a center frequency of 2.45GHz, for the IEEE802.11b and IEEE802.11g. Fig. 2 shows the schematic of the mobile robot and the control office.



Figure 2 Schematic of the mobile robot and the control office [3].

Other wireless technology usage is developed tele-operation robots repairing the leaky chemical container as in [4]. This project used WLAN for transmitting every movement of the virtual robot to the real robot. This WLAN responsible for transmitting operators' commands, the position information of the robot and the leak, remote video from the real robot, and so on. On the spot, control center is far from the real robot, and several buildings are among them. Through using a high gain antenna and an amplifier communication distance of WLAN can extend to over 30km. Fig. 3 shows the WLAN of Bridge Connection Pattern used in this project.

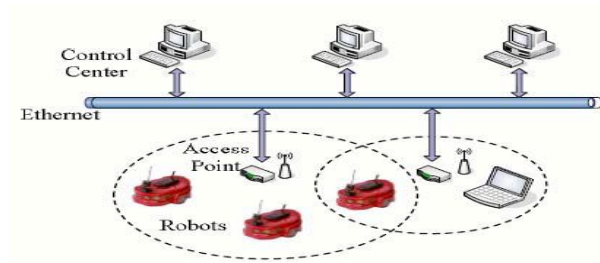


Fig.3 Bridge Connection Pattern WLAN [4]

The main objectives of this design are to build a robot that can be navigated remotely and wirelessly monitor the environment in multiple-angle in minimal development cost. The user can control the robot through a computer which can access a Wi-Fi network and a Visual Basic application. The two methods how the user can access the robot are depicted in Fig.4. Fig.5 illustrates functional block diagram of the design. The details of each component will be discussed in next section.

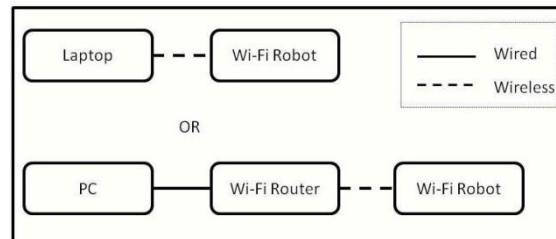


Fig. 4 Elementary block diagram of the design

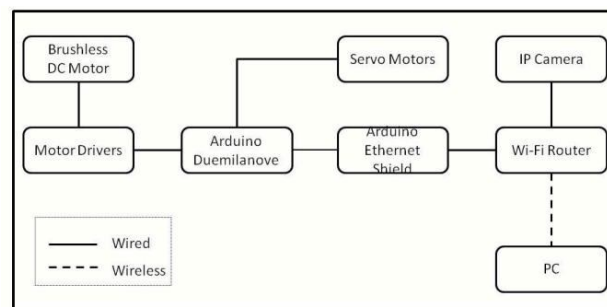


Fig.5 Functional Block Diagram of the Design



C. ZigBee

The name ZigBee is said to come from the domestic honeybee which uses a zig-zag type of dance to communicate important information to other hive members. This communication dance (the "ZigBee Principle") is what engineers are trying to emulate with this protocol a bunch of separate and simple organisms that join together to tackle complex tasks

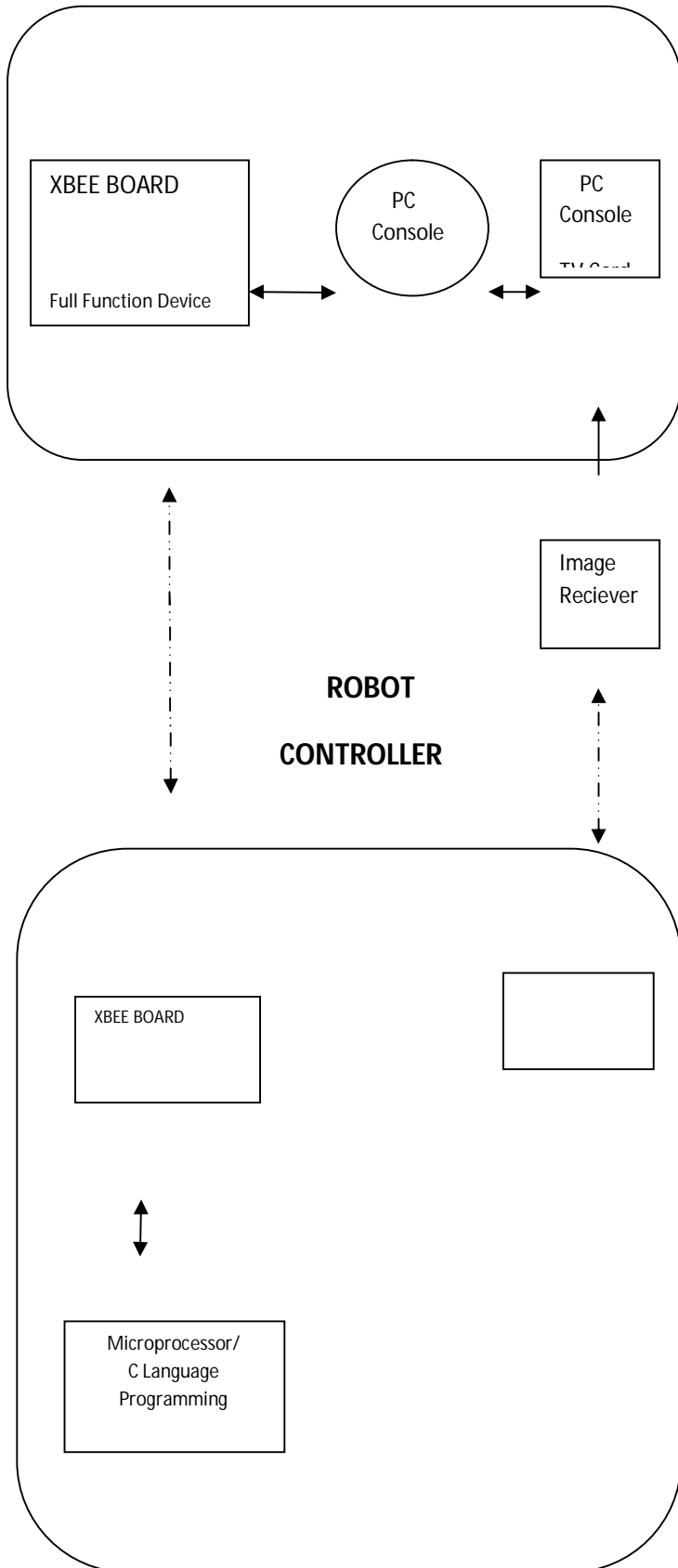
ZigBee is a low-cost, low-power, wireless mesh networking proprietary standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range.

ZigBee operates in the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz in the USA and Australia, and 2.4 GHz in most jurisdictions worldwide. The technology is intended to be simpler and less expensive than other WPANs such as Bluetooth.

Because ZigBee can activate (go from sleep to active mode) in 15 msec or less, the latency can be very low and devices can be very responsive — particularly compared to Bluetooth wake-up delays, which are typically around three seconds. Because ZigBees can sleep most of the time, average power consumption can be very low, resulting in long battery life.

ZigBee protocols are intended for use in embedded applications requiring low data rates and low power consumption. ZigBee's current focus is to define a general-purpose, inexpensive, self-organizing mesh network that can be used for industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation, home automation, etc. The resulting network will use very small amounts of power – individual devices must have a battery life of at least two years to pass ZigBee certification.

The hardware and software development are summarized as shown in Fig. 6.



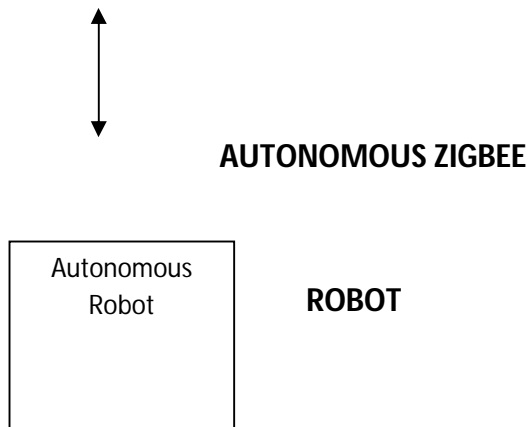


Fig. 6 System Block Diagram

Comparative Study

Table I summarizes the main differences among the three protocols. Each protocol is based on an IEEE standard. Obviously, Wi-Fi provide a higher data rate, while Bluetooth and ZigBee give a lower one.

	ZigBee	Wi-Fi	Bluetooth
Range	10-100 meters	50-100 meters	10 – 15 meters
Networking Topology	Ad-hoc, peer to peer, star, or mesh	Point to hub	Ad-hoc, very small networks
Operating Frequency	868 MHz (Europe) 900-928 MHz (NA), 2.4 GHz (worldwide)	2.4 and 5 GHz	2.4 GHz
Complexity (Device and application impact)	Low	High	High
Power Consumption (Battery option and life)	Very low (low power is a design goal)	High	Medium
Security	128 AES plus application layer	Depands	64 and 128 bit encryption



	security		
Max data rate (Mbit/s)	0.72	0.25	54
Bit time (μs)	1.39	4	0.0185
Max data payload (bytes)	339 (DH5)	102	2312
Max overhead (bytes)	158/8	31	58
Typical Applications	Industrial control and monitoring, sensor networks, building automation, home control and automation, toys, games	Wireless LAN connectivity, broadband Internet access	Wireless connectivity between devices such as phones, PDA, laptops, headset

TABLE I

In general, the Bluetooth and ZigBee are intended for WPAN communication (about 10m), while Wi-Fi is oriented to WLAN (about 100m). However, ZigBee can also reach 100m in some applications.

CONGRUENCE

This paper has presented a broad overview of the three most popular wireless standards, Bluetooth, ZigBee, and Wi-Fi that might be used to control mobile robots, with a quantitative evaluation in terms of the Networking Topology, Operating Frequency, Complexity (Device and application impact), Power Consumption (Battery option and life), Security, Max data rate (Mbit/s), Bit time (μ s), Max data payload (bytes), Max overhead (bytes). It is important to compare this technology and the bandwidth, frequency, data rate to transfer data among the devices for better development for mobile robot controller. All we need to do is to focus on how to bring the different characteristics of all the wireless technologies together in one portable application. Selection of wireless technologies depends on the type of application to be developed considering the following; range, frequency and data rate.



References

- [1] Ricardo Tesoriero, José A. Gallud, María D. Lozano, Víctor M. R. Penichet “Tracking Autonomous Entities using RFID Technology” IEEE Transactions on Consumer Electronics, Vol. 55, No. 2, May 2009.
- [2] YeongChe Fai, Shamsudin H.M. Amin, NorsheilabtFisal, J. Abu Bakar. “Bluetooth Enabled Mobile Robot.” IEEE ICIT'02, Bangkok, Thailand 2002.
- [3] Marcelo B. Perotoni , Beatriz E. Garibello, Silvio E. Barbin “ An IEEE802.11 Low Cost Planner Antenna for a Mobile Robot”, 2006.
- [4] Feng Cui , Minglu Zhang , Genqun Cui , Xiaolong Wu “A Robot Teleoperation System Based on Virtual Reality and WLAN”, Proceedings of the 6th World Congress on Intelligent Control and Automation, Dalian, China, June 21 - 23, 2006.



RECENT ADVANCES IN WEB PLC FOR INDUSTRIAL CONTROL AND AUTOMATION

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ABSTRACT

This paper presents the review of web-PLC recently developed. In the past, remote monitoring and control of industrial systems and processes had limited application because the control system was not accessible from multiple locations. Modems made it possible to access the control system from different locations, but they are generally restricted to downloading and uploading data files and require a customized interface to access the control system. Embedding the Web server in the PLC ensures the timely flow of information from the factory floor. A web server in the PLC has direct access to this information. At the same time, the built-in Ethernet interface allows this information to be easily shared across the enterprises for faster decision making. A new kind of Nano-10 PLC has all the Embedding Web server features. All the features of new kind of web-PLC have illustrated and a comparative study is made among the different embedded PLC currently available in the market. A small laboratory based project on nano-10 PLC is presented in this paper to understand the features, operation and advantages of web-PLC.



Keywords: Embedded Web PLC, Embedded web server, Programmable Automation Controller (PAC), MODBUS TCP/IP server, NANO-10.

1. INTRODUCTION

Programmable Logic Controllers (PLC) are widely used in industrial control today because they are inexpensive, easy to install and very flexible in applications. A PLC interacts with the external world through its inputs and outputs. Since the technology for motion control of electric drives became available, the use of PLC with power electronics in electric machines applications has been introduced in the manufacturing automation [1-3].

The industrial application of PLC spreads over almost all type of industries. With the development of all kinds of technology, function of PLC has improved drastically; therefore application scope of PLC has enlarged continuously [4].

A PLC is a microprocessor-based control system, which uses a programmable memory for the internal storage of user-orientated instructions for implementing specific functions such as arithmetic, counting, logic, sequencing, and timing [5-6].

PLC can communicate in network with other PLC, remote I/O module, CAN communication with several PLCs and can constitute DCS with other intelligent devices. PLC proves themselves as a very versatile and effective tool in industrial control of electric drives [7].

Many factories use PLCs in automation processes to diminish production cost and to increase quality and reliability [8-9]. Machine tools with improved precision computerized numerical control (CNC) are there due to the use of PLC [10]. To obtain accurate industrial electric drive systems, it is necessary to use PLCs interfaced with power converters, personal computers, and other electric equipment [4]–[11].

In the above systems, remote monitoring and control of industrial systems and processes took many forms. Dedicated lines were the most common form of communication between a control system and a remote location. This had limited application because the control system was not accessible from multiple locations. Modems made it possible to access the control system from different locations, but they are generally restricted to downloading and uploading data files and require a customized interface to access the control system. Also, providing any type of control function between locations is rather limited [12].

If the application needs more advanced control, more analog I/O, more advanced online data processing, very high speed control, high speed data logging, advanced motion control or machine vision, or especially if it needs any of these in combination, then a Programmable Automation Controller (PAC) is going to be the best solution. In short, if we are looking at a control system where we are putting together a PLC and PC, then we need to be using a PAC [13].



But again the PAC is not so much reliable in the context of complexity, size, cost and power consumption. Also for more complex control application, more hardware is required to use as the PAC is much more hardware specific.

Most small machines either don't have analog I/O or may have a couple, and they never have Ethernet built-in. If anyone wants to connect equipment to the Internet that is got to be done with a high-priced controller and it can be an expensive solution [14].

Web-enabled PLCs can significantly change the way plants are run, reducing downtime, communicate proactively and increasing productivity. Embedding the Web server in the PLC ensures the timely flow of information from the factory floor. A web server in the PLC has direct access to this information. At the same time, the built-in Ethernet interface allows this information to be easily shared across the enterprises for faster decision making [15]. When breakdowns do occur, Web-PLC allows the manufacturer who built it to remotely monitor and even repair their machines, reducing response time and cost that ultimately are passed to the user, including staff time and travel expenses. Engineers can now fix problems within a factory over the Web from their office or even from home. This same technology allows plant engineers to simultaneously monitor or manage multiple plants even from a single location.

2. Comparative study of Embedded existing PLC

A Comparative chart of all popular Embedded PLC existing on the market worldwide is presented in Table 1. Size of Embedded PLCs by the manufacturer varies by models. Only the small models are shown in Figure 1.



Figure 1: Some popular Embedded PLC lines

Since Embedded PLCs go into Original Equipment Manufacturer (OEM) products, size plays an important role in deciding which PLC line to use. Dimensions include headers (where applicable). These headers may recess into the product, reducing the PLC's impact on product's size.

**Table1: comparative structure of different manufacturer in Tabular form**

Product Line	Key Features/Compatibility					Physical Size
	Cost Range \$	Ethernet support	USB support	Available I/O Type		
				Analog Type	Digital Type	All are in Inches
Velocio.net eAce	45 +	NO	YES	NO	6 I/O	2.5x2.5x0.55
SPLAT CC18	53	YES	NO	2 in	16 bi-directional	3.35x2.13
Velocio.net eBranch	69+	NO	YES	6 in	12 I/O	2.5x2.5x0.55
Divelbiss Micro Bear	99	NO	NO	1 in	6 in; 4 out	4.35x2.86x0.75
Tri-PLC Nano-10	149	YES	NO	2 in	4 in; 4 out	3.34x2.84x0.75
Entertron Smart-PAK/ PAK Plus	195	NO	NO	NO	6 in; 6 out	6.50x4.50x2.00
Tri-PLC FMD	229	YES	NO	8 in;2 out	8 in; 8 out	
Tri-PLC F	429	YES	NO	8 in;4 out	16 in; 16 out	

Different ladder logic language snap shot by different manufacturer are presented in figure 2-6. Velocio uses ladder logic & flow chart languages as shown in figure 2. It is tag based and allows subroutines. Splat uses a basic text based language as in figure 3. It comes with a helpful tutorial. Triangel Research, Divelbiss and Entertron use a basic ladder logic language as shown in figure 4, 5 and 6 respectively.

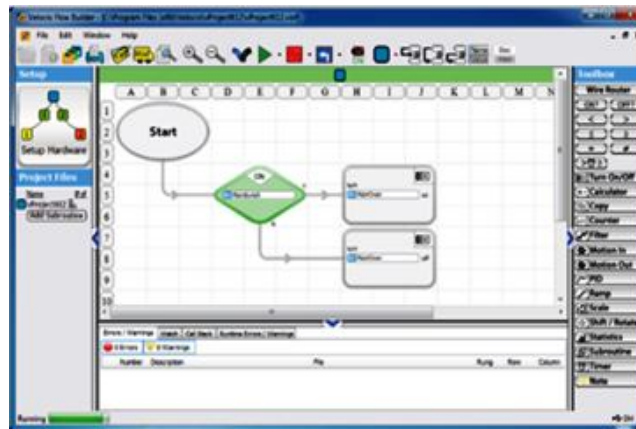


Figure 2: Velocio Ladder Logic

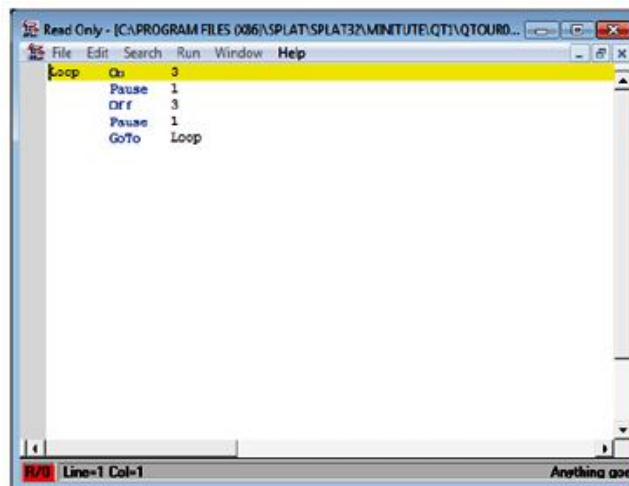


Figure 3: Splat window

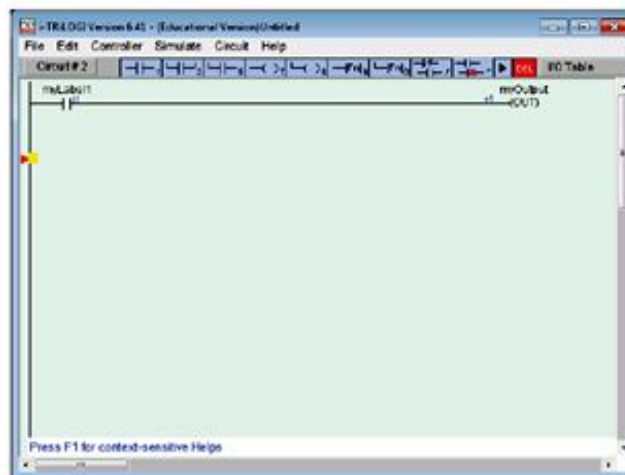


Figure 4: Triangel

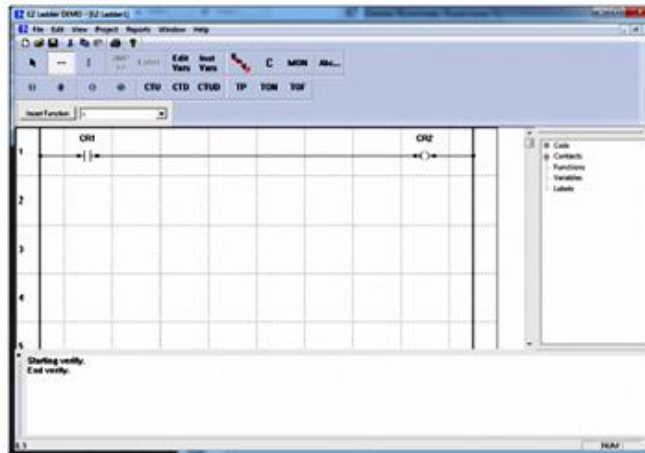


Figure 5: Divelbiss

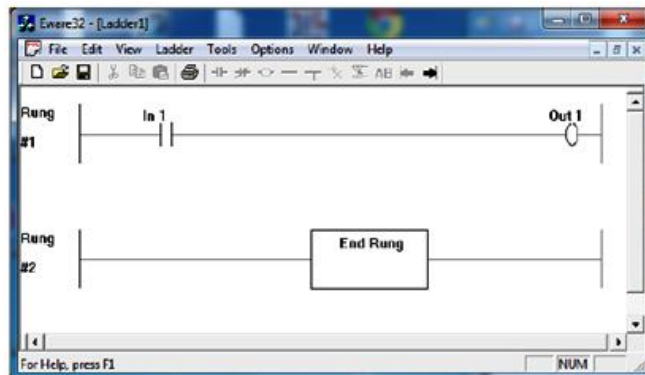


Figure 6: Entertron

3. Nano-10 PLC

Triangle's Nano-10 Embedded PLC has only 10 I/O, but is a full-function PLC. This Nano-class controller has a built-in Ethernet port that supports Modbus TCP/IP server and client connections; which allows information to be easily shared across the enterprises for faster decision making. Nano-10 is quite powerful Nano-class PLC. This has specific features like

- a. All 4 digital inputs can also be used as interrupt inputs, allowing fast events to be handled in the shortest possible time and to not be constrained by the program scan time.
- b. Built-in Ethernet port that can be connected directly to a network router, switch, or hub for access to the LAN or to the Internet. The Ethernet port supports the FServer (for remote programming or monitoring) and a Modbus/TCP server (for access by third party devices) with up to 6 simultaneous connections.
- c. The built-in RS485 port allows interface with many peripheral devices such as an LCD display (e.g. MDS100-BW [16] or a serial touch panel (e.g. Maple System HMI). The RS485 port is conversant in



- MODBUS protocol and can be used as a MODBUS master or slave to construct a highly sophisticated control system.
- d. In addition, an RS-485 connection which supports native host link commands protocol as well as MODBUS RTU and MODNUS ASCII, makes it possible not only to communicate with other Nano-10 family, but also with other make PLCs and a whole range of other devices that support the same industry standards.
 - e. It can also used as an interface to bar-code readers, serial printers, RFID readers, or for programming/monitoring via the TLServer software (part of the i-TRiLOGI software suite).
 - f. The Nano-10 PLC allows users to easily create their own savvy web page for remote interaction with the controlled equipment without the need to write any internet program.
 - g. It has counters/internal relays/sequencers, PID computation engine and real-time clock inbuilt and it's processing speed is $4\mu\text{s}$ per step,.

There are many possible applications for Nano-10 PLC. In continuous bottle filling systems, PLC becomes an important requisite controller. Use NANO-10 PLC can control and monitor the whole system from any location worldwide. in case of building automation application like building management system or Building Automation System (BAS) where the computer networking of electronic devices are designed to monitor and control the mechanical, security, fire and flood safety, lighting, AC & humidity control and ventilation systems in a building. BAS core functionality keeps building climate within a specified range, lights rooms based on an occupancy schedule, monitors performance and device failures in all systems, and provides malfunction alarms to building engineering/maintenance staff and contractors. BAS reduce building energy and maintenance costs compared to a non-controlled building. NANO-10 PLC may have a vital role here to optimize and achieve desired results through control over remote location. Similarly, the handling and conveying of material, be it the raw ingredients or the finished product, use of NANO-10 PLC could transform the whole system controlled and monitored from anywhere in the word.

4. LABORTARY BASED PROJECT USING Nano-10

A simple laboratory setup with a project of real time temperature monitoring and control is carried on to realize and demonstrate the utility of Nano-10 PLC.

Figure 7 presents the simple ladder logic program for the temperature measurement and Figure 8 presents the TBASIC Function used in the ladder logic. The temperature sensor output is kept at a value 28.6°C which is less than set value (32.5°C).

In order to access the web pages stored in the Nano-10 web server, we need to open our web browser and enter the IP address and port number of the Nano-10 server in the address bar. We also need to append the filename of the web page to the end of the address. All should be done in the format 'IP:Port/Filename'.

In the screen shot of online monitoring and controlling of the Nano-10 shown in Figure 9, the IP address is 192.168.1.5 and the port number is 9080, then following in the address bar in order to access the "4.HTM" file: <http://192.168.1.5:9080/4.HTM>

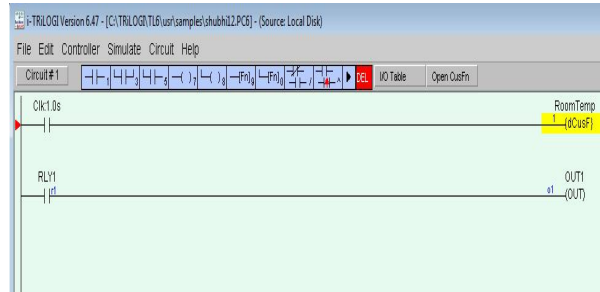


Figure 7: Ladder logic program

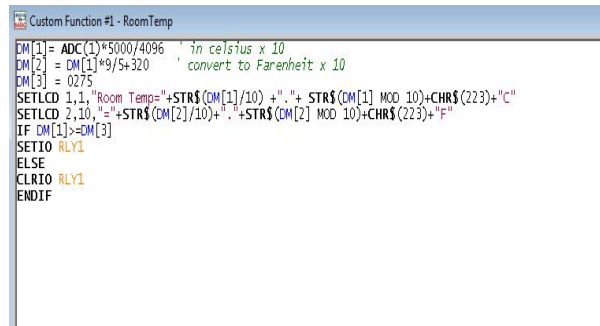


Figure 8: TBASIC Function used in above ladder logic

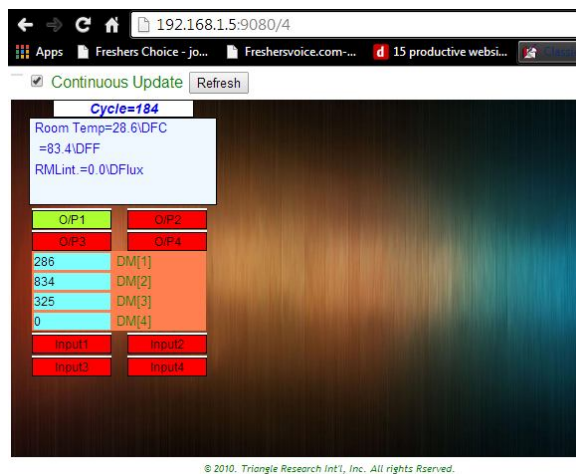


Figure 9: Online monitoring and controlling through internet



Online control and monitoring window developed through HTML files have the following components available:

- Background Image, which can be defined in the HTML file. The background image is set to the blue border picture and all the other components are positioned inside the blue border. The background image should be a JPEG file loaded from any web server.
- LCD Display, which will display whatever the PLC program is displaying on an LCD screen. The LCD display is positioned at the top of the output port image and it is displaying a real time temperature value, which is controlled by PLC program.
- Eight internal relay bits as buttons with configurable label names. The 4 “Output” buttons and 4 “Input” buttons shown in the figure are all mapped to internal relay bits in the Nano-10 PLC. The buttons are labeled as “Input” and “Output”, they are not actually connected directly to any physical I/O. So it is up to the PLC program to map the internal relay bits to the physical I/O in the PLC program. The program maps these relay bits to the physical inputs and outputs of the PLC.
- Four data memory variables (DM[1]-DM[4]) with configurable label names. There are four data memory locations that can display the values set by the PLC program and accept new values to be stored in the PLC DM locations. The first four DM locations are used here as DM[1], DM[2], DM[3], and DM[4]. These are the label names which may be modified through our program.
- Continuous Update checkbox with cycle count and refresh button.

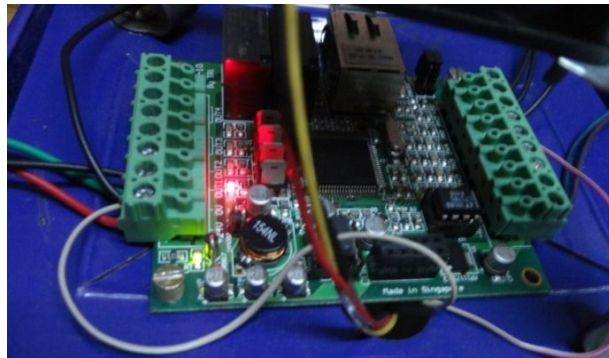


Figure 10: A laboratory setup of nano-10 PLC with temperature monitoring and control.

The RED led ON indicates the input temperature is greater than 32°C, which control the output i.e. OFF state.



5. CONCLUSION

PLC, the versatile and effective tool in industrial control, has many developments recently. For the application with more advanced control, more advanced online data processing, very high speed control, high speed data logging, advanced motion control or machine vision, an Embedded PLC plays the role.

Built-in Ethernet interface in Embedded Web PLC allows the controlling information data to be easily shared across the industry or enterprises for faster decision making. Embedding the Web server in the PLC ensures the timely flow of information requires on the factory floor.

Triangle's Nano-10 PLC has only 10 I/O, but is a full-function PLC. This Nano-class controller having built-in Ethernet port, supports MODBUS TCP/IP server and client connections. The Nano-10 PLC allows users to easily create their own savvy web page for remote interaction with the controlled equipment without the need to write any internet program. The simple laboratory experimental set-up presented shows a clear view of the application and operation Nano-10 PLC for the use in remote factory area. This will definitely open up a new aspect of automation in industrial scenario.

REFERENCES

1. Surajeet Ghosh, Sanchita Saha Ray, "4th Generation Programmable Logic Computing: A Road Map", IETE Technical Review, Volume 24, No.6, 2007.
2. S. S. Peng, M. C. Z. hou, Ladder Diagram and Petri-Net-Based Discrete-Event Control Design Methods, IEEE Transactions on Systems, Man, and Cybernetics- Part C, Applications and Reviews, Vol.34 No.4 Nov. 2004 pp. 523-531.
3. L. Wang, K. Liu, Improvement of power factor and voltage for renewable energy systems using PLC's new fuzzy module, Circuits and Systems, 2004. Proceedings. The 2004 IEEE Asia-Pacific Conference on Volume 2, 6-9 Dec. 2004 Page(s):957 - 960 vol.2.
4. yao Dong, Xin Yang-ming Application of PLC [J]. Science and Technology Consulting Herald, 2007 (19) 310.
5. Programmable Controllers. Part 1: General Information, 1992.
6. British Standard, BS EN 61131-1, 1994.
7. Yasar Birbir*, H.Selcuk Nogay- "Design and Implementation of PLC-Based Monitoring Control System for Three-Phase Induction Motors Fed by PWM Inverter", International Journal of Systems Applications, Engineering & Development, Issue 3, Volume 2, 2008.



8. A. Hossain and S. M. Suyut, "Monitoring and controlling of a real time industrial process using dynamic model control technology," in Proc. IEEE Ind. Applicat. Soc. Workshop on Dynamic Modeling Control Applications for Industry, 1997, pp. 20–25.
9. Z. Futao, D. Wei, X. Yiheng, and H. Zhiren, "Programmable logic controller applied in steam generators water levels," in Proc. IEEE/IAS 31st Annu. Meeting Conf. Rec., vol. 3, 1996, pp. 1551–1556.
10. K. Dong-II, S. Jin-II, and K. Sungkwun, "Dependence of machining accuracy on acceleration/deceleration and interpolation methods in CNC machine tools," in Proc. Conf. Rec. IEEE Industry Applications Soc. Annu. Meeting, vol. 3, 1994, pp. 1898–1905.
11. T. Krairojananan and S. Suthapradit, "A PLC program generator incorporating sequential circuit synthesis techniques," in Proc. IEEE Asia-Pacific Conf. Circuit and Systems, 1998, pp. 399–402.
12. <http://www.prlog.org/10788403-programmable-logic-controller-plc-in-the-australian-mining-industry.html>
13. IEE Manufacturing Engineer | August/September 2005.
14. Control Design, page 43, March 2010.
15. Machine Design, page 96, Nov. 16, 2000.
16. <http://www.tri-plc.com/mds100bw.htm>
17. <http://www.triplc.com/nano10.htm>



STUDY OF OPTICAL PROPERTIES OF AMORPHOUS $\text{Se}_{70-x}\text{Te}_{30}\text{In}_x$ CHALCOGENIDE THIN FILMS PREPARED BY THERMAL EVAPORATION TECHNIQUE

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Thin films of amorphous $\text{Se}_{70-x}\text{Te}_{30}\text{In}_x$ ($x= 0, 2, 4$ and 6) are deposited on glass substrate at room temperature by thermal evaporation technique. Transmittance measurements were used to calculate dissipation factor ($\tan \delta$) with the help of refractive index n and the extinction coefficient k using Swanepole's method. The optical band gap E_g is estimated using Tauc's relation and is found to increase with the increasing In content.

Keywords: Refractive index, Thermal evaporation, Dispersion energy, Optical band gap.

Introduction

Chalcogenide glasses based on the chalcogen elements like S, Se and Te have received great attention because of their important optical applications in the infrared region due to their high optical transparency in IR region [1]. These materials are also called lone-pair semiconductors, because the conduction properties determines by the lone-pair band [2]. In pure state Se has several disadvantage because of its short life time and low sensitivity. The Se-Te alloys have been found to be more useful from the technological point of view due to their greater hardness, higher T_c , and lower ageing effect as compared to amorphous Se [3,4].

The optical properties of chalcogenide films have been the subject of numerous studies due to their technological importance. The present work deals with the determination of the dissipation factor and optical band gap, of Se-Te-In thin films by analyzing the transmission spectra in the 700- 1800 nm wavelength range.

2. Experimental details

Different compositions of bulk $\text{Se}_{70-x}\text{Te}_{30}\text{In}_x$ (where $x= 0, 2, 4$ and 6) chalcogenide glasses were prepared by melt quenching technique. The material was then sealed in evacuated (10^{-5} Torr) quartz ampoule. The



sealed ampoules containing materials were kept inside a muffle furnace whose temperature was raised at a rate of 3 K/minute upto 950 °C for 24 hours. During heating, the ampoules were constantly rocked and the obtained melt was rapidly quenched in ice cooled water. The ingots of quenched samples were taken out by breaking the quartz ampoules.

The chalcogenide thin films used in the present study of the system were deposited by thermal evaporation technique on to glass substrates using a high vacuum coating unit (HIND HIGH VAC. 12A4D).

The optical transmission spectra were recorded at room temperature for all the samples using a (Shimadzu UV 3600) spectrophotometer, in the wavelength range 700- 1800 nm.

3. Results and discussion

3.1 Optical properties

The optical constants are obtained by using only the transmission spectrum. The optical parameters are calculated by using Swanepoel's method [5,6].

3.1.1 Determination of optical constants

For the method proposed by Swanepoel, the optical constants are deduced from the fringe patterns in the transmittance spectrum. The refractive index in the transmittance region where $\alpha \approx 0$ was calculated by using the formula.

$$n = \sqrt{N + \sqrt{N^2 - s^2}} \quad (1)$$

where

$$N = \frac{2s}{T_{min}} - \frac{(s^2 + 1)}{2} \quad (2)$$

where T_{max} is the upper extreme transmission point and T_{min} lower extreme transmission point for particular wavelength and 's' is the refractive index of the glass substrate ($s = 1.52$). In the weak region where the absorption coefficient ($\alpha \neq 0$) the value of N is given by

$$N = 2s \frac{T_{max} - T_{min}}{T_{max} T_{min}} + \frac{s^2 + 1}{2} \quad (3)$$

If n_1 and n_2 are the refractive indices of two adjacent maxima or minima at wavelengths λ_1 and λ_2 , then the thickness of the film is given by

$$d = \frac{\lambda_1 \lambda_2}{2(\lambda_1 n_2 - \lambda_2 n_1)} \quad (4)$$

The extinction coefficient k can be calculated from the following relation



$$k = \frac{\lambda}{4\pi d} \ln\left(\frac{1}{x}\right) \quad (5)$$

Where x is the absorbance, given by

$$x = \frac{E_M - \sqrt{E_M^2 - (n^2 - 1)^3 (n^2 - s^4)}}{(n - 1)^3 (n - s^2)} \quad (6)$$

and

$$E_M = \frac{8n^2s}{T_{max}} + (n^2 - 1)(n^2 - s^2) \quad (7)$$

The real and imaginary dielectric constant of amorphous thin films has been calculated by the relation (8) and (9), respectively.

$$\varepsilon' = n^2 - k^2 \quad (8)$$

$$\varepsilon'' = 2nk \quad (9)$$

And dissipation factor, $\tan \delta$, is expressed as

$$\tan \delta = \frac{\varepsilon''}{\varepsilon'} \quad (10)$$

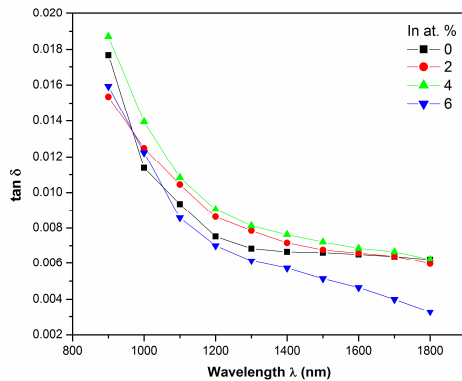


Fig.1. Variation of dissipation factor ($\tan \delta$) with wavelength (λ) in $Se_{70-x}Te_{30}In_x$ thin films.

3.1.2 Determination of optical band gap

The analysis of absorption coefficient of the amorphous films was found suitable with the Tauc's [7] relation given as

$$\alpha h\nu = B (h\nu - E_g^{opt})^m \quad (11)$$



Where α is the absorption coefficient; B is the band tailing parameter that depends on the transition probability; $h\nu$ is the photon energy; E_g^{opt} optical energy gap; m-index, depending on the nature of electronic transitions. For amorphous materials non-direct optical transitions ($m = 2$) are observed.

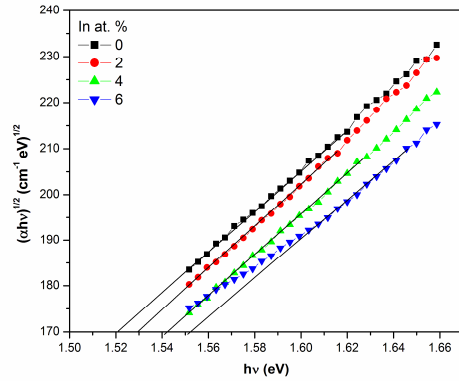


Fig.2. Variation of $(\alpha h\nu)^{1/2}$ as a function of photon energy, $h\nu$, for $Se_{70-x}Te_{30}In_x$ thin films.

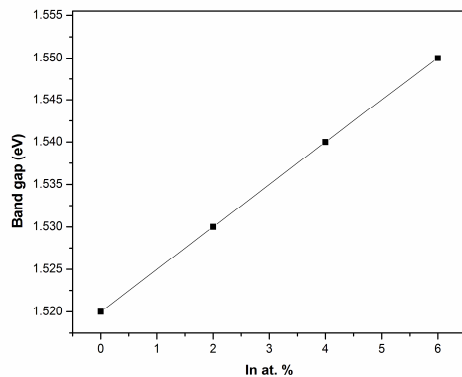


Fig.3. Variation in band gap with In concentration.

The optical band gap E_g^{opt} can be determined by the extrapolation of the best fit line between $(\alpha h\nu)^{1/2}$ and $h\nu$ to intercept the $h\nu$ axis for the $Se_{70-x}Te_{30}In_x$ system as shown in fig. 2. The values of the optical band gap are plotted in fig. 3 as a function of In content (x). The value of band gap of system without Indium is 1.52 eV. After incorporating In at. 2%, 4% & 6% in binary Se-Te alloy, it is observed that the optical band gap increases from 1.53 eV to 1.55 eV.

The optical band gap is a bond sensitive property [8]. Hence the change in the optical band gap, with In incorporation may also be understood on the basis of the change in the average bond energy of the system.

The increase in optical band gap may be correlated with the electronegativity difference of the constituent elements. It is expected that if the electronegativity difference is large, the probability of defect formation will be more.



4. Conclusions

Thin films were prepared by thermal evaporation technique. The glassy nature of as deposited thin films is confirmed by X-ray diffraction analysis. The change in the optical band gap with In incorporation is explained on the basis of the change in electronegativity and bond energy difference between the constituent elements.

5. Acknowledgement

The authors would like to thank department of physics, Gurukula Kangri University, Haridwar for providing instrumental facilities sponsored by D S T -FIST New Delhi (India).

References

- [1] J. A. Savage, Infrared Optical Materials and their Antireflection Coatings, Adam Hilger, Bristol (1985).
- [2] M. Kastner, Phys. Rev. Lett. **28** (6), 355 (1972).
- [3] K. Shimakawa, Philos. Mag. **46**, 123 (1982).
- [4] S. O. Kasap, T. Wagner, V. Aiyah, O. Krylouk, A. Bekirov, L. Tichy, J. Mat. Sci. **34**, 3779 (1999).
- [5] R. Swanepoel, J. Phys. E: Sci. Instrum. **17**, 896 (1984).
- [6] R. Swanepoel, J. Phys. E **16**, 1224 (1983).
- [7] J. Tauc, "Amorphous & Liquid Semiconductor", New York: Plenum press (1974) p. 171.
- [8] A. K. Pattanaik, A. Srinivasan, J. Optoelectron Adv. Mater. **5**, 1161(2003).



**ELECTRONIC ABSORPTION SPECTRA AND EFFECT OF PH OF
4-CHOLORO-3-NITRO PHENOL**

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ABSTRACT

The electronic absorption spectra of 4-Choloro-3-Nitro Phenol has been recorded in the region 2000-3500Å. The electronic absorption spectra has been recorded in various solvents (viz. ethanol, methanol and water). The effect of substituents has been discussed. The effect of pH variation in ethanol solvent is also studied and discussed.

Keywords: Electronic Spectra, pH Effect etc.

INTRODUCTION

Many investigators have studied the electronic absorption spectra of phenols and their derivatives. The spectroscopic studies of these aromatic compounds have been motivated due to their great biological importance.



In present investigation the electronic absorption spectra of 4-chloro-3-nitro phenol has been discussed. The effect of solvent on electronic transition ($n-\pi^*$, $\pi-\pi^*$ and $n-\sigma^*$) is also analysed. The effect of pH variation on electronic transitions of this compound in ethanol solvent has been studied. The electronic spectra of substituted nitro and hydroxy group also appear in literature [1,2]

EXPERIMENTAL DETAILS

98% spec-pure compounds 4-chloro-3-nitro phenol (here after referred as 4,3-CNP) was obtained from M/s Sigma Aldrich Chemie, West Germany and used as such without further purification. However their purity was confirmed by elemental analysis and melting point determination [126–128°].

The experimental technique in the ultraviolet spectra of said compound was recorded on Beckman spectrophotometer model-35 in the region 200–350 nm[3]. The spectra have been recorded in various solvents (viz. ethanol, methanol and water). The concentration of the solution in all the cases was kept constant (8×10^{-3} gm/litre). All the solvents used was of spectroscopic grade. The ratio of pure solvent was obtained at 9 : 1 by volume[4,5].

RESULTS AND DISCUSSION

The molecular structure of 4,3-CNP are shown in figure-1. The electronic transition of said compound recorded in different solvent (a) ethanol (b) methanol (c) water are shown in fig.-2. The effect of pH variation on electronic transitions of this compound recorded in ethanol (neutral, acidic and alkaline) are shown in fig-3[6-8]. The electronic transition of said compound along with their relative intensities and probable assignments are presented in Table-1 and Table-2.

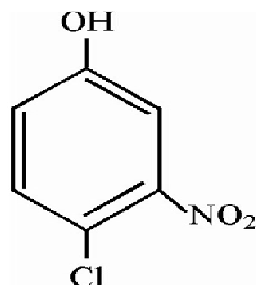


Fig.-1 Molecular structure of 4,3-CNP



ULTRA VIOLET ABSORPTION SPECTRA

Many investigators have suggested that changing of the solvent, effect the position of band in the electronic spectra, which may be used to identify the band as $n-\pi^*$, $\pi-\pi^*$ and $n-\sigma^*$. The $n-\pi^*$ transition of substituted benzene occur at distinct bands in the region 340–300 nm. $n-\pi^*$ transition corresponds to out-of- plane transitions while $\pi-\pi^*$ and $n-\sigma^*$ in-plane transitions.

In view of this, for the molecule of 4,3–CNP belonging at the point group C_s , the transition $A_{1g} \rightarrow B_{2u}$ in benzene becomes $A_{1g} \rightarrow A_{1u}$. Due to present investigation, the $n-\sigma^*$ transition at 210 nm (methanol) and $\pi-\pi^*$ transition at 228 nm in 2,4–CNP have been taken to represent in-plane transition, while the $\pi-\pi^*$ transition at 218 nm (ethanol and water), 224 nm (methanol) in 4,3–CNP have been represent in-plane transition. The $n-\pi^*$ transition bands around at 300 nm in trisubstituted benzene[8,9].

Solvent Effect

Generally, the solvent used in recording these spectrum are non-polar-one (like hexane) or polar solvents (like ethanol, methanol and water etc.). The band will be called blue shift or red shift . According to the band shift towards shorter wavelength or longer wavelength on changing the solvent form hexane to water, then $n-\pi^*$ transitions are attributed to blue shift band while $\pi-\pi^*$ and $n-\sigma^*$ transition are attributed to red shift band. The amount of blue shift has been used as a measure of the strength of the H–bonding in ethanol, methanol and water and increase in transition energy[9,10]. This energy required to weaken or break the hydrogen bond . In the present investigation, the $n-\pi^*$ transition is blue shift in the compound 4,3–CNP with increasing polarity of the solvents (ethanol \rightarrow methanol \rightarrow water) as shown in Table–1. The red shift has been observed in the $\pi-\pi^*$ and $n-\sigma^*$ transitions in the said compound with increasing polarity of the solvents are also given in Table–2. The attraction between the solute and solvent molecule will be more if the polarity of the molecule will be more, which results the system more stable . Thus, with increasing the dielectric constant of the solvent, the ionizing polarity of the solute molecule will be increase. Hence, grater the polarity of the solvents, greater will be the degree of the solution[11-13] .

Effect of pH

Ultraviolet spectra sufficiently depict the electronic structure of molecule. In present study, there is a blue shift in the position of entire band with decrease in pH , the $n-\pi^*$ band is reported to shifted towards



shorter wavelength in acidic solution by many coworkers. In accordance with the above, we have observed a red shift in $n-\pi^*$ band with the addition of alkali in the aqueous solution of 4,3-CNP shown in Fig.-2 and Fig.-3 and Table -1 and Table-2 respectively[5,7]. On increasing pH, a slight red shift $\pi-\pi^*$ band of the said compound observed which is similar to the behavior observed in the literature[14-17].

TABLE-1
SOLVENT EFFECT ON ELECTRONIC ABSORPTION SPECTRA OF
4 - CHLORO-3-NITRO PHENOL
(ALL VALUES ARE IN NM)

Solvent	DC*	RI**	4-chloro-3-nitro phenol		
			$n-\pi^*$	$\pi-\pi^*$	$n-\sigma^*$
Ethanol	25.0	1.3773	–	218	–
Methanol	32.0	1.3362	–	224	–
Water	80.5	1.3380	–	218	–

Where, DC* = Dielectric Constant, RI** = Refractive Index

TABLE-2.
EFFECT OF PH VARIATION ON ELECTRONIC TRANSITION OF
4 - CHLORO-3-NITRO PHENOL
(ALL VALUES ARE IN NM)

Solvent	4-chloro-3-nitro phenol		
	$n-\pi^*$	$\pi-\pi^*$	$n-\sigma^*$
Ethanol	314	220	208
Ethanol+Hcl	287	221	–
Ethanol+ NaOH	302	230	–

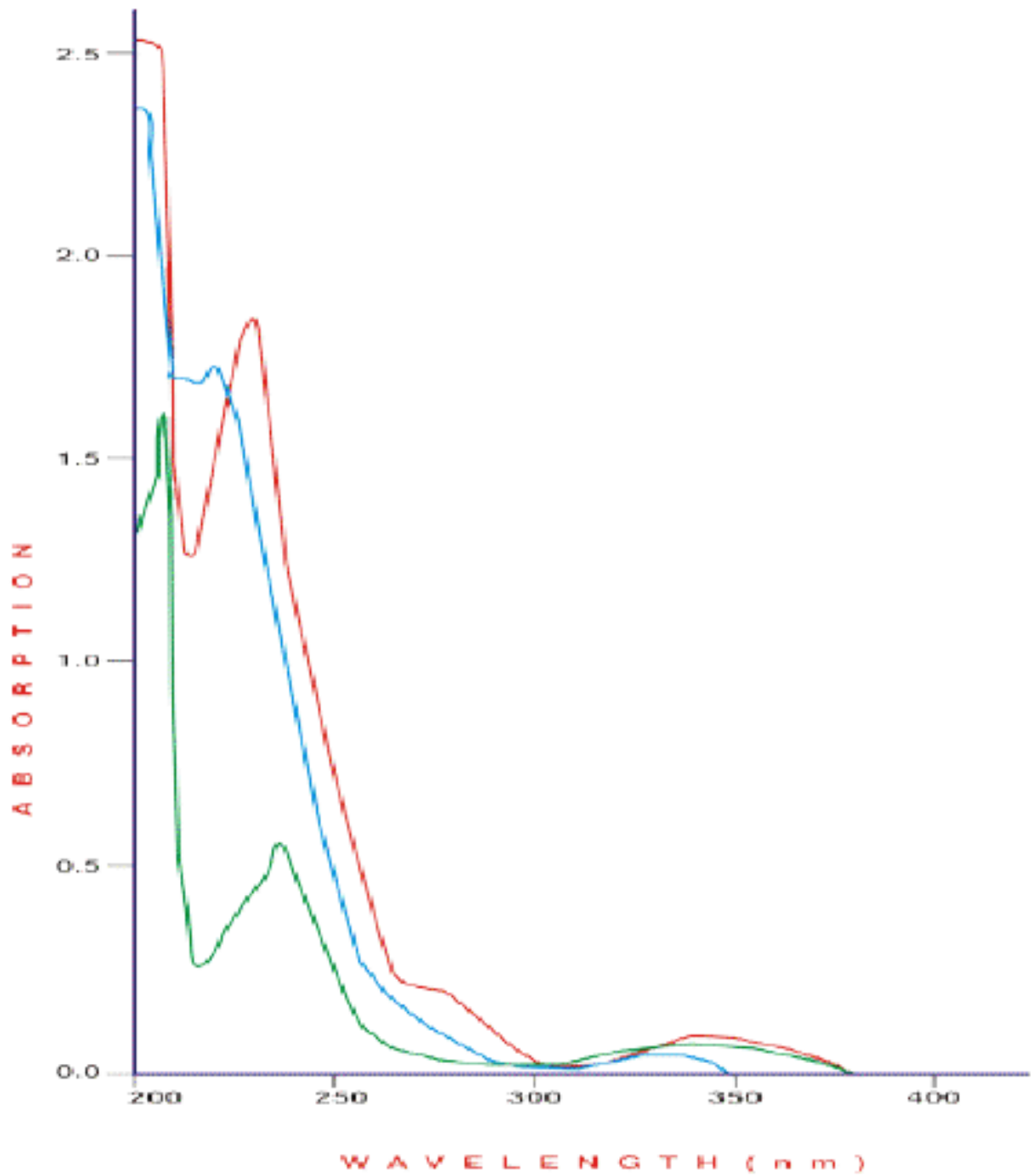


Fig. 1 : ULTRAVIOLET ABSORPTION SPECTRA OF 4.3 -CNP
(—) ETHANOL, (—) METHANOL AND (—) WATER

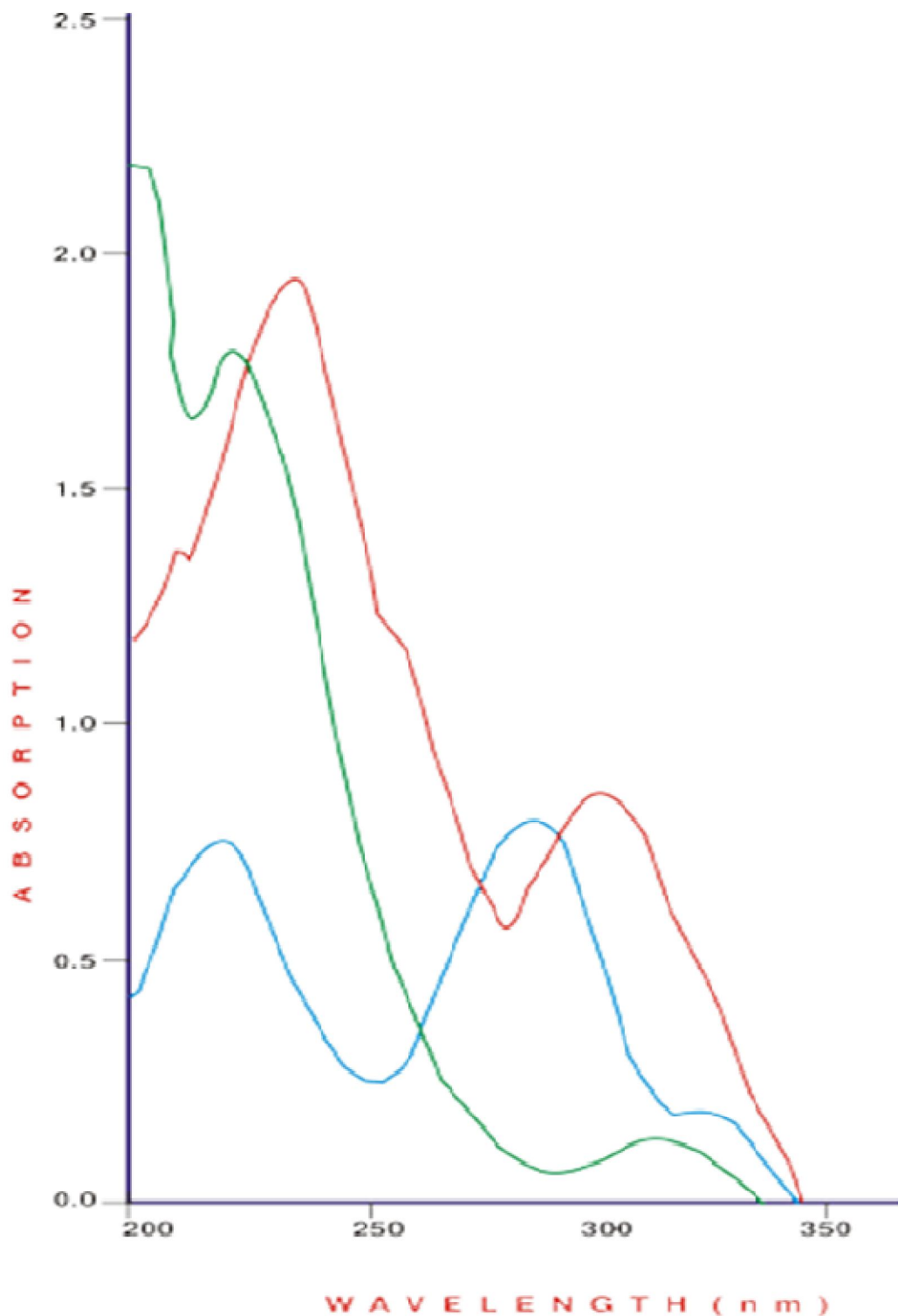


Fig. 2 : ULTRAVIOLET ABSORPTION SPECTRA OF 4,3 -CNP IN ETHANOL:
(—) NEUTRAL, (—) ACIDIC AND (—) ALKALINE MEDIUM



REFERENCES

1. G.Varasanyi, "Assignments of the spectra of 700 benzene derivative" Academic press New York (1974).
2. B.S.Yadav, Israt Ali & Seema, Ultra Science, 19 (1) 51 (2016).
3. N.B. Colthup, L.H. Daly & W.E. Wimberley, "Introduction to Infra & Raman spectroscopy" New York (1964).
4. F.Liakath Ali Khan, P.Sivaguranathan & J.Asgar, IJP & AP 46 (2015).
5. B.S. Yadav, M.K.Yadav, Pradeep Kumar, Oriental J. Chemistry, 22 (2), 447 (2008).
6. H.A. Szymansky, "Theory & Practice of I.R. Spectroscopy"(Plenum Press inc. New York) (1964).
7. N.Sunderaganesan, B.Dominic Joshua, IJP & AP, 45 (12) 969 (2007).
8. Herzberg, "Molecular spectra & Molecular structure III" (1965).16
9. L.J. Bellamy, "The I.R. spectra of complex molecule" John willy & Sons, New York (1957).
10. C.N.R. Rao, "Chemical application of I.R. spectra of complex molecule" John Willy & Sons, New York (1957).
11. G.Varsanyi, "Vibrational spectra benzene derivaives" New York academic (1969).
12. S.Guneshekarana & D.Uthasa , IJP & AP, 46 (2) 100 (2016)
13. V.N. Verma and D.K. Rai, "Application spectroscopy", 24,445 (1987).
14. B.S.Yadav, Vaishali Agnihotry , Priti Yadav & Pradeep Kumar ,Ultra Science ,19 (1) 73 (2007).
15. Tripathi & Pandey, I.J.P., 12 (1974).
16. N.Sunderganeshan, M.Priya, C.Meganathan & B.Dominic Joshua & J.P. Cornord , Spectrochimica Acta , 70 (1) 50 (2008).
17. Baruash, amma, Dube & Rai, I.J. P & AP, 761, (1996).



CASE STUDY OF DIFFERENT STRAIN LEVEL OF BURIED CONTINUOUS WATER PIPELINE SYSTEM FOR DELHI CITY

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ABSTRACT

Pipelines are used for the transportation of liquid fuel, gas, oil, etc. sometimes cross unstable slopes, where earthquake-induced slope movements can easily take place but after the Gujrat earthquake it was realised how destructive could be the pipelines. So, an attempt was made regarding pipeline analysis and its larger study as accordance to the seismic movements. These movements can induce strains and stress in the pipe which can compromise the safety of the structure. The aim of the pipe stress prediction is to assess the failure risk and eventually to plan monitoring.

The topic “case study of different strain level of buried continuous pipeline system for Delhi city “ is initially dealt with, the soil interaction as discussed in which the finite element models are explained as well as the soil structure interaction is explained in detail and various site visit had been done to collect the borehole data required for the same and after that the complete study of different strain levels i.e. Axial strain due to operation, Axial strain due to earthquake excitation and Strain induced in the pipe line by friction at the soil pipe interface is calculated for the design criteria and the same is checked for various locations in delhi leading to the final use of pipes as mentioned later in detail.

INTRODUCTION

The performance of buried continuous pipe lines during an earthquake has been a major concern as these structures are classified into the lifeline category. Moreover, the absence of any specific standard or guidelines for seismic evaluation of these structures in India has always called for site specific response evaluation. Post Bhuj earthquake, the Gujrat State Disaster Management Authority had initiated the study in a more holistic approach and Indian Institute of Technology, Kanpur came up with guidelines incorporating different provisions and commentary.

The present article is a parametric study of pipe diameter on the seismic performance of the continuous pipeline system comparing different strain levels. Along with, the effect of installation depth is investigated. A case study on pipeline systems of DELHI city, (India) is presented.

Pipelines for the transportation of liquid fuel, gas, oil, etc. sometimes cross unstable slopes, where earthquake-induced slope movements can easily take place. These movements can induce strains and stress in the pipe which can compromise the integrity and the safety of the structure. The aim of the pipe stress prediction is to assess the failure risk and eventually to plan monitoring. The evaluation of seismic response of buried pipelines will depend on various factors, such as the direction of the ground movement, the entity of the earthquake-induced slope motion, the dimension and the stiffness of the pipe.



Objective of the Study

The objectives of the study are as follows:

- i. To collect borehole data from various places
- ii. Study the soil pipe interaction completely
- iii. Calculation of various strain levels in that particular area

METHODOLOGY

The initial stress in the pipeline is calculated due to internal pressure and temperature change due to installation and operation.

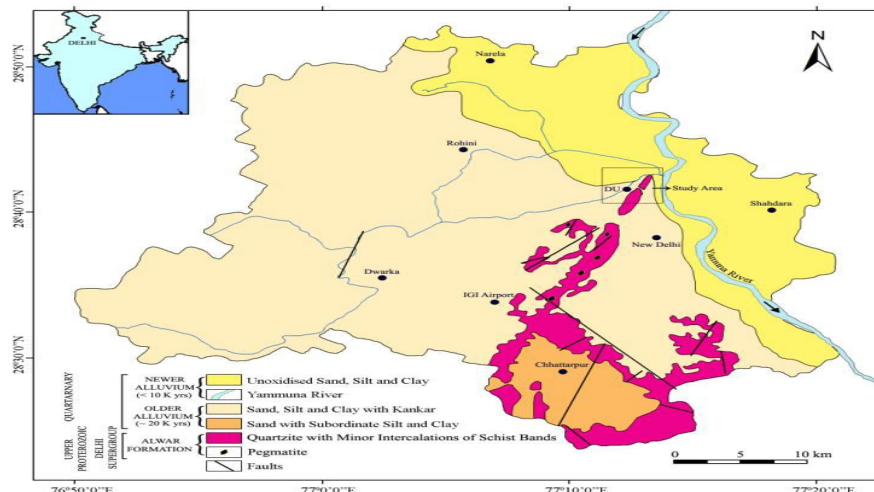
The longitudinal stress (S_p) in the pipe due to internal pressure is calculated as per the guidelines prepared by IITK- GSDMA.

The seismic vulnerability assessment of buried pipelines which includes calculation of transitory strains caused by differential ground displacement of pipe system in soft soils.

Then as per ALA-ASCE 2001 guidelines, for a continuous system the axial strain μ_{af} induced by friction at the soil pipe interface. Similarly, the method is applied for various pipes and the most suitable type of pipe is recommended for some areas.

DESCRIPTION OF DELHI

Delhi is located within $28^{\circ}24'17''N$ to $28^{\circ}53'00''N$ latitudes and $76^{\circ}50'24''E$ to $77^{\circ}20'37''E$ longitudes and it falls in the seismic zone IV as per Bureau of Indian Standards (BIS 1893, Part 1:2002). Several earthquakes of magnitudes ranging from 3 to 7.4 have been observed in and around Delhi during the past three centuries. Moreover earthquake events which occurred in the Himalayan region, along the Main Boundary Thrusts (MBT) and Main Central Thrusts (MCT) have been felt in Delhi.

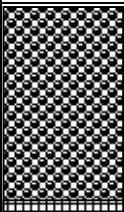
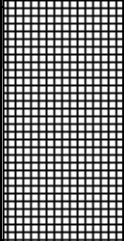
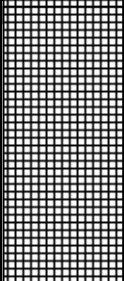
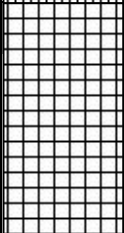
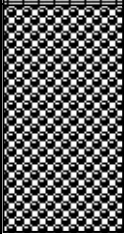




Map of Delhi showing different soil strata

BOREHOLE DATA COLLECTED DURING SITE VISIT

CHATARPUR CONSTITUENCY (CHATARPUR TEMPLE TO FATEHPUR)

Sl. no.	Soil strata	Type of soil	Depth
1.		Sandy gravel	0-6m
2		Soft rock	6-15m
3.		Semi hard rock	15-35m
4.		Hard rock	35-60m
5.		Wet soil+ boulders	65-75m
6.	-----	Water table	120-140m

BOREHOLE DATA FOR CHATARPUR CONSTITUENCY

Similarly, it has been collected for JANPATH, YAMUNA BANK , BADARPUR , SARITA VIHAR.



PIPELINE INFORMATION

PIPELINE DETAILS-

- a) Pipe geometry (diameter, thickness);
- b) Type of joint;
- c) Stress-strain relationship of pipe material;
- d) Pipeline function and its post seismic performance requirement;
- e) External pipe coating specification;
- f) Operating pressure in the pipe;
- g) Operational and installation temperature

Site Information

- a) Burial depth of the pipeline;
- b) Basic soil properties (unit weight, cohesion, internal friction angle and in situ density).
- c) Properties of backfill soil in the trench;
- d) Depth of water table; [2]

Seismic Hazard Information

- a) Expected amount of seismic ground motion at the site;
- b) Expected amount and pattern of permanent ground deformation and its spatial extent;
- c) Length of pipeline exposed to permanent ground deformation;
- d) Active fault locations; expected magnitude of fault displacement, and orientation of pipeline with respect to direction of fault movement



Site visit for borehole data collection

SOIL-PIPE INTERACTION

The soil-pipe interaction analysis is often carried on with a finite element discretization of the pipe and a non-linear spring-type model to represent the soil response. Lateral force-displacement response of buried pipes can be modelled with the method of the load transfer curves that relates the relative displacement between soil and pipe ($y_s - y$) to the applied load.

According to the load transfer functions, the ground around the pipeline can be modelled, in the most general case, in three space directions with non-linear springs for each direction. Two springs are normal to the pipe axis, while the spring parallel to the pipe axis supplies the force in the longitudinal force. In



general, the problem should be considered in all the space directions, but in most practical applications only a direction normal to the pipe axis can be considered. Thus in this paper only the case where the ground motion is parallel to the slope will be analyzed. No movements will be considered in the direction of the pipeline axis.



Excavation for laying pipes underground in delhi

STRAIN LEVEL OF THE SOIL

The study basically considers three different levels of strain-



- Axial strain due to operation
- Axial strain due to earthquake excitation and
- Strain induced in the pipe line by friction at the soil pipe interface

AXIAL STRAIN GENERATED DUE TO OPERATIONAL MECHANISM:

As per JSCE (2000b), the internal pressure for oil and gas pipeline, can be classified as below. The guidelines prepared by IITK GSDMA also incorporate the same for India.[1]

High pressure $P \leq 10$ kgf/cm²

Medium pressure $3 < P < 10$ kgf/cm²

Low pressure $P \geq 3$ kgf/cm²

The Ramberg-Osgood parameters (n, r) for pipe materials are shown in Table 1 [IITKGSDMA guideline].

The initial stress in the pipeline is developed due to internal pressure and temperature change due to installation and operation. The longitudinal stress (S_p) in the pipe due to internal pressure is calculated as per the guidelines prepared by IITK- GSDMA.

$$S_p = PD\mu/2t \quad \text{equation 1}$$

Where,

P = Max internal operating pressure in pipe

D = Outside diameter of the pipe

μ = Poison's ratio (0.3 for steel)

t = Nominal wall thickness of the pipe

Using Ramberg-Osgood stress-strain relationship, the longitudinal strain in the pipe will be-

$$\epsilon_p = S_p/E[1 + (n/1+r)\{S_p/\rho_y\}^2] \quad \text{equation 2}$$

where,

ϵ_p = Longitudinal strain in pipe

ρ = Stress in the pipe

E = Initial young's modulus



ρ_y = Yield strain of the pipe material

n, r – Ramberg-Osgood parameters

The longitudinal stress in pipe due to temperature change is expressed as

$$S_r = E \alpha t (T_2 - T_1) \quad \text{equation 3}$$

where

E Modulus of elasticity

αt = Linear coefficient of thermal expansion of steel

T_1 = Temp in the pipe at the time of installation

T_2 = Temp in the pipe at the time of operation

The longitudinal strain in the pipe due to temperature change will be

$$\epsilon_t = \frac{S_t}{E} \left[1 + \left\{ \left(\frac{n}{1+r} \right) \left(\frac{S_t}{\rho_y} \right)^2 \right\} \right] \quad \text{equation 4}$$

The total strain in the continuous pipeline due to internal pressure and temperature is

$$\epsilon_{op} = \epsilon_p + \epsilon_t \quad \text{equation 5}$$

The guidelines prepared by IITK-GSDMA have approved the use of above calculated

strain as the operational strain in pipe ignoring the strains due to installation imperfection or initial bending.

AXIAL STRAIN GENERATED DUE TO SEISMIC WAVE PROPAGATION-

The seismic vulnerability assessment of buried pipelines includes calculation of transitory strains caused by differential ground displacement. As per ALA-ASCE 2001 guidelines, the approximate axial strain μ_{aw} induced in a buried pipe due to wave propagation can be calculated as

$$\epsilon_{aw} = \frac{V_g}{a \epsilon C_s} \quad \text{equation 6}$$

where

V_g Design peak ground velocity

$a \epsilon$ = Ground strain coefficient (= 2 as per GSDMA)

C = Velocity of seismic wave propagation (= 2 km/s, assuming shear wave velocity effect is dominating)



The same equation is adopted by IITKGDMA guidelines for seismic design of buried pipelines considering Indian scenario.

AXIAL STRAIN TRANSMITTED BY SOIL FRICTION

The importance of a frictional interface in soil pipe interaction during an earthquake was investigated by Akiyoshi and Fuchida (1984). They showed that in a branch pipe system in soft soils, there is remarkable slippage in main pipe which subsequently increases the stresses in auxiliary pipes. As per ALA-ASCE 2001 guidelines, for a continuous system the axial strain ϵ_{af} induced by friction at the soil pipe interface can be calculated as

$$\epsilon_{af} = T_u \lambda / 4AE \quad \text{equation 7}$$

where

T_u -Peak friction force per unit length at soil pipe interface

λ - Apparent wavelength of seismic waves at ground surface, sometimes assumed to be 1.0 km without further information

A -Pipe cross sectional area

E- Steel modulus of elasticity.

DESIGN CASE STUDY –

YAMUNA BANK AREA (sandy)—WATER PIPELINE

The continuous buried pipeline is designed to carry water at a pressure of 3 MPa. The pipe is of API X-52 grade with 0.6m diameter (D) and 0.0060 m wall thickness (t). The installation temperature and operating temperature of the pipeline are 30 °c and 65 °c respectively. The pipeline is buried at 1.5m of soil cover. Poisson's ratio and coefficient of thermal expansion of the pipe material can be considered as 0.3 and 12×10^{-6} respectively.

For API X-52 Grade pipe:

Yield stress of pipe material = $\sigma_y = 358 \text{ MPa}$ pg-27

Ramberg-Osgood parameters $n = 9$ and $r = 10$

The longitudinal stress induced in the pipe due to internal pressure will be

$$S_p = PD\mu / 2t \quad \text{pg-27}$$



$$=(3000000 * 0.6 * 0.3) / (2 * 0.0064)$$

$$=42.18 \text{ mpa}$$

where

P= Max internal operating pressure in pipe

D =Outside diameter of the pipe

μ = Poison's ratio (0.3 for steel)

t =Nominal wall thickness of the pipe

Using Ramberg-Osgood's stress-strain relationship the longitudinal strain in the pipe will

$$\epsilon_p = S_p / E [1 + (n/1+r) \{ S_p / \rho_y \}^2] \quad \text{pg-27}$$

$$= 42.18 * 10^6 / 2 * 10^{11} [1 + \{ 9/1+10 \} (42.18 * 10^6 / 358 * 10^6)^2]$$

$$= 0.002109\% \text{ (tensile)}$$

Pipe Strain Due to Temperature Change:

The longitudinal stress induced in the pipe due to change in temperature will be

$$S_t = E \alpha (T_2 - T_1) \quad \text{pg-28}$$

$$= 2 * 10^{11} * 12 * 10^{-6} (65-30)$$

$$= 84 \text{ MPa}$$

Using Ramberg-Osgood's stress-strain relationship the longitudinal strain in the pipe will

$$\epsilon_t = S_t / E [1 + \{ (n / (1 + r)) (\frac{S_t}{\rho_y})^r \}]$$

$$= 84 * 10^6 / 2 * 10^{11} [1 + (9/1+10) \{ 84 * 10^6 / 358 * 10^6 \}^{10}]$$

$$= 0.00042 = 0.042\% \text{ (tensile)}$$

The total strain in the continuous pipeline due to internal pressure and temperature is

$$= 0.002109 + 0.042$$

$$= 0.04419\%$$



Ignoring the strain in pipe due to installation imperfection or initial bending, the above calculated strain can be considered as the operational strain in pipe.

Seismic Wave Propagation

The expected peak ground acceleration of the site at base rock layer = $PGAr = 0.45g$

For this soil Peak ground acceleration (PGA) at ground = $0.45g \times Ig$

$$= 0.45g \times 0.9$$

pg- 22

$$= 0.405g$$

Converting the soil as soft and the magnitude of design basis earthquake (M) is equal to 6.5, and distance of site from earthquake source is about 20km

$$PGA/PGV=66$$

$$PGV = 0.405 \times 66 = 26.73 \text{ cm/s}$$

pg-24

Design peak ground velocity

$$Vg = PGV \times Ip$$

$$= 26.73 \times 1.5$$

$$= 40.095 \text{ cm/sec}$$

$$= 0.40095 \text{ m/s}$$

Maximum axial strain in the pipe due to wave velocity can be calculated as

$$\epsilon a = Vg/a \in C$$

pg-57

$$= 0.4009/2 \times 2000$$

$$= .000100$$

Maximum axial strain that can be transmitted by soil friction can be calculated as

$$\epsilon a = \frac{tu\lambda}{4AE}$$

pg-57

tu = maximum axial soil force per unit length of pipe for soil condition. (annx-b)

The maximum axial soil resistance (tu) per unit length of pipe can be calculated as

$$t = \pi Dc\alpha + \pi DH\gamma(1+K0/2)\tan\delta'$$



Where D = diameter of pipe = 0.6m

C = Coefficient of cohesion = 0kpa

H = soil cover above the centre of the pipeline = 1.5m

$F\phi$ = Interface angle of friction between soil and pipe δ_1

Here f = friction factor = 0.7 for smooth steel pipe

$$\delta_1 = F\phi = 0.7 \times 32^\circ = 22.4^\circ$$

K_0 = coefficient of soil pressure at rest

$$= 1 - \sin 32^\circ = 0.47$$

The first part of equation becomes 0.

$$t_u = 22/7 \times 0.6 \times 1.5 \times 18000 [(1+0.47)/2 \tan 22.4^\circ]$$

$$t_u = 15.410 \text{ kn/m}$$

$$\epsilon_a = \frac{t_u \lambda}{4AE}$$

$$= [15410 \times 1000 / 4 \times 3.14 \times 0.3 \times 0.3 \times 2 \times 10^{11}]$$

$$= 0.0000681$$

The calculated axial strain due to wave passage need not be larger than the strain transmitted by soil friction.

The operational strain in the pipeline = $\epsilon_{oper} = 0.0013$

The total strain in pipe in tension

$$= 0.0000681 + 0.0013 = 0.0013681$$

The allowable strain in pipe in tension is 3% = 0.03

The maximum strain in pipe due to wave propagation pipe is less than the allowable strain.



DISCUSSIONS

Pipelines for the transportation of liquid fuel, gas, oil, etc. sometimes cross unstable slopes, where earthquake-induced slope movements can easily take place.[1] These movements can induce strains and stress in the pipe which can compromise the integrity and the safety of the structure. The aim of the pipe stress prediction is to assess the failure risk and eventually to plan monitoring. The evaluation of seismic response of buried pipelines will depend on various factors, such as the direction of the ground movement, the entity of the earthquake-induced slope motion, the dimension and the stiffness of the pipe.[2] After that a detailed study for soil-pipeline interaction is done and keeping in mind the finite element modelling of the soil-pipeline system, the effects of soil pipeline is discussed and non-linearities in pipeline soil system and dynamics of soil-structure interaction is also dealt. Then, study for the various strain levels is done and the design of the API X-60, X-70, X-52 is calculated for all the three types of strain with respect to the data collected from the site. and accordingly best type of pipe for some specific areas is designed.

CONCLUSION

It can be concluded that the pipelines act as basic transportation medium for various liquids and gases such as water, oil, natural gas, diesel etc. So, there is a need to make the transportation of these substances easy so that it doesn't effect the demand. But in this mean time we sometimes completely ignore the features of the soil under which the pipeline passes and reaches the final point. Such was the case during the Gujrat earthquake, as no precautions were taken during the placement of continuous pipeline in the buried soil and when the earthquake struck it resulted in severe loss to life and property due to bursting of pipes.

In this paper the study of continuous buried pipeline is studied for the city of delhi. Initially the borehole data were collected from various locations. After that a detailed study for soil-pipeline interaction is done and keeping in mind the finite element modelling of the soil-pipeline system, the effects of soil pipeline is discussed and non-linearities in pipeline soil system and dynamics of soil-structure interaction is also dealt. Then, study for the various strain levels is done and the design of the API X-60, X-70, X-52 is calculated for all the three types of strain with respect to the data collected from the site. and accordingly best type of pipe for some specific areas is designed.

REFERENCES:

- [1]. [Mukherjee P] Page 1- 14 Case study of buried continuous pipeline for dehradun
- [2]. Shen C.K., 1992. SUMDES: A nonlinear procedure for response analysis of horizontally-layered sites subjected to multi-directional earthquake loading, University of California, Davis
- [3] O'Rourke, T.D. (1998). An Overview of Geotechnical and Lifeline Earthquake Engineering. Geotechnical Special Publication No. 75, ASCE, Reston, VA. Proceedings of Geotechnical Earthquake Engineering and Soil Dynamics Conference. Seattle, WA, Vol. 2, 1392-1426.
- [4] Bolton, M.D. 1986. The strength and dilatancy of sands. Géotechnique, 36(1): 65-78.
- [5] IITK-GSDMA guidelines for seismic design of buried pipelines



ICT AND ITS ROLE IN E-BUSINESS

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ABSTRACT

Information and Communication Technology play an important part with respect to the Business. Due to the effect of the ICT the Business has been reached to the limits with respect to the consumer. The E-Business grow day by day and the daily sales of the companies are expected to rise quarter per quarter by applying the new technology aspects. The main aim of this paper is to define the role of the ICT and E-Business in the current scenario keeping in mind all the security threats with respect to the technology.

Keywords: ICT, E-Commerce, SEM and SERP.

INTRODUCTION:

1. E-Business: A Review from Indian Context From a buzzword to a current-day reality, e-commerce in India has been experiencing remarkable growth, successfully changing the way people transact. People today can shop literally everywhere within minutes, be it their workstations or homes, and most importantly, at any time of the day at their leisure. However, industry experts believe this is just the start of the e-commerce wave in India. The growing penetration of technology facilitators such as Internet connections, broadband and third generation (3G) services, laptops, smart phones, tablets and dongles, coupled with increasing acceptance of the idea of virtual shopping, is set to drive the e-commerce ecosystem. The e-commerce story in India would surely witness a new world of digitalisation in the coming decade, with a host of start-ups emerging to compete with existing players in order to draw benefits from the new and existing markets.

We all know when it comes to improve the quality of any service the technology plays a vital role. Internet Technology can be addressed as third revolution after agricultural and industrial revolution, particularly in Indian context. E-commerce is the end result of Information technology, on one side it facilitates the organizations for reaching and interacting with customers like online advertising and marketing, online order taking and online customer service etc, other hand it also reduce cost in managing orders and interacting with a wide range of suppliers and trading partners, areas that typically add significant overheads to the cost of products and services. Every organization is now a days using the Internet for commercial activities. Global access of the Internet has made it an extremely effective mode of communication between businesses and customers. Electronic commerce, commonly known as e-commerce



or e-Commerce, consists of the buying and selling of products or services over electronic system such as internet and other computer network. Digital marketing is a well received tool by all the business organization, In this they use various tools like SEO (search Engine optimization), SEM (Search engine marketing). SEO is tool through which companies display their advertisement on a higher rank than competitors. SEO is basically focused with the improvement of rank whenever anyone try to search anything related with the company or company product. SEM is a form of web advertising that companies use to promote their products and services on search engine results pages (SERPs). SEM is focused on the effective use of search engine advertisements (a.k.a., sponsored results, sponsored links) that appear on the SERP. SEM which allows firms to target consumers by placing ads on search engines has proven to be an effective audience acquisition strategy. Unlike traditional online advertising, advertisers pay only when users actually click on an ad when successfully implemented, SEM can generate steady traffic levels and tremendous return on investment (ROI).

Any organization that is advertising online may have two main objectives: to enhance its brand equity in terms of enhanced brand awareness and brand prefer ability and getting a direct response from existing as well as targeted customers. Organization that offers products and services through the e-commerce can achieve above both objectives easily because their prospective customers are already online. Because of these advantages even off-line organizations are also entering in the same field in order to increase exposure and promote brand. SEM allows companies to closely track their ROI from an audience acquisition standpoint. SEM delivers ads to users who are already searching for the products or services that an advertiser is offering, meaning that theoretically, they are only receiving qualified traffic. Unlike traditional banner ads, advertisers are charged based on the number of clicks they receive, not on the number of impressions (number of times an ad appears). Furthermore, many marketing campaigns place a great deal of importance on branding. PPC ads can be very effective in terms of driving home a brand name because they appear alongside search results for thousands of different search terms. SEM is a form of Internet marketing that involves the promotion of websites by increasing their visibility in SERP through optimization (both on-page and off-page) as well as through advertising (paid placements, contextual advertising, and paid inclusions)

Categories of e-commerce:

B2B: Companies doing business with each other such as manufacturers selling to distributors and wholesalers selling to retailers. Pricing is based on quantity of order and is often negotiable.

B2C: Businesses selling to the general public typically through catalogues utilizing shopping cart software. By dollar volume, B2B takes the prize, however B2C is really what the average Joe has in mind with regards to e-commerce as a whole. For example indiatimes.com.

C2C: There are many sites offering free classifieds, auctions, and forums where individuals can buy and sell thanks to online payment systems like PayPal where people can send and receive money online with



ease. EBay's auction service is a great example of where customer-to customer transactions take place every day.

Pros of E-Business:

Organizations are investing more into e-commerce today because – It can effectively reach the target customer. Faster and less expensive to conduct direct marketing campaigns. Measurable, which means that successes are identifiable and repeatable. Open 24-hours a day. Cost-effective, in the long run.

Cons of E-Business:

There is no actual face-to-face contact involved in the Internet communication. For the types of products that rely heavily on building personal relationship between buyers and sellers such as the selling of life insurance, and the type of products that requires physical examination, Internet marketing maybe less appropriate. While internet marketing cannot allow prospective buyers to touch, or smell or taste or 'try on' the products, However a survey of consumers of cosmetics products shows that email marketing can be used to interest a consumer to visit a store to try a product or to speak with sales

Some of the other disadvantages of e-commerce are dependability on technology, Security, privacy issues, Maintenance costs due to a constantly evolving environment, higher transparency of pricing and increased price competition, and worldwide competition through globalization.

The Different Security threats with for E-Business:-

The electronic system supports e-commerce, is susceptible to abuse & failure in many ways Frauds, Thefts, Disruption of services, Illegal intrusion in customer data. One Major issue is Identity Theft few basic guidelines for the users to protect them from the identity thefts are-

- Protect your identification No/SSN No/License No by supplying it whenever it is necessary
- Check your credit report at least once in a year.
- Be careful whom you talk to on telephone.
- Use strong passwords.
- Remove your mails from your mailbox promptly.

The Security aspects for E-Business:- The different basic steps involve in designing the security system, are Accessing the security needs of the firm,adopt a security policy that makes sense,consideration of web-security needs,Designing the security environment,Authorize and monitor the security system,Confidentiality- this is done by encryption,Authentication of users,Integrity of Information,Firewalls.

Conclusion:

In the near future, India will have almost 100 million Internet users which will equal to the count of the many of the developed countries.The economy of Internet will then become more meaningful in India. With the rapid expansion of internet, E-Business, is set to play a very important role in the coming century,



the new opportunities that will be thrown open, will be accessible to both large corporations and small growing companies as the Indian Government is also playing a vital role in the growth of the online mode of activities to make the system more transparent. The potential huge and wit and energy of the entrepreneurs in the sector are impressive. Few extra efforts are required on the name of cyber security, then every organization, and every buyer would be there on online platform.

References:

- 1) D. Agrawal, R. P. Agrawal, J. B. Singh and S. P. Tripathi, "E-commerce: True Indian Picture", *Journal of Advances in IT*, vol. 3, no. 4, (2012), pp. 250-257.
- 2) R. Rastogi, "Country Report on E-Commerce (India, Ministry of Communications and Information Technology)", Department of Information Technology, Office of the Controller of Certifying Authorities), pp. 133-146.
- 3) J. G. T. Waghmare, "E-commerce; A Business Review and Future Prospects in Indian Business", *Internet Marketing in India: Indian Streams Research Journal*, vol. 2, no. IV, (2012), pp. 1-4.
- 4) SEMPO Research, "The State of Search Engine Marketing 2008 Survey of Advertisers and Agencies Search Engine Marketing Professional Organization", SEMPO, February, Search Engine Marketing Professional Organization, (2009). *International Journal of u- and e- Service, Science and Technology* Vol.6, No.6 (2013) 194 Copyright © 2013
- 5) H.-T. Chang and S. Wu, "A Switching Proxy for Web Search Engines. *Advanced in Information Sciences and Service Sciences*", Advanced Institute of Convergence Information Technology, vol. 3, no. 5, (2011), pp. 52.



SEISMIC ANALYSIS OF A RCC FRAME WITH FLOATING COLUMN

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ABSTRACT

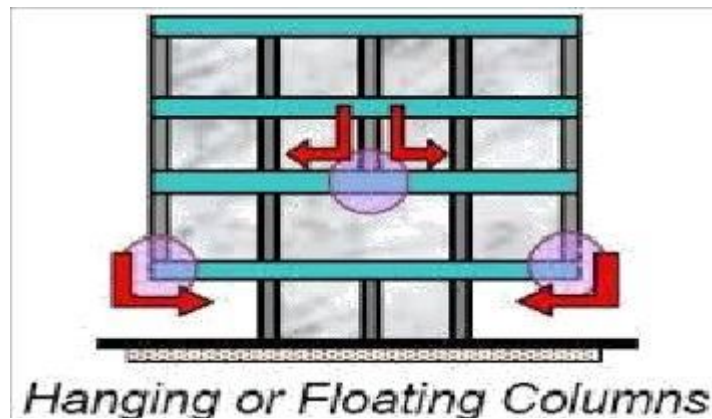
In present scenario buildings with floating column is atypical feature in the modern multi-storey construction in urban India. Such features are highly undesirable in building built in seismically active areas. This study highlights the importance of explicitly recognizing the presence of the floating column in the analysis of building. Alternate measures, involving providing inclined girder, are proposed to reduce the irregularity induced by the floating column.

Keywords: Floating Column, STADD PRO, Seismic Analysis,

Introduction:

1. STADD Pro Computer program is used for static analysis of 2D multi-storey frame with and without floating column to study the response of the structure under static load and SAP 2000 software is used for Dynamic analysis of the 2-D multi-storey frame with and without floating column to study the response of the structure under dynamic load. The floor displacements, floor acceleration, deflection, inter storey drift and base shear are computed and compared for both the frames with and without floating column and with inclined girder. The floor displacements, floor acceleration, deflection, inter storey drift and base shear are computed for different sizes of columns and girders for frames with floating column.

1.1 Many urban multi-storey building in India today have open first storey as an unavoidable feature. This is primarily being adopted to accommodate parking or reception lobbies in the first storey. Whereas the total seismic base shear as experienced by a building during an earthquake is dependent on its natural period, the seismic force distribution is dependent on the distribution of stiffness and mass along the height.



Frame with Floating Column

Fig:-1

The behaviour of a building during an earthquake depends critically on its overall shape, size and geometry, in addition to how the earthquake forces are carried to the ground. The earthquake forces are developed at different floor levels in a building need to be brought down along the height to ground by shortest path; any deviation and discontinuity in this load transfer path results in poor performance of the building. Building with vertical setbacks (like the hotel buildings with a few storey's wider than the rest) causes the sudden jump in earthquake forces at the level of discontinuity. Building that has fewer columns or walls in particular storey or with unusually tall storey tends to damage or collapse which is initiated in that storey. Many buildings with an open ground storey intended for parking collapsed or were severely damaged in Gujarat during the 2001 Bhuj earthquake. Building with columns that hangs or float on beams at an intermediate storey and do not go all the way to the foundation, have discontinuities in total load transfer path.

2. Objective of the Work:

The objective of the present work is to study the behaviour of multi-storey building with floating columns under earthquake. STADD Pro. Computer program is used for 2D multi- storey frame with and without floating column to study the response of the structure under earthquake. The floor displacement, inter storey drift, base shear, overturning moment are computed and compared for both the frames with and without floating column. The floor displacement, inter storey drift, base shear, overturning moment are computed for different sizes of ground floor columns for frames with floating column.

The importance and explicitly recognizing the presence of the Floating Column in the analysis of building. Measures involving stiffness balance of the first storey and the storey above are proposed to reduce the



irregularity introduced by the Floating Columns. Author carried out analysis for 2D multi storey frames with and without floating column to study the responses of the structure under different earthquake excitation having different frequency content keeping the PGA and time duration factor constant.

2.1 Effect of floating Columns on Frame:

The behavior of building frame with and without floating column is studied under static load, free vibration and forced vibration condition. The results are plotted for both the frames with and without floating column by comparing each other time history of floor displacement, base shear.

In urban areas, multi storey buildings are constructed by providing floating columns at the ground floor for the various purposes which are stated above. These floating column buildings are designed for gravity loads and safe under gravity loads but these buildings are not designed for earthquake loads. So these buildings are unsafe in seismic prone areas. The authors aim to create awareness about these issues in earthquake resistant design of multi-storeyed buildings.

3. Conclusion:

The static analysis of frames with and without floating column shows that the floating column increases its deflection and inters story drift than frame with usual column. The static analysis results also shows that the rectangular column is better than square column as it has less deflection and inter story drift. The dynamic analysis shows that the displacement, acceleration and base shear is increased in frame with floating column than in frames with usual column.

References:

1. Sabari S, Mr.Praveen J.V, "Seismic Analysis of Multistorey Building with Floating Column". International Journal of Civil and Structural Engineering Research ISSN 2348-7607 (Online) Vol. 2, Issue 2, pp: (12-23), Month: October 2014 - March 2015.
2. T.RajaSekhar et al, Carib.j.SciTech, (2014). "Study Of Behaviour Of Seismic Analysis Of Multi Storied Building With And Without Floating Column".
3. SreekanthGandlaNanabala, Pradeep Kumar Ramancharla and Arunakanthi E(2014). "Seismic Analysis of A Normal Building and Floating Column Building".
4. International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol. 3 Issue 9, September- 2014.



5. Kavya N, Dr.K.Manjunatha and Sachin.P.Dyavappanavar (2015). “Seismic evaluation of multistoreyrc building with and without floating column”.International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 02 Issue: 06| Sep-2015.
6. Srikanth.M.K and Yogeendra.R.Holebagilu (2014). “Seismic response of complex buildings with floating column for zone ii and zone v”. International journal of Engineering Research Vol.2., Issue.4, 2014.
7. SunilkumarKalyani and Vishwanath B Patil (2015). “Seismic Analysis of Multistorey Building with Underneath Satellite Bus-Stop having Floating Columns with Top Soft Storey”. IJSTE - International Journal of Science Technology & Engineering | Volume 2 | Issue 01 | July 2015 ISSN (online): 2349-784X.
8. A.P. Mundada and S.G. Sawdatkar (2014). “Comparative Seismic Analysis of Multistorey Building with and without Floating Column”. International Journal of Current Engineering and Technology E-ISSN 2277 – 4106, P-ISSN 2347 – 5161.
9. BadgireUdhav S., Shaikh A.N. and Maske Ravi G. (2015). “Analysis of Multistorey Building with Floating Column”. International Journal of Engineering Research ISSN:2319-6890)(online),2347-5013(print) Volume No.4, Issue No.9, pp : 475-478.



MULTI OBJECTIVE ECONOMIC EMISSION DISPATCH USING MODIFIED MULTI OBJECTIVE PARTICLE SWARM OPTIMIZATION

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ABSTRACT

Out of the major challenges at present, the major-one issue is to address the global environmental change. The increasing concern over the environmental conditions has forced us to optimize the thermal power generation not only in terms of cost but also in terms of emissions. This paper focuses on multi objective economic emission dispatch (MOEED) which is a conflicting objective function problem for minimizing both cost and emissions and the implementation of dynamic search space squeezing strategy based MOPSO to solve MOEED optimization problem.

1 Introduction

The use of fossil fuels, primarily coal on large scale for electricity generation, has been the main cause of environmental pollution due to emissions of different type of gases such as oxides of nitrogen, sulphur and carbon into the atmosphere. As energy consumption has to climb in future, an efficient power generation has become a vital component of reliable and eco friendly energy systems. This has forced the thermal power plants to modify their design and operational strategies to reduce pollution and environmental emissions [1]. Multi objective economic emission dispatch (MOEED) is an upcoming approach to minimize both the emissions and the fuel cost. At present this method has received more attention [2] as it requires only small modification of the basic economic dispatch to include emissions. Several techniques have been suggested to handle the MOEED problem [2]. Generally there are three major approaches to solve MOEED problem. The first approach treats emissions as a constraint with a permissible limit [2]. The second approach treats emissions as another objective in addition to usual cost objective [3]. Third approach handles both fuel cost and emissions simultaneously as competing objectives. Several literature reviews have been prepared in the area of minimizing pollution level but still a lot of progress is to be made in the area of MOEED. Gent and Lamton [5] have discussed minimum-emission dispatch problem wherein a computer program has been developed for online steam unit dispatch resulting in minimization of NO_x emission employing the newton-raphson convergence for curve fitting. Sullivan [6] suggested only the minimum pollution dispatch by applying Kun-Tuker condition. Zahavi and Eisenberg [7] proposed an interactive search method based on golden section search technique to solve the MOEED problem. Nanda *et al.* [8] came up with computational approach by using an improved complex box method to find



minimum emission dispatch problem. Heslin and Hobbs [9] have suggested a model for calculating the cost and employment impacts of effluent dispatching and fuel switching as means for reducing emissions from power plants. Palanichamy and Srikrishna [10] stated an algorithm for successful operation of the system to economical and environmental constraints. A price penalty factor has been defined which has blended the emission cost with the normal fuel cost. The quadratic form of objective function has been used because these functions give the optimal result directly. Nanda *et al.* [11] solved the conflicting MOEED problem by using linear goal programming technique as well as non linear goal programming technique. El-Keib *et al.* [12] proposed a general formulation of the environmentally constrained economic dispatch problem, using a lagrangian-relaxation-based solution algorithm, which can easily be accommodated in different environmental constraints without major modification. Fan *et al.* [13] presented a solution based on quadratic programming techniques to solve the real-time economic dispatch problems involving emission constraints. Huang *et al.* [14] came up with a combined abdicative reasoning network and a technique for order preference by similarity to ideal solution decision approach to solve the MOEED problem and give the best compromise solution. Singh and Dhillon [15] converted the MOEED problem into a scalar problem. This scalar set optimization problem was then solved using different weight pattern to generate non-dominated solutions between the conflicting objectives. Osman, *et al.* [16] presented an epsilon (ϵ)-dominance based multi objective genetic algorithm for MOEED optimization problem. The algorithm maintains a finite-sized archive of non-dominated solution which gets iteratively updated, by using the concept of Epsilon (ϵ) dominance.

Abido [17] presented an MOPSO algorithm to solve MOEED problem. Wang and Singh [18] worked on MOEED problem by using a modified MOPSO algorithm for searching out a set of Pareto-optimal solutions. Airashidi and El-Hawary [19] implemented a PSO technique for solving MOEED. Abido [20] used SPEA based approach to handle MOEED. Jeyakumar, *et al.* [21] described a multi-objective evolutionary programming method to solve the MOEED problem by converting it into single objective optimization problem using weighted sum method. Bhattacharya *et al.* [22] implemented the hybrid differential evolution DE/biogeography-based optimization (BBO) method to solve MOEED problem of thermal generators of power systems. Hota *et al.* [23] used a modified bacterial foraging algorithm to solve MOEED problem. A fuzzy based mechanism is used to extract the best compromise solution over the trade-off curve. The bacterial foraging algorithm appears to be a robust and reliable optimization algorithm as compared to other methods. Guvenc *et al.* [24] formulated gravitational search algorithm as a bi-objective optimization problem to find the optimal solution for MOEED problems. This technique provided a high-quality solution for MOEED problems.

In recent years, several researches have been made on the development of multi objective evolutionary search strategies. Strength Pareto evolutionary algorithm (SPEA), non dominating sorting genetic algorithm II (NSGA II), multi objective evolutionary algorithm (MOEA), multi objective particle swarm optimization, etc., represent the revolutionary multi objective approaches which have been applied to solve the MOEED problem.

In the past few years, multi objective evolutionary algorithm for MOEED problem solution based on the advance version particle swarm optimization (PSO) algorithm, which is called multi-objective PSO (MOPSO) method, has been implemented. Changing conventional single objective PSO to a MOPSO requires redefinition of global and local best individuals to find out a front of optimal solutions. In



MOPSO, there is not a single global best, but rather a set of global best. In addition, there may be no single local best entity for each particle of the swarm. The main aim of MOPSO is to reach closer to the set of Pareto-optimal solutions and to get a set of diversified solutions. The reason for success of extending PSO to MOPSO arises because there implementation is simple and it require less parameter tuning.

The intent of this research work is to solve MOEED problem by modified MOPSO method. The MOEED problem is formulated as a nonlinear constraints multi objective optimization problem. The rest of this paper is organized in 9 sections. Section 2 indicates different notations as applicable in this paper. The problem formulation of the MOEED is introduced in Section 3. Section 4 elaborates the principle of multi objective optimization. Section 5 represents the modified MOPSO algorithm .Section 6 elaborates an implementation of modified MOPSO for MOEED problem. Section 7 illustrates optimum results for two test system by using modified MOPSO method. Finally, conclusions are mentioned in sections 8.

2 Notation

N_g	The number of generators
a_j, b_j and c_j	Cost coefficients of the j^{th} generator
d_j and e_j	Fuel cost coefficients of unit j with valve-point effect
P_G	Vector of real power outputs of generators
$\alpha_j, \beta_j, \gamma_j, \zeta_j$ and λ_j	Coefficients of the j^{th} generator emission characteristics
$P_{G_j}^{min}$	Minimum power generated
$P_{G_j}^{max}$	Maximum power generated
P_D	Total load demand
P_{loss}	Transmission losses
V_j^{max}	Maximum velocity in the j^{th} dimension
V_j^{min}	Minimum velocity in the j^{th} dimension

3 Problem formulation

3.1 Objectives

i. Fuel cost

The classical economic dispatch problem of finding the optimal combination of power generation, which minimizes the total fuel cost while satisfying the total required demand can be mathematically stated as follows [26]:

the total fuel cost $F(P_G)$ can be expressed as:



$$F(P_G) = \sum_{j=1}^{Ng} a_j + b_j P_{G_j} + c_j P_{G_j}^2 + \left| d_j \sin \left(e_j \left(P_{G_j}^{min} - P_{G_j} \right) \right) \right| \quad (1)$$

ii. Emission

The minimum emission dispatch optimizes the classical economic dispatch including emission objective, which can be modeled using second order polynomial functions. The environmental pollutants such as SO_x and nitrogen oxides NO_x caused by fossil-fueled thermal units can be modeled separately. However, for comparison purposes, the total emission $E(P_G)$ of these pollutants can be expressed as [27], [28] :

$$E(P_G) = \sum_{j=1}^{Ng} \left(\alpha_j + \beta_j P_{G_j} + \gamma_j P_{G_j}^2 \right) + \zeta_j \exp \left(\lambda_j P_{G_j} \right) \quad (2)$$

3.2 Problem constraints

The optimization problem is bounded by the following constraints:

i. Maximum and minimum limits of power generation

The power generated, P_{G_j} , by each generator is constrained between its minimum and maximum limits, i.e.

$$P_{G_j}^{min} \leq P_{G_j} \leq P_{G_j}^{max} : (j = 1, \dots, Ng) \quad (3)$$

ii. Equality constraints

Equality constraints in which the total system generation should meet the load demand and system losses as stated below:

$$\sum_{j=1}^{Ng} P_{G_j} - P_D - P_{loss} = 0 \quad (4)$$

the power loss in transmission lines can be calculated by B-coefficients, is defined as [28]:

$$P_{loss} = B_{00} + \sum_{j=1}^{Ng} B_{j0} P_{G_j} + \sum_{j=1}^{Ng} \sum_{i=1}^{Ng} P_{G_j} B_{ij} P_{G_i} \quad (5)$$

3.3 Multi-objective EED problem formulation

The MOEED optimization problem [26] is therefore formulated by aggregating the objectives and constraints, the problem can be mathematically formulated as a nonlinear constrained multi objective optimization problem as follows.



Minimize $[F(P_G), E(P_G)]$

(6)

Subject to:

$$P_{G_j}^{min} \leq P_{G_j} \leq P_{G_j}^{max} \quad (j = 1, 2, \dots, Ng)$$

(7)

$$\sum_{j=1}^{Ng} P_{G_j} - P_D - P_{loss} = 0$$

(8)

4 Principle of Multi-Objective Optimization

Multi-objective optimization problem consists of a number of conflicting objectives to be optimized simultaneously and is associated with a number of equality and inequality constraints. It can be formulated as follows: [29]

$$\text{Minimize} \quad F_i(x) \quad (i = 1, 2, \dots, N)$$

(9)

$$\text{Subject to:} \quad G_j(x) \quad (j = 1, 2, \dots, M)$$

(10)

$$H_k(x) \quad (k = 1, 2, \dots, P)$$

where F_i is the i^{th} objective functions, x is a decision vector that represents a solution, N is the number of objectives and M, P is a number of equality and inequality constraints respectively. To compare candidate solutions to the multi-objective optimization problems, the concepts of Pareto optimality are commonly used. These concepts were generalized by Vilfredo Pareto [30]. Formally, a decision vector $\vec{x} = [\vec{x}_1, \vec{x}_2, \vec{x}_3 \dots, \vec{x}_p]$ is said to Pareto-optimal or Pareto dominate the decision vector $[\vec{y} = \vec{y}_1, \vec{y}_2, \vec{y}_3 \dots, \vec{y}_p]$ in a minimization context, if and only if:

$$1. \quad \forall i \in \{1, 2, \dots, K\}: \quad F_i(\vec{x}) \leq F_i(\vec{y})$$

(11)

$$2. \quad \exists j \in \{1, 2, \dots, K\}: \quad F_j(\vec{x}) < F_j(\vec{y})$$

(12)

where K is a number of objective functions.



5 Modified multi-objective particle swarm optimization

Modified Multi objective particle swarm optimization is an evolutionary search method based on the social behavior of a flock of birds, a fish school, etc. Suppose there are L particles so at the start of optimization, for all L particles, positions and velocities are initialized randomly. The velocity of a particle gets constantly modified using local best (own previous best) position ($P_{i,j}^*$) and global best (adjoining particle's) position ($P_{i,j}^{**}$). The velocity and position of i^{th} particle in the j^{th} dimension is calculated by using the following equation [28]:

$$v_{i,j}(t) = w \times v_{i,j}(t-1) + c_1 r_1 (P_{i,j}^*(t-1) - P_{i,j}(t-1)) + c_2 r_2 (P_{i,j}^{**}(t-1) - P_{i,j}(t-1)) \quad (13)$$

$$P_{i,j}(t) = v_{i,j}(t) + P_{i,j}(t-1) \quad (14)$$

where $v_{i,j}(t)$ is velocity of i^{th} particle for the j^{th} dimension at t^{th} iteration, $v_{i,j}(t-1)$ is velocity of i^{th} particle for the j^{th} dimension at $(t-1)^{th}$ iteration, $P_{i,j}(t)$ is the position of i^{th} particle for the j^{th} dimension at t^{th} iteration, $P_{i,j}(t-1)$ is the position of i^{th} particle for the j^{th} dimension at $(t-1)^{th}$ iteration, c_1, c_2 are learning constants, r_1, r_2 are random numbers and w is inertia weight. Multi objective MOPSO maintains a specific size of an external archive. In the beginning it is empty and can store a maximum number of non-dominated solutions of the population. These non dominated solutions are updated after every iteration. In case the number of non-dominated solutions exceeds the maximum size of the archive, in any generation then clustering technique is used to find out the pre-specified archive size [4]. In each iteration 't', every particle is assigned two guides i.e. local best and global best from its local best archive and global best archive. To improve the performance of the solution, speed of convergence and finding the highly optimal solution, dynamic search space squeezing strategy is activated to modify the MOPSO. The computational processes of modified MOPSO technique can be described in the following steps: [29], [33]:

Step 1 (Initialization): Set the iteration counter $t=0$ and initialize L particles randomly, $\{P_i(0), i = 1, 2, \dots, L\}$, where $P_i(0) = [P_{i,1}(0), P_{i,2}(0), \dots, P_{i,Ng}(0)]$. Initially generated elements, $P_{i,j}$ will be within the limits $[P_j^{min}, P_j^{max}]$ where $(j= 1, 2, \dots, Ng)$. Similarly, generate initial velocities of all particles randomly, $\{V_i(0)\}$, where $V_i(0) = [v_{i,1}(0), \dots, v_{i,Ng}(0)]$. Initial generated velocity, $v_{i,j}(0)$ will be within the limits $[V_j^{min}, V_j^{max}]$. The maximum and minimum value of velocity can be calculated as:

$$V_j^{max} = .001 * P_j^{max} \quad (15)$$

$$V_j^{min} = - .001 * P_j^{max} \quad (16)$$



Step 2 (Evaluate Objective function): Each particle in the initial population is evaluated using the objective functions.

Step 3 (Initialization of Local best and Global best): For each particle, set $S_i^*(0) = \{P_i(0)\}$ and the local best $P_i^*(0) = P_i(0)$. Where $S_i^*(0)$ is a non-dominated local set and $P_i^*(0)$ is local best. Search for the non dominated solutions and form the global set $S^{**}(0)$. Set the external set equal to $S^{**}(0)$ and find the global best.

Step 4 (Update Iteration, inertia weight): Update the iteration counter $t = t + 1$ and inertia weight.

Step 5 (Update Velocity and position): Using the local best $P_i^*(t)$ and the global best $P_i^{**}(t)$ of each particle, the velocity is updated according to equation (13). Based on the updated velocities, each particle position is updated by using equation (14). If velocity and position limits violates, make it lie within the limits.

Step 6 (Evaluate Objective function): Evaluate the objective functions as discussed in step 2.

Step 7 (Non- dominated local set expanding and updating): The updated position of the i^{th} particle is added to non-dominated local set ($S_i^*(t)$). The dominated solutions in $S_i^*(t)$ will be shortened and the set will be updated accordingly. If the size of $S_i^*(t)$ exceeds a pre specified value, clustering algorithm will be invoked to reduce the size to its maximum limit [31].

Step 8 (Non dominated global set expanding and updating): The union of all non dominated local set is formed and the non dominated solutions out of this union are members in the non dominated global set ($S^{**}(t)$). The specified size of the set can be find out by applying clustering algorithm.

Step 9 (Update External archive): The external Pareto-optimal archive is updated as follows. Copy the members of $S^{**}(t)$ to the external archive (A_t). Find out non dominated solutions from ' A_t ' and eliminate all dominated solutions. If the number of non dominated solution exceeds pre-specified size of archive, apply clustering algorithm to regain the specific size.

Step 10 (Local best and global best updating): Find the local best and global best for each particle.



Step 11 (Apply dynamic search space squeezing strategy): In case there are no considerable improvements in the performance of solutions achieved, the dynamic search-space squeezing approach is applied. It improves the speed of convergence and provides the highly optimal solution. In this case, the search space is dynamically readjusted (i.e. squeezed) based on the relative distance between global best (G_{best}) and lower and upper limits of particle (i.e. active power) of i^{th} thermal plant a j^{th} interval denoted by ΔV_{lij} , ΔV_{hij} respectively, which are represented at t^{th} iteration as follows:

$$\Delta V_{lij}^t = \frac{G_{best}^t - P_{ij}^{min}}{P_{ij}^{max} - P_{ij}^{min}} \quad (17)$$

$$\Delta V_{hij}^t = \frac{P_{ij}^{max} - G_{best}^t}{P_{ij}^{max} - P_{ij}^{min}} \quad (18)$$

$$\Delta V_{lij} + \Delta V_{hij} = 1 \quad \text{where } (i=1, 2, \dots, L) \quad (19)$$

$$(j=1, 2, \dots, Ng)$$

The limits of particle (i.e. active power) at $t+1$ iteration can be updated as:

$$P_{ij}^{min,t+1} = P_{ij}^{min} + (G_{best}^t - P_{ij}^{min}) \times \Delta V_{lij}^t \quad (20)$$

$$P_{ij}^{max,t+1} = P_{ij}^{max} + (P_{ij}^{max} - G_{best}^t) \times \Delta V_{hij}^t \quad (21)$$

Step 12(Stopping criteria): If the number of iterations exceeds maximum then stop, else go to step 4.

Step 13(Find best compromise solution): Once the Pareto-optimal set of non dominated solution is prepared, the Fuzzy based approach is applied to find the best compromise solution. Due to imprecise nature of the decision maker's judgment, each objective function of the i^{th} solution is represented by a membership function μ_i defined as [29].



$$\mu_i = \begin{cases} 1 & F_i \leq F_i^{min} \\ \frac{F_i^{max} - F_i}{F_i^{max} - F_i^{min}} & F_i^{min} \leq F_i \leq F_i^{max} \\ 0 & F_i \geq F_i^{max} \end{cases} \quad (22)$$

for each non dominated solution k , the normalized membership function μ_k is calculated as:

$$\mu_k = \frac{\sum_{i=1}^{Nd} \mu_i^k}{\sum_{k=1}^K \sum_{i=1}^{Nd} \mu_i^k} \quad (i = 1, 2, \dots, Nd), (k = 1, 2, \dots, K) \quad (23)$$

where Nd is the number of objective functions. K is the number of non dominated solutions. The best compromise solution is the one having the maximum of μ_k .

6 Implementation of modified MOPSO for MOEED problem

In this section, an algorithm based on Modified MOPSO for solving MOEED problem is described below:

6.1. Initialization:

The decision variables for the MOEED problem are real power (P) generations. They are used to form a swarm. Each element of the swarm matrix is initialized randomly within the real power operating limits by using the equation:

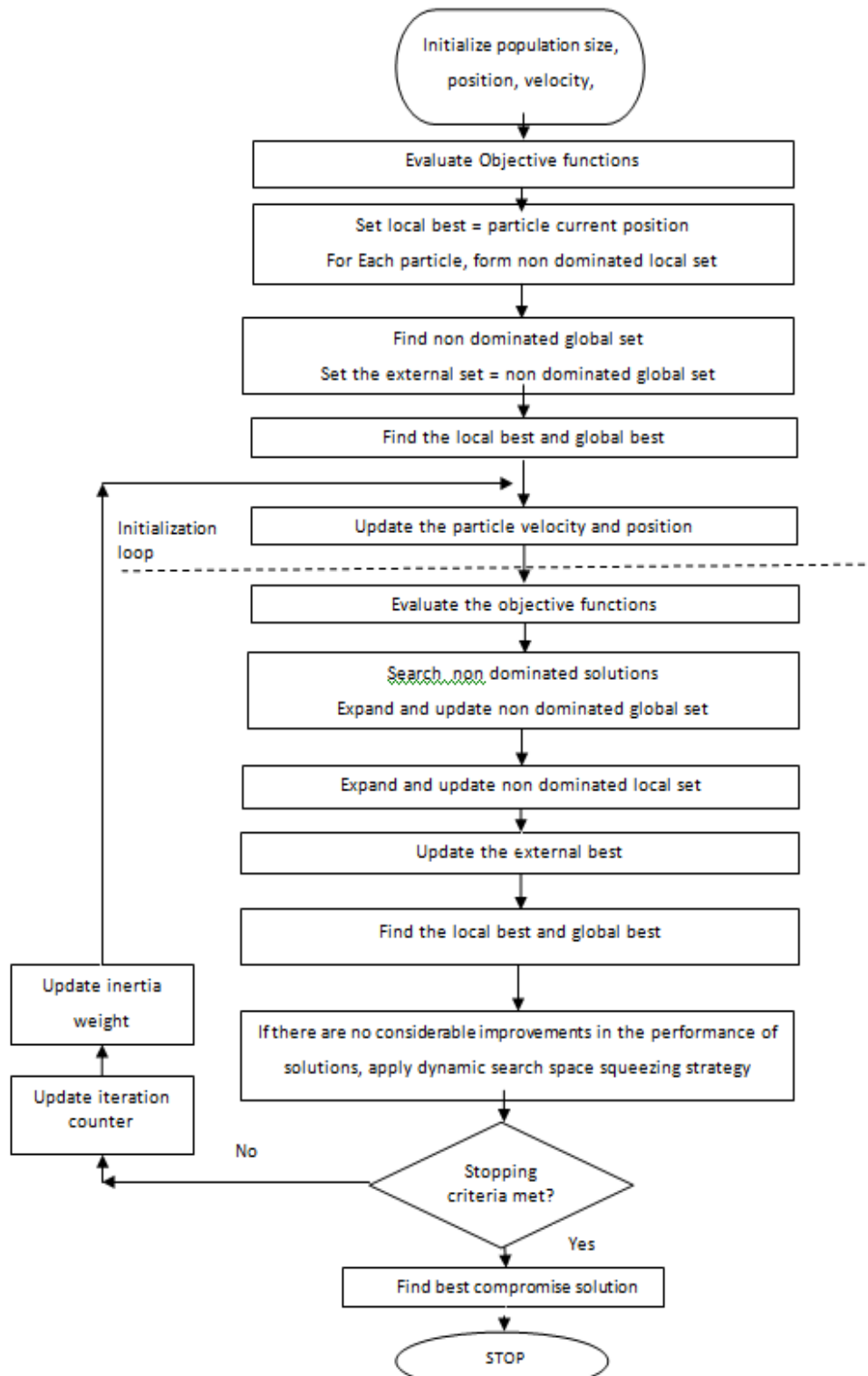
$$P_{ij} = P_j^{min} + rand()(P_j^{max} - P_j^{min}) \quad (24)$$

where $(i=1, 2, \dots, L)$, $(j=1, 2, \dots, Ng)$, P_{ij} and $rand()$ ranging over $[P_j^{min}, P_j^{max}]$, $[0,1]$ respectively.

The velocities of the particles are initialized randomly according to the equation:

$$V_{ij} = V_j^{min} + rand()(V_j^{max} - V_j^{min}) \quad (25)$$

Each population should satisfy the constraints given by eq. (3), and (4). Evaluate the value of $F(P_{i,j})$ and $E(P_{i,j})$ of each population.



Flowchart of Modified MOPSO



6.2. Initialization of local best, $P_i^*(0)$, and global best, $P^{**}(0)$:

The global and local best are selected as follows: The individual distances between members in non dominated local set ($S_i^{\square}(0)$) of the i^{th} particle and members in non dominated global set ($S^{**}(0)$) are measured in the objective space. If $P_i^*(0)$ and $P_r^{\square\square}(0)$ are the members of $S_i^{\square}(0)$ and $S^{**}(0)$ respectively that give the minimum distance, are selected as the local best and the global best of the i^{th} particle respectively. The distance between local best set members and global best set members is calculated as:

$$DISTANCE = \sum_{j=1}^d \left(\frac{f_j(P_i^*) - f_j(P_r^{**})}{\max(f_j(P^{**}) - \min(f_j(P^{**})))} \right)^2 \quad (26)$$

where r is maximum number of members in global best set. i is maximum number of members in local best set. d is number of objective functions.

6.3. Velocity and real power updating:

Using the local best and the global best of each particle, the velocity and position are updated according to the equation (13), (14) respectively. If power violates its limits in any dimension, set it at the proper limits. Now evaluate the objective functions $F(P_{i,j})$, $E(P_{i,j})$ in MOEED problem by using updated real power.

6.4. Non dominated local set, non dominated global set expanding and updating:

The updated position of the i^{th} objective functions is added to $S_i^*(t)$. If the size of $S_i^*(t)$ exceeds a pre specified value, the clustering algorithm [4] will be used to reduce the size. The union of all non dominated local sets is formed and the non dominated solutions out of this union are members in the non dominated global set $S^{**}(t)$. The size of global set will be reduced by clustering algorithm if it exceeds a pre specified value.

6.5 External Set, Local Best and Global Best Updating:

The external Pareto-optimal set is updated as follows: copy the members of $S^{**}(t)$ to the external Pareto set. If the size of external Pareto set exceeds the pre-specified limit, reduce the set by means of clustering. Again find the local best and global best for each particle.

6.6 Dynamic Search Space Squeezing Strategy:

When there is no improvement in the performance of the solution, then dynamic search-space squeezing strategy is activated to adjust the upper and lower boundaries of the particles relative to most recent gbest applying (20) and (21).

6.7 Stopping criteria:

If the number of iterations exceeds the maximum then stop. Upon having the Pareto-optimal set of non dominated solution, fuzzy-based method is applied to extract the best compromise solution.

7 Simulation results

MOEED is formulated with objectives of minimizing fuel cost and emission. The algorithm of modified MOPSO has been implemented for solving MOEED problem. The outcome have been obtained by using



modified MOPSO and tested on two cases. Case study 1 is for 6 generating units [24] and case study 2 for 10 generating units [33].

7.1 Case Study 1

Data for the case study 1 has been referred from [24]. The system has six generating units. The modified MOPSO has been applied to obtain the results (cost and emission). The power generation corresponding to the obtained result is given in the table (7.1) Cost and emission of six unit system for power demand (PD) = 1000 MW are 51348.81000 \$/hr and 833.362900 Kg/hr respectively are given in table 7.1.

Table 7.1- Shows generation (PG), cost, emission of 6-unit system problem for power demand (PD) = 1000 MW without losses.

Units	Power (MW)
1	97.210690
2	67.510540
3	148.65180
4	173.73290
5	243.59570
6	269.29830
Cost (\$/hr)	51348.810
Emission (Kg/hr)	833.36290

7.2 Case Study 2

Data for the case study 2 has been referred from [33]. The system has ten generating units. The modified MOPSO has been applied to obtain the results (cost and emission). Cost, emission and losses of 10-unit system for power demand (PD) = 2000 MW are 113466.50 \$/hr, 4114.230Kg/hr and 80.818380MW respectively as given in the table 7.2.

Table 7.2 - Shows generation (P_G), cost, emission, losses for ten-unit system problem for power demand (P_D) = 2000 MW, by using modified MOPSO.

Units	Power (MW)
1	54.976920
2	75.519490
3	87.805580
4	83.366030
5	139.51390
6	168.94480
7	289.46100
8	315.57570
9	434.62510
10	433.95480
Cost \$/hr	113466.50
Emission Kg/hr	4114.2300
Losses(MW)	80.818380



8 Conclusion

Modified multi objective particle swarm optimization is a evolutionary algorithm. It evolves a multi-objective version of the conventional PSO technique to utilize its efficiency in solving the multi objective optimization problems. Dynamic search space squeezing strategy based MOPSO has been simulated in this paper to solve MOEED optimization problem. By applying MOPSO multiple Pareto-optimal set (non-dominated solutions) are produced in one simulation run. Then fuzzy cardinal approach has been used to extract best compromise solution from the Pareto-optimal set. In this paper, MOEED problems have been solved for six and ten generating unit systems using dynamic search space strategy based modified MOPSO algorithm.

References:

1. Keib A., Ma H., Hart J.L., “*Economic dispatch in view of the clean air act of 1990*”, IEEE Trans. on Power Syst.vol. 9(2), pp.972–978, 1994.
2. Granelli G.P., Montagna M., Pasini G.L., Marannino.P, “*Emission constrained dynamic dispatch*”, Electric Power Syst. vol. 24, pp.56–64, 1992.
3. Farag A., Cheng T.C., “*Economic load dispatch multi-objective optimization procedures using linear programming techniques*”, IEEE Trans. on Power Syst., vol. 10(2), pp.731–738, 1995.
4. Dev K., “*Multi-objective optimization using evolutionary algorithms*”, John Wiley & Sons, Chichester, 2001.
5. Gent M. R., Lamont J.W., “*Minimum emission dispatch*”, IEEE Trans. on Power Syst., vol. 90(6), pp. 2650-2660, 1971.
6. Sullivan R.L, “*Minimum pollution dispatching*”, IEEE Summer Power Society Meeting, pp. 4672-4687, 1972.
7. Zahavi J. and Eisensberg L., “*Economical-environmental power dispatch*”, IEEE Trans. On Power Syst., vol. 5(5), pp. 185-189, 1975.
8. Nanda J., Kothari D. P., Lingamurthy K. S., “*A new approach to economic and minimum emission dispatch*”, Journal Indian Institute of Science, vol. 67, pp. 249-256, 1987.
9. Hobbs B. F., “*Emissions dispatch under the underutilization provision of the 1990 u. s. clean air act amendments: models and analysis*”, IEEE Trans. on Power Syst., vol. 8(1), pp. 177-183, 1993.
10. Palanichamy C., Srikrishna K., “*Economic thermal power dispatch with emission constraint*”, Journal Institution for Engineers (India), vol. 72, pp. 11-18, 1991.
11. Nanda J., Kothari J., Linyamurthy K. S., “*Economic-emission load dispatch through goal programming techniques*”, IEEE Transactions on Energy Conversion, vol. 3(1), pp.26-32, 1988.
12. El-Keib A. A., Ma H., Hart J. L., “*Environmentally constrained economic dispatch using the lagrangian relaxation method*”, IEEE Trans. on Power Syst., vol. 9(4), pp.1723-1729, 1994.
13. Fan J., Zhang L., “*Real-time economic dispatch with line flow and emission constraints using quadratic programming*”, IEEE Trans. on Power Syst., vol. 13(2), pp.320-325, 1998.
14. Huang C., Huang Y., “*A novel approach to real-time economic emission power dispatch*”, IEEE Trans. on Power Syst.,vol.18(1), pp.(288-294), 2003.
15. Singh L., Dhillon J. S., “*Surrogate worth trade-off method for economic emission dispatch*”, IEEE Power Syst. Conference, pp. 230-235, 2006.



16. Osman M. S., Abo- Sinna M. A., Mousa A. A., “*Epsilon-dominance based multi objective genetic algorithm for economic emission load dispatch optimization problem*” ,IEEE Power Syst. Conference, pp. 576-581, 2006.
17. Abido M. A., “*Multi objective particle swarm optimization for environmental economic dispatch problem*”, Electric Power Systems Research, vol. 79(7), pp.1105-1113, 2009.
18. Wang L., Singh C., “*Reserve-constrained multi area environmental-economic dispatch based on particle swarm optimization with local search*”, Engineering Applications of Artificial Intelligence, vol. 22(2), pp.298-307, 2009.
19. Al-Rashidi M. R., El-Hawary M. E., “*Economic dispatch with environmental considerations using particle swarm optimization*”, IEEE Power Engineering Conference, pp.41-46., 2006.
20. Abido M. A., “*Environmental/economic power dispatch using multi objective evolutionary algorithms*,” IEEE Trans. on Power Syst., vol. 18(4), pp.1529-1537, 2003.
21. Jeyakumar D. N., Venkatesh P., Lee K. Y., “*Application of multi objective evolutionary programming to combined economic emission dispatch problem*,” IEEE International Conference on Neural Network, pp.1162 - 1167, 2007.
22. Bhattacharya A., Chattopadhyay P. K., “*Solving economic emission load dispatch problems using hybrid differential evolution*”, Applied Soft Computing, vol. 11(2), pp. 2526-2537, 2011.
23. Hota P. K., Barisal A. K., Chakrabarti R., “*Economic Emission Load Dispatch through Fuzzy Based Bacterial Foraging Algorithm*”, International Journal of Electrical Power & Energy Systems, vol. 32(8), pp.794-803, 2010.
24. Guvenç U., Sonmez Y., Duman S., Yorukeren N., “*Combined Economic and Emission Dispatch Solution using Gravitational Search Algorithm*”, Scientia Iranica, vol. 19(6), pp.1754-1762 , 2012.
25. Sasikala J., Ramaswamy M., “*Optimal λ based Economic Emission Dispatch using Simulated Annealing*”, International Journal of Computer Applications, vol. 1(10), pp.(0975– 8887), 2010.
26. Abido M. A., “*Environmental/Economic Power Dispatch using Multi-Objective Evolutionary Algorithms*”, IEEE Trans. Power Syst., vol. 18(4), pp.(1529–1537), 2003.
27. Farag A., Al-Baiyat S., Cheng T. C., “*Economic Load Dispatch Multi-Objective Optimization Procedures using Linear Programming Techniques*”, IEEE Trans. Power Syst. vol. 10(2), pp.731–738, 1995.
28. Yokoyama R., Bae S. H., Morita T., Sasaki H., “*Multi-Objective Generation Dispatch Based on Probability Security Criteria*”, IEEE Trans. Power Syst. vol. 3(1) pp.(317–324), 1988.
29. Abido M. A., “*Multiobjective evolutionary algorithms for electric power dispatch problem*”, IEEE Trans. Evol. Comput. vol. 10(3) , pp.315–329, 2006.
30. Coello C. A., Van V., Lamont G. B., “*Evolutionary algorithms for solving multi-objective problems*”, Kluwer Academic Publishers, New York, 2002.
31. Morse J. N., “*Reducing the Size of Non dominated Set: Pruning by Clustering*”, Computers and Operations Research, vol. 7(1-2), pp. 55-66, 1980.
32. Branke J., Mostaghim S., “*About Selecting the Personal Best in Multi-Objective Particle Swarm Optimization*”, In Parallel Problem Solving from Nature, LNCS vol. 4193, pp. 523–532, 2006.
33. Basu M., “*Economic environmental dispatch using multi-objective differential evolution*”, Applied Soft Computing, vol. 11, pp.2845-2853, 2011.



ULTRASONIC BLIND WALKING STICK

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ABSTRACT

God gifted sense of vision to the human being is an important aspect of our life. But there are some unfortunate people who lack the ability of visualizing things. The visually impaired have to face many challenges in their daily life. The problem gets worse when there is an obstacle in front of them. Blind stick is an innovative stick designed for visually disabled people for improved navigation. The paper presents a theoretical system concept to provide a smart ultrasonic aid for blind people. The system is intended to provide overall measures – Artificial vision and object detection. The aim of the overall system is to provide a low cost and efficient navigation aid for a visually impaired person who gets a sense of artificial vision by providing information about the environmental scenario of static and dynamic objects around them. Ultrasonic sensors are used to calculate distance of the obstacles around the blind person to guide the user towards the available path. Output is in the form of sequence of beep sound which the blind person can hear.

Keywords: Ultrasonic sensors, visually impaired person, Microcontroller.

I. INTRODUCTION

There are approximately 37 million people across the globe who are blind, over 15 million are from India. Even for the non-visually impaired the congestion of obstacles is sometimes problematic, it's even worse for the visually impaired. People with visual disabilities are often dependent on external assistance which can be provided by humans, trained dogs, or special electronic devices as support systems for decision making. Existing devices are able to detect and recognize objects that emerge on the floor, but a considerable risk is also includes the objects that are at a sudden depth, or obstacles above waist level or stairs. Thus we were motivated to develop a smart white cane to overcome these limitations. The most common tool that the blind currently use to navigate is the standard white cane. We decided to modify and enhance the walking cane, since blind are only able to detect objects by touch or by cane. The user sweeps the cane back and forth in front of them. When the cane hits an object or falls off of the edge of a stair, the user then becomes aware of the obstacle – sometimes too late. We accomplished this goal by adding ultrasonic sensors at specific positions to the cane that provided information about the environment to the



user through audio feedback. The main component of this system is the Radio-Frequency module which is used to find the stick if it is misplaced around.



Fig.1 A Man Walking With A Blind Stick

II. BACKGROUND

Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The 2011 statistics by the World Health Organization (WHO) estimates that there are 285 million people in world with visual impairment, 39 billion of which are blind and 246 with low vision. The traditional and oldest mobility aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs. The most important drawbacks of these aids are necessary skills and training phase, range of motion and very little information conveyed. With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind navigate independently and safely. Also high-end technological solutions have been introduced recently to help blind persons to navigate independently. Many blind guidance systems use ultrasound because of its immunity to the environmental noise. Another reason why ultrasonic is popular is that the technology is relatively inexpensive, and also ultrasound emitters and detectors are small enough to be carried without the need for complex circuit. Blind people have used canes as mobility tools for centuries, but it was not until after World War I that the white cane was introduced.

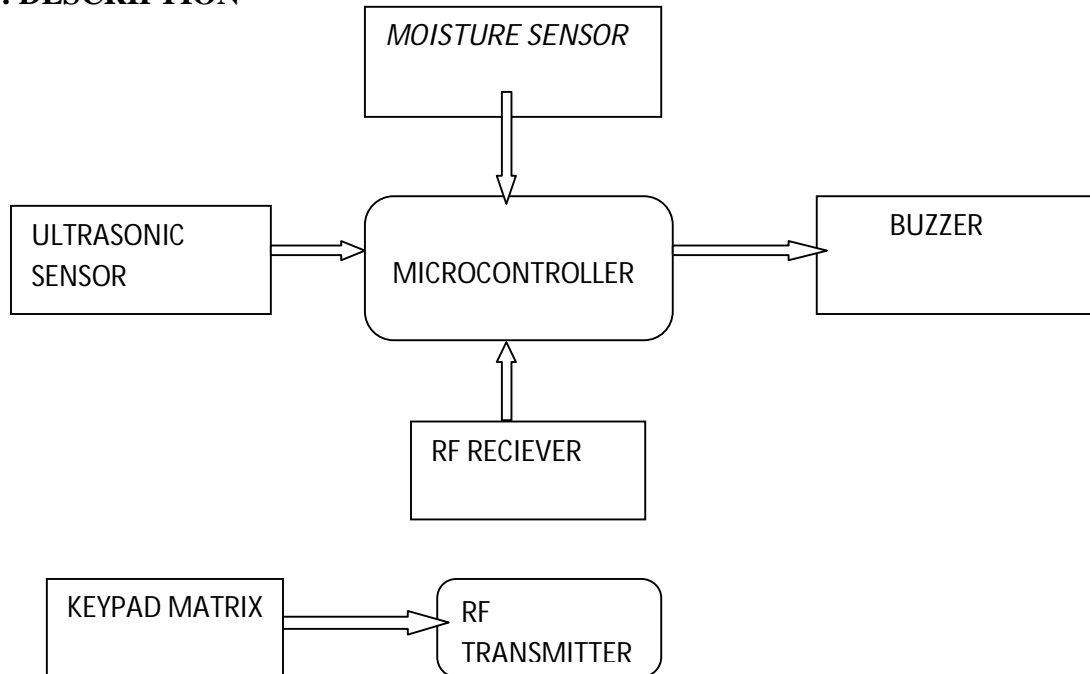
III. LITERATURE SURVEY:

Numerous attempts have been made in the society to help the blind. "Project Prakash" is a humanitarian mission to help the blind children especially by training them to utilize their brains to learn a set of objects around them. The stick has a ping sonar sensor to sense the distant objects. It also has a wet detector to detect the water. The micro-controller used is PIC microcontroller. The microcontroller circuit is on the outside of the stick but is protected with a code so its security cannot be breached. The only feedback given to the user is through the vibration motor. Three sensors are used viz. ultrasonic, pit sensor and the water sensor. Even this is a PIC based system. The feedback given is through the vibration as well as the speaker/headphones. There is a GPS system where-in the user has to feed his location. No information on



how a blind man would do that. Also they haven't mentioned anything about the size and shape of their cane and neither about the placement of their circuitry. The author has made a detachable unit consisting of an ultrasonic sensor and a vibration motor. It can be fit on any stick. It detects obstacles up to 3m. The vibration feedback varies in the intensity as the obstacles come nearer. Many different approaches have been taken with the primary purpose of creating a technology to aid the visually impaired. The priorities set by different authors are different leaving a scope of improvement in every application.

IV. DESCRIPTION



a) Block Diagram of System

In this system the ultrasonic sensor are used to sense the obstacle (if there is any). The signal is then send to microcontroller to operate a buzzer. There is one more advantage of this system. Sometimes when the blind loose there sticks or forgot where have they put it, they can find it by using the wireless remote.

V. COMPONENT DETAILS

1.1 Major components names

1. Ultrasonic sensor
2. Microcontroller
3. RF module
4. Micro-switch



1.2 Components description

1.2.1 Ultrasonic Sensor: Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. This technology can be used for measuring: wind speed and direction (anemometer), fullness of a tank and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, sonar, medical ultra sonography, burglar alarms and non-destructive testing. Systems typically use a transducer which generates sound waves in the ultrasonic range, above 18,000 hertz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be measured and displayed. The technology is limited by the shapes of surfaces and the density or consistency of the material. For example foam on the surface of a fluid in a tank could distort a reading.

1.2.2 Microcontroller: A microcontroller is a small computer (SoC) on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

1.2.3 RF Module: An RF module (radio frequency module) is a small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and/or receiver.

1.2.4 Micro switch: A micro switch, also known as snap-action switch, is a generic term used to refer to an electric switch that is actuated by very little physical force, through the use of a tipping-point mechanism. They are very common due to their low cost and durability, greater than 1million cycles and



up to 10 million cycles for heavy duty models. This durability is a natural consequence of the design. Internally a stiff metal strip must be bent to activate the switch. This produces a very distinctive clicking sound and a very crisp feel. When pressure is removed the metal strip springs back to its original state. Common applications of micro switches include the door inter lock on a microwave oven, leveling and safety switches in elevators, vending machines, and to detect paper jams or other faults in photocopiers. Micro switches are commonly used in tamper switches on gate valves on fire sprinkler systems and other water pipe systems, where it is necessary to know if a valve has been opened or shut. The defining feature of micro switches is that a relatively small movement at the actuator button produces a relative large movement at the electrical contacts, which occurs at high speed (regardless of the speed of actuation).

VI. LIST OF REQUIREMENTS

1.3 HARDWARE REQUIREMENT:

1. Microcontroller
2. Ultrasonic sensor
3. RF module

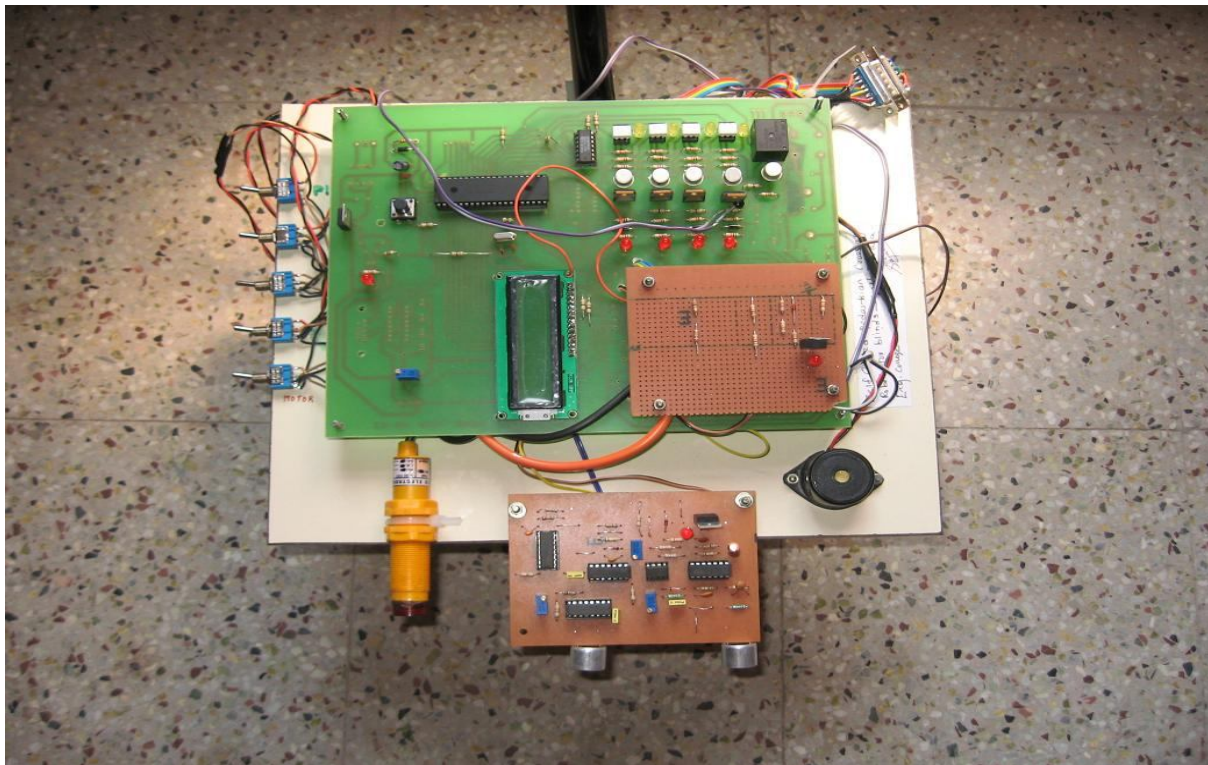


Fig2. Hardware Design



4. LDR
5. LED
6. Buzzer
7. Push button
8. GPS module
9. GSM modem

1.4 SOFTWARE REQUIREMENTS

1. Keil micro vision (IDE)
2. Compiler

VII. DEFINITION & ABBREVIATION

1.5 Microcontroller (ATMEGA328): A microcontroller (sometimes abbreviated μC , uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals.

1.6 Ultrasonic Sensor: Ultrasonic sensor provides a very low-cost and easy method of distance measurement. This sensor is perfect for any number of applications that require you to perform measurements between moving or stationary objects. Naturally, robotics applications are very popular but you'll also find this product to be useful in security systems or as an infrared replacement if so desired.

1.7 RF Module: An RF Module is a small electronic circuit which is used to receive, transmit or transceiver radio waves on one of a number of carrier frequencies.

1.8 LDR: A photo resistor or light-dependent resistor (LDR) or photocell is a light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photo conductivity.

1.9 LED: A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. When a light-emitting diode is forward biased (switched on), electrons are able to recombine with holes within the device, releasing energy in the form of photons.



1.10 Buzzer: A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

1.11 Resistors: A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law: $V = IR$.

1.12 Push Buttons: A push-button (also spelled pushbutton) or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed.

1.13 GPS Module: New improved GPS Module with built-in antenna and memory back-up for OEM and hobbyists projects. This unit features low power consumption, high sensitivity. The unit is ideal for navigation systems, distance measurements, vehicle monitoring and recording, boating direction and location, together with hiking and cross country exploring.

1.14 GSM Modem: A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

1.15 Keil Micro Vision (IDE): Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulator's for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families. Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new system, simply select the microcontroller you use from the Device Database and the μ Vision IDE sets all compiler, assembler, linker, and memory options for you.



1.16 COMPILER: Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors.

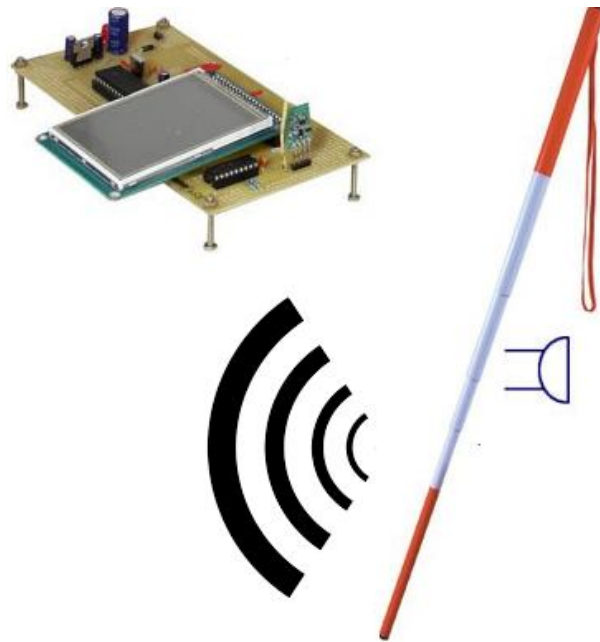


Fig 3. Blind Stick

VIII. FUTURE SCOPE

The system can be supplemented with actual GPS MODULE used in cars and we can provide a vibrator for the partially deaf person.

VI. CONCLUSION

This paper proposed the design and architecture of a new concept of Smart Electronic Travel Aid Stick for blind people. The advantage of the system lies in the fact that it can prove to be a very low cost solution to millions of blind person worldwide. The proposed combination of various working units makes a real-time system that monitors position of the user and provides dual feedback making navigation more safe and secure.

VII. ACKNOWLEDGMENT

The satisfaction that accompanies the successful completion of any task would be incomplete without mentioning the people who make it possible. We are grateful to a number of individuals whose professional guidance along with encouragement have made it very pleasant endeavor to undertake this



paper. We have great pleasure in presenting the paper on “ULTRASONIC BLIND WALKING STICK” under the guidance of Prof. Basanta Mahato are truly grateful to our guide Prof. Basana Mahato for his valuable guidance and encouragement. His encouraging words went a long way in providing the patience and perseverance, which were needed to complete this paper successfully. We would like to express our gratitude to Prof. Harish Bhatia, Dean of Mangalmay Institute of Engineering And Technology and Prof. Dhananjay Yadav, Department of Electronics And Communication for their support and guidance. Finally we express our sincere thanks to our parents and all those who helped us directly or indirectly in many ways in completion of this paper.

REFERENCES

- [1] Rohit Sheth “Smart White Cane- an Elegant and Economic Walking Aid”
- [2] www.who.int/mediacentre/factsheets/fs282/en/
- [3] “Project Prakash” <http://web.mit.edu/bcs/sinha/prakash.html>
- [4] Mohammad Hazzaz Mahmud, “Smart walking stick - an electronic approach to assist visually disabled persons” “<http://www.ijser.org/researchpaper%5Csmart-walking-stick-an-electronic-approach-to-assist-visually-disabledpersons.pdf>”.
- [5] G.Gayathri, “Smart Walking Stick for visually impaired” “<http://ijecs.in/issue/v3-i3/8%20ijecs.pdf>”.
- [6] Singh Vaibhav, “ ‘SMART’ CANE FOR THE VISUALLY IMPAIRED: DESIGN AND CONTROLLED FIELD TESTING OF AN AFFORDABLE OBSTACLE DETECTION SYSTEM” http://assistech.iitd.ernet.in/doc/Traned2010_Smart_Cane.pdf



A REVIEW ON THE FLOW ANALYSIS AND MATHEMATICAL FORMULATION OF FLOW AND HEAT TRANSFER OF A CASSON FLUID FROM A HORIZONTAL CIRCULAR CYLINDER

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ABSTRACT

This is a review paper which deals with a theoretical investigation of flow and heat transfer of a Casson fluid from a horizontal circular cylinder in a non-Darcy porous medium under the action of slips and thermal radiation parameters. The numerical solution has been obtained for the dimensionless velocity and temperature of the Casson fluid. The effects of various important parameters on the dimensionless velocity, temperature as well as on the skin friction and the dimensionless heat transfer rates are investigated.

1 Introduction

For half a century, extensive attention has been paid to predict the flow behavior and energy transport of the non-Newtonian fluids. Non-Newtonian transport phenomena arise in many branches of process mechanical, chemical and materials engineering. Several non-Newtonian models exist in open literature. These include power-law fluids [1–3], viscoelastic fluids [4–7], Walters-B short memory models [8,9], Johnson-Segalman rheological fluids [10], micropolar fluid [11,12] and Bingham plastics [13] among others. The non-Newtonian fluid flow and heat transfer cover many important applications, such as plastic films and artificial fibers and have been one of the most attractive field in different aspects of engineering for the last few decades [14,16]. The Casson fluid model is one of the non-Newtonian fluid models. The Casson fluid exhibits yield stress. If the shear stress is less than the applied yield stress, it behaves like a solid, whereas if the shear stress is greater than the applied yield stress, it starts to move. Human blood, jelly, tomato sauce, honey, soup, concentrated fruit juices, etc, are some examples of the Casson fluid. A great number of investigations concern the boundary layer behavior of non-Newtonian fluids for its importance in many mechanical and industrial applications [17,18]. The natural convection



flow [19–21] of a viscous incompressible fluid from a horizontal circular cylinder represents an important problem, which is related to numerous engineering applications, such as handling hot wire, steam pipe, etc. Sparrow and Lee [22] have considered the problem of vertical stream over a heated horizontal circular cylinder. The similarity solution for natural convection heat transfer on a horizontal cylinder in a saturated porous medium was examined by Merkin [23]. Merkin and Pop [24] considered the natural convection about two-dimensional bodies with uniform surface heat flux in a porous medium. Heat and mass transfer about a vertical cylinder with constant wall temperature and concentration are considered by Yu'cel [25]. Yih [26] examined heat and mass transfer characteristics in natural convection flow about a permeable horizontal cylinder in a saturated porous medium subjected to constant wall temperature and concentration. Pop et al. [27] have examined the problem of natural convection heat transfer about cylinders of elliptic cross section in a porous medium. Natural convection heat and mass transfer from a horizontal cylinder of elliptic cross section with constant wall temperature and concentration in saturated porous media were studied numerically by Cheng [28]. Cheng [29] investigated further heat transfer by free convection from permeable horizontal cylinders of elliptic cross section in porous media using a thermal non-equilibrium model. Hossain and Alim [30] investigated natural convection-radiation interaction on the boundary layer flow along a vertical thin cylinder. Hossain et al. [31] examined the radiation-conduction interaction on mixed convection from a horizontal circular cylinder. Prasad et al. [32] examined MHD natural convection flow along a horizontal cylinder in porous media with viscous dissipation, joule-heating and internal heat generation effects. The Casson fluid is a non-Newtonian fluid with yield stress, which is widely used for modeling the blood flow in narrow arteries. Numerous researchers have used the Casson fluid model for the mathematical modeling of the blood flow in narrow arteries at low shear rates. It has been verified by Blair [33] and Copley [34] that the Casson fluid model is adequate for the representation of the simple shear behavior of the blood in narrow arteries. Casson [35] examined the validity of the Casson fluid model in his studies pertaining to the flow characteristics of blood and reported that, at low shear rates, the yield stress for blood is nonzero. Some relevant studies for the Casson fluid can be found in [36–39]. Recently, Sheikholeslami and Allahi [40] investigated the influence of a non-uniform electric field on a Fe₃O₄ethylene glycol nanofluid hydrothermal treatment in an enclosure with sinusoidal upper and lower moving walls. The study employed the Control Volume-based Finite Element method. Sheikholeslami et al. [41] studied the heat and mass transfer behavior of a steady nanofluid between parallel plates in the presence of uniform magnetic field, thermophoresis and



Brownian effects. Sheikholeslami et al. [42] analyzed the effects of the non-uniform magnetic field on forced convection heat transfer of Fe₃O₄-water nanofluid in a lid-driven semi-annulus enclosure. Sheikholeslami and Rashidi [43] applied the Control Volume-based Finite Element method to simulate the Fe₃O₄-water nanofluid mixed convection heat transfer in a lid-driven semi-annulus in the presence of a non-uniform magnetic field. Malvandi et al. [44] theoretically studied the effects of nanoparticles migration on the magneto hydrodynamic mixed convective heat transfer of an alumina/water nanofluid inside a vertical microchannel. Qi et al. [45] proposed a numerical method based on the Cartesian mesh and grid-less approach applied to forced and natural convection flows over arbitrary geometry. Sheikholeslami and Rashidi [46] investigated the effect of a spatially variable magnetic field on ferrofluid flow and heat transfer through an enclosure which is filled with Fe₃O₄-water nanofluid. Malvandi, and Ganji [47] theoretically investigated the effects of nanoparticle migration and asymmetric heating on the forced convective heat transfer of laminar/water nanofluid in microchannels. Sheikholeslami and Allahi [48] presented magneto hydrodynamics nanofluid hydrothermal treatment in a cubic cavity heated from below. Motivated by the previously mentioned investigations on flow of non-Newtonian fluids across a horizontal circular cylinder and its vast applications in many industries, the steady two-dimensional flow of a non-Newtonian Casson fluid and heat transfer from a circular cylinder in non-Darcy porous medium with slip conditions and thermal radiation effects are investigated. Using similarity transformations, the governing equations are transformed. The converted system of equations is solved by the Runge-Kutta Fehlberg fourth-fifth-order method. The numerical results are plotted to see the effects of physical parameters on the flow and heat transfer characteristics.

2. Flow analysis and mathematical formulation

We consider a steady, laminar, two-dimensional viscous incompressible free convection heat transfer flow around a horizontal permeable circular cylinder embedded in a Casson non-Newtonian fluid. The x-coordinate is measured along the circumference of the horizontal cylinder from the lowest point and the y-coordinate is measured normal to the surface, with a denoting the radius of the horizontal cylinder. The angle of the y-axis with respect to the vertical is taken to be $\varphi = x/a$, such that $0 \leq \varphi < \pi$. Both the horizontal cylinder and the fluid are maintained initially at the same temperature. Instantaneously they are raised to a temperature $T_w > T_\infty$, the ambient temperature of the fluid remains unchanged. See fig. 1. Following Mustafa et al. [36] the rheological equation of the Casson is given by:



$$\tau_{ij} = \left[\mu_B + \left(\frac{P_y}{(2\pi)^{0.5}} \right) \right]^n 2e_{ij}$$

Where μ_B is the plastic dynamic viscosity on non-Newtonian fluid, $\pi = e_{ij} e_{ij}$ and e_{ij} is the (i,j)-th component of the deformation rate, π denoted the product of the component of deformation rate with itself, P_y is the yield stress of the fluid.

Following the approach of Yih [26] and introducing the boundary layer approximations, the governing conservation equations are written as:

$$\left(\frac{\partial u}{\partial x} \right) + \left(\frac{\partial v}{\partial y} \right) = 0$$

$$u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} = v \left(1 + \frac{1}{\beta} \right) \frac{\partial^2 u}{\partial y^2} + g\Omega(T - T_\infty) \sin\left(\frac{x}{a}\right) - \frac{1}{K}u - u^2$$

$$u \frac{\partial T}{\partial x} + v \frac{\partial T}{\partial y} = \alpha \frac{\partial^2 T}{\partial y^2} - \frac{1}{\rho c_p} \frac{\partial q_r}{\partial y}$$

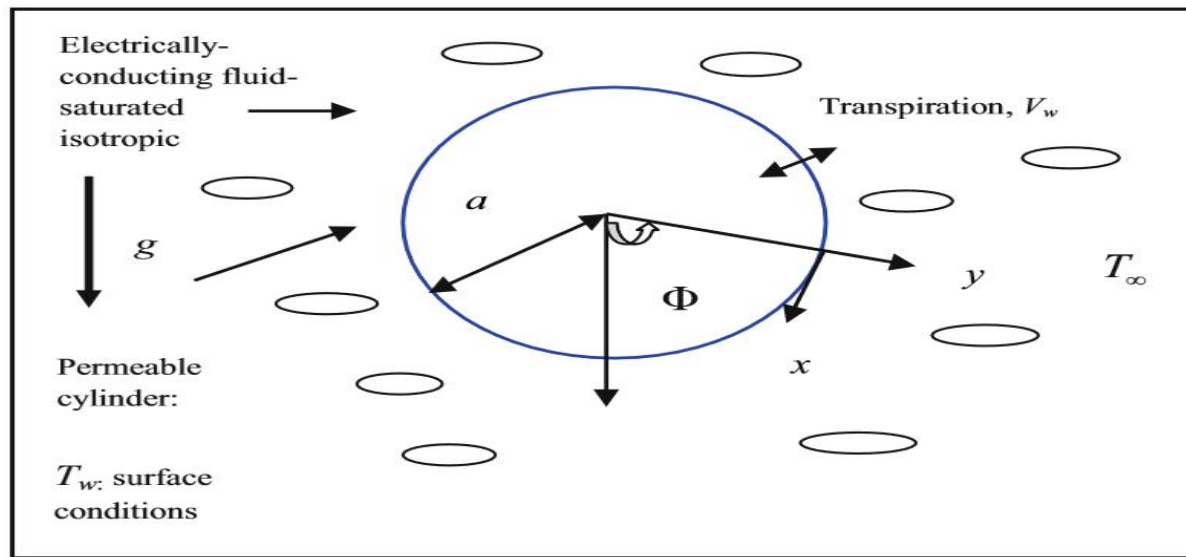


Fig. 1 Physical model and coordinate system.

where u and v are the velocity components in the x - and y -direction, respectively, T is the temperature, α is the thermal diffusivity, ν is the kinematic viscosity, β is the non-Newtonian Casson parameter, K and Γ are the permeability and inertia coefficient of the porous medium, respectively, Ω is the coefficient of the



thermal expansion, T_∞ is the free stream temperature. The boundary conditions are prescribed at the cylinder surface and the edge of the boundary layer regime, respectively, as follows:

$$u = N_0 \left(1 + \frac{1}{\beta} \right) \frac{\partial u}{\partial y}, \quad v = -V_w \quad T = T_w + K_0 \frac{\partial T}{\partial y} \quad \text{at } y = 0$$

$$u \rightarrow 0, \quad T \rightarrow T_\infty \quad \text{as } y \rightarrow \infty$$

where N_0 is the velocity slip factor, and K_0 is the thermal slip factor. We define the stream function ψ such that $u = \partial\psi/\partial y$ and $v = -\partial\psi/\partial x$ so that the continuity is automatically satisfied.

6 Conclusion

In this review paper, we developed a mathematical model for two-dimensional, laminar, viscous incompressible free convection heat transfer flow from a horizontal permeable circular cylinder in a Casson fluid. The governing equations were transformed into a system of dimensionless nonlinear differential equations using suitable similarity transformations.

3.Nomenclature

a- radius of the cylinder,

α -thermal diffusivity,

β -Casson fluid parameter,

Da- Darcy number,

e_{ij} -component of rate of deformation,

ρ - fluid density,

μ_B -dynamic viscosity,

ν -kinematic viscosity,

k -thermal conductivity,

ψ - stream function,

K- permeability of the porous media,

K_0 . thermal slip factor,



Π - product notation,

N_0 - velocity slip factor,

φ -vertical angle

Ω -coefficient of the thermal expansion

Γ -inertia coefficient of the porous media,

P_y -stress of the fluid,

R -radiation parameter,

T_∞ - free stream temperature,

T_w -surface temperature,

u -velocity in x direction,

v -velocity in y direction,

References

1. B.P. Jadhav, B.B. Waghmode, Waerme- StoꝞuebertrag. 25, 377 (1990).
2. H.I. Andersson, J.B. Aaresth, N. Braud, B.S. Dandapat, J. Non-Newtonian Fluid Mech. 62, 1 (1996).
3. I.A. Hassanien, A.A. Abdullah, R.S.R. Gorla, Comput. Model. 28, 105 (1998).
4. B.S. Dandapat, A.S. Gupta, J. Non-Linear Mech. 24, 215 (1989).
5. K. Vajravelu, D. Rollins, J. Math. Anal. Appl. 158, 241 (1991).
6. S. Syrijal'a, Int. Commun. Heat Mass Transfer 25, 191 (1998).
7. F. Mabood, W.A. Khan, A.I.M. Ismail, PLoS ONE 8, e83581 (2013) doi:10.1371/journal.pone.0083581.
8. K. Walters, Quart. J. Mech. Appl. Math. 15, 63 (1962).
9. S.G. Mohiddin, V.R. Prasad, S.V.K. Varma, O.A. B'eg, Int. J. Appl. Math. Mech. 6, 88 (2010).
10. T. Hayat, Z. Iqbal, M. Sajid, K. Vajravelu, Int. Commun. Heat Mass Transfer 35, 1297 (2008).
11. A. Iahak, R. Nazar, I. Pop, Can. J. Phys. 84, 399 (2006).
12. M.M. Rahman, M.A. Rahman, M.A. Samad, M.S. Alam, Int. J. Thermophys. 30, 1649 (2009).
13. R.R. Huilgol, Z. You, J. Non-Newtonian Fluid Mech. 128, 126 (2005).



14. M.M. Rashidi, M.T. Rastegari, M. Asadi, O.A. B'eg, *Chem. Eng. Commun.* 199, 231 (2012).
15. M.H. Abolbashari, N. Freidoonimehr, F. Nazari, M.M. Rashidi, *Adv. Powder Technol.* 26, 542 (2015).
16. M. Keimanesh, M.M. Rashidi, A.J. Chamkha, R. Jafari, *Comput. Math. Appl.* 62, 2871 (2011).
17. S. Shateyi, *Bound. Value Probl.* 2013, 196 (2013) doi:10.1186/1687-2770-2013-196.
18. S. Shateyi, G.T. Marewo, *Math. Probl. Eng.* 2013, 670205 (2013) doi:10.1155/2013/670205.
19. J.H. Markin, *Int. J. Heat Mass Transfer* 18, 237 (1975).
20. M.J. Huang, C.K. Chen, *J. Chin. Inst. Eng.* 6, 209 (1983).
21. W.A. Khan, I. Pop, *J. Porous Media* 16, 637 (2013).
22. E.M. Sparrow, L. Lee, *Int. J. Heat Mass Transfer* 19, 229 (1976).
23. J.H. Merkin, *Int. J. Heat Mass Transfer* 22, 1461 (1979).
24. J.H. Merkin, I. Pop, *Acta Mech.* 70, 235 (1987).
25. A. Yu'cel, *Int. Commun. Heat Mass Transfer* 33, 2265 (1990).
26. K.A. Yih, *Int. Commun. Heat Mass Transfer* 26, 431 (1999).
27. I. Pop, M. Kumari, G. Nath, *Int. J. Eng. Sci.* 30, 35 (1992).
28. C.Y. Cheng, *J. Mech.* 22, 257 (2006).
29. C.Y. Cheng, *Int. Commun. Heat Mass Transfer* 34, 613 (2007).
30. M.A. Hossain, M.A. Alim, *Heat Mass Transfer* 32, 515 (1997).
31. M.A. Hossain, M. Kutubuddin, I. Pop, *Int. J. Heat Mass Transfer* 35, 307 (1999).
32. V.R. Prasad, A.S. Rao, O.A. B'eg, *Theor. Appl. Mech.* 41, 37 (2014).
33. G.W.S. Blair, *Nature* 183, 613 (1959).
34. A.L. Copley, *Apparent Viscosity and Wall Adherence of Blood Systems*, in *Flow Properties of Blood and Other Biological Systems*, edited by A.L. Copley, G. Stainsly (Pergamon Press, Oxford, UK, 1960).
35. N. Casson, *Rheology of disperse systems*, in *Flow Equation for Pigment Oil Suspensions of the Printing Ink Type. Rheology of Disperse Systems*, edited by C.C. Mill (Pergamon Press, London, UK, 1959) pp. 84–102.
36. M. Mustafa, T. Hayat, I. Pop, A. Aziz, *Heat Transfer-Asian Res.* 40, 563 (2011).
37. K. Bhattacharyya, *J. Thermodyn.* 2013, 169674 (2013).
38. S. Mukhopadhyay, K. Bhattacharyya, T. Hayat, *Chin. Phys. B* 22, 114701 (2013).
39. S. Pramanik, *Ain Shams Eng. J.* 5, 205 (2014).



40. M. Sheikholeslami, R. Ellahi, *Appl. Sci.* 5, 294 (2015) doi:10.3390/app5030294.
41. M. Sheikholeslami, M.M. Rashidi, Dhafer M. Al Saad, F. Firouzi, Houman B. Rokni, G. Domairry, J. King Saud University - Sci. (2015) doi:10.1016/j.jksus.2015.06.003.
42. M. Sheikholeslami, M.M. Rashidi, D.D. Ganji, *Comput. Methods Appl. Mech. Eng.* 294, 299 (2015).
43. M. Sheikholeslami, M.M. Rashidi, *Eur. Phys. J. Plus* 130, 115 (2015).
44. A. Malvandia, M.H. Ka□asha, D.D. Ganji, *J. Taiwan Inst. Chem. Eng.* 52, 46 (2015).
45. S. Qi, T. Furusawa, S. Yamamoto, *Int. J. Heat Mass Transfer* 85, 375 (2015).
46. M. Sheikholeslami, M.M. Rashidi, *J. Taiwan Inst. Chem. Eng.* (2015) DOI: 10.1016/j.jtice.2015.03.035.
47. A. Malvandi, D.D. Ganji, *Physica E* 66, 181 (2015).
48. M. Sheikholeslami, R. Ellahi, *Int. J. Heat Mass Transfer* 89, 799 (2015).
49. J.D. Faires, R.L. Burden, *Numerical Methods*, fourth edition (Cengage Learning, 2012).



SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL STUDIES ON MIXED LEGEND COMPLEXES OF FEW TRANSITION METAL IONS

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ABSTRACT

The synthesis and characterization of few mixed ligand complexes of the type $\{ m_1l_2 \}$ $m=co(ii), ni(ii), cu(ii), mn(ii) \&zn(ii)$ $L_1 = 1 - acetoacet-o-toluidide-4-phenyl-3-the o semicarbazone$ (primary ligand) $L_2 = 2-N-phenyl imino - 3 - phenyl - 4 - (p - hydroxyl phenyl) -4-$ thiozoline (co-ligand) are reported. I.R spectra suggest the co-ordination of azomethine nitrogen, enolic oxygen and thiol sulphur of primary ligand are taking part in coordination after enolization/thiolization. The secondary ligand is coordination by ring sculpture showing unidentate nature octahedral symmetry were assigned by magnetic and electronic study. Fungicidal activities – show that legend are more toxic these metal complexes.

INTRODUCTION

The important of mixed ligand complexes in medicinal analytical and industrial chemistry has led to a large number of reports in the formation of stabilities of mixed ligand complexes. The role of mixed ligand complexes in the biological process has well recognized. Mixed ligand complexes of transition metal containing ligand with N, and N,S,O donors are known to show interesting stereo chemical, electro chemical and electronic properties. Recently thiosemicarbazone has attracted the attention of many works due to their biological importance. However the survey of the literature revealed that no work has been done so far on mixed ligand, complexes of thiosemicarbazone as primary and thiazoline as secondary ligand. This paper deals with the preparation and characterization of mixed ligand complexes of few transition metal ions with 1-Acetoacet-o toluidide- 4- phenyl-3-thiosemicarbazone and 2-N-phenylimino-3 phenyl-4-(hydroxy phenyl) 4, the thiozoline. The ligand and their complexes were also screened for their fungicidal activity against various fungi viz *Phoma exigua*, *Colletotrichum capsici* and *Marcophoma phascoliat* different concentrations ie 100,50 and 20P Pm using growth method.

Material and Methods



All the reagents were used chemically pure of analytical reagent grade. Solvents were purified and dried according to the standard methods. The analyses of carbon, hydrogen and nitrogen were performed at CDRI Lucknow. IR spectra were recorded in KBr and electronic spectra were recorded from IIT Delhi. The magnetic measurements were done at IITRoorkee at room temperature using Mercury tetrathicyanate cobaltate as calibrant.

Preparation of Ligand and Complexes

The primary ligand (Schiff base) was prepared by the condensation of thiosemicarbazide with acetoacet-o-toluidide and thizoline was prepared using reported method. The desired mixed ligand complexes was prepared either by taking ethanolic solution of chlorides of Co(ii), Ni(ii), Mn(ii), Zn(ii), Cu(ii) and adding ethanolic solution of primary ligand and then ethanolic solution of secondary ligand was added or by reacting the various metal ions with primary ligand and then the complexes obtained was reacted with secondary ligand by refluxing it in appropriate solvents.

Result and Discussion

All the complexes are colored and quite stable in air. The analytical data shows that all the complexes are having (ml112) formula showing that the primary ligand is dibasic in nature.

On comparison of IR spectra of ligands with those of complexes it is found that both ligands are coordinated to the metal. IR spectra of the free ligand (thiosemicarbazone) shows two bands around 3450 and 3300 cm^{-1} due to ν_{as} and ν_{sym} of terminal $-\text{NH}_2$ group. These bands remain unchanged in the complexes showing the non-involvement of this group in complexation. The absorption due to $\nu_{\text{C=N}}$ of the free ligand appearing at 1625 cm^{-1} region undergoes a negative shift in the spectra of complexes showing that azomethine nitrogen is taking part in coordination. The band obtained around 1655 cm^{-1} assigned to $\nu_{\text{C=O}}$ disappear in the complexes and a new band appear at 1620 cm^{-1} shows the enolisation and subsequent coordination through deprotonated oxygen atoms. The band due to $\nu_{\text{C=S}}$ appear around 825 cm^{-1} in free ligand disappears on complexation and a new band appears around 720-745. This shows thioenolisation of $-\text{NH-C=S}$ group and coordination through deprotonated sulphur from .IR spectra data it is clear that the primary ligand behave as dibasic tridentate ligand. On comparison of the IR spectra of thiazoline with those of metal complexes it is found that except and band others remains practically on charged. The band observed in the region 690 cm^{-1} assigned to $\nu_{\text{C=S}}$ of thiazole ring shifted to lower frequency by 10-15 cm^{-1}



giving as indication that ring s-atom is coordinated to metal ion presence of a band in the region 315-290 cm assigned to m-s band also support that ring s is coordinating to metal ion.

Analytical Data of mixed ligand complexes of Co(ii), Ni(ii), Cu(ii), Mn(ii) & Zn(ii) with I-acetoacet-o-toluidide-4-phenyl-3-thiosemicarazone as primary and 2-N-phenylimino-3-phenyl-4-(p-hydroxy phenyl)-thiazoline as co-ligand.

Complex	% Found/cal.					
	C	H	N	S	Cl	M
[Co(C ₁₈ H ₁₈ N ₄ SO)(C ₂₁ H ₁₆ N ₂ OS)H ₂ O:Cl]	58.90 58.92	4.50 4.31	10.57 10.61	8.05 8.01	4.46 4.44	7.42 7.44
[Ni(C ₁₈ H ₁₈ N ₄ SO)(C ₂₁ H ₁₆ N ₂ OS)Cl:H ₂ O]	58.92 58.91	4.53 4.50	10.57 10.54	8.05 8.03	4.46 4.42	7.39 7.41
[Cu(C ₁₈ H ₁₈ N ₄ SO)(C ₂₁ H ₁₆ N ₂ OS)H ₂ O:Cl]	58.57 58.60	4.50 4.52	10.51 10.46	8.01 7.97	4.44 4.43	7.94 7.91
[Mn(C ₁₈ H ₁₈ N ₄ SO)(C ₂₁ H ₁₆ N ₂ OS)H ₂ O:Cl]	59.20 58.17	4.55 4.49	10.62 10.59	8.09 8.10	4.49 4.47	6.95 6.96
[Zn(C ₁₈ H ₁₈ N ₄ SO)(C ₂₁ H ₁₆ N ₂ OS)H ₂ O:Cl]	58.46 58.41	4.49 4.51	10.49 10.50	7.99 7.95	4.43 4.41	8.11 8.09

MAGNETIC MOMENT AND ELECTRONIC SPECTRAL STUDIES

Correlations of the magnetic and spectral properties of transition metal complexes derived from nitrogen and oxygen atom ligands have been reported by a number of workers.

Mn(ii) mixed ligand Complexes-

Mn(ii) ion in a weak octahedral field, would show para magnetism corresponding to five unpaired electrons having magnetic moment 5.92 B.M. with the ground-state $(t_{2g})^3(e_g)^2$ while in the strong field ligand would force two of the spins to pair leaving only one unpaired electron, hence such compounds exhibit magnetic moment 2.5B.M., a little larger than the spin only value in one unpaired electron. Since Mn(ii) ion has d^5 configuration; it is capable of forming spin free as well as spin paired complexes. Additional stability of half-filled d-shell, spin free complexes are most predominant. Since spin free Mn(ii) complex an orbitally non-degenerate to ground term, spin only magnetic moments of 5.92 B.M. is however, expected which will independent of temperature and stereochemistry. In the present course of study the complex shows magnetic moment in the range 8.5 suggesting, thereby, that it is spin free octahedral complex having five unpaired electrons. The absorption bands in the spectra correspond to the



spin forbidden transition from the ground state (A_1) to the levels arising from 4G , 4P & 4D excited states of the free ion. Further, three absorption bands due to transition to the levels arising from 4F state will occur in UV region. The energies 5A_1 , ${}^4E({}^4G)$ and ${}^4E(G)$, ${}^4A({}^4G)$ states are independent of $10Dq$ and depends only on B & C .

The colour of the complex is very pale pink. However the density of electronic transitions from the ground state to the state four fold multiplicity is very weak. The complex display three absorption band at 18550cm^{-1} , 22300cm^{-1} and 28060cm assigned to sextet quartet transitions ${}^6A_{1g} \rightarrow {}^4T_{1g}({}^4G)$ ($\square 1$), ${}^6A_{1g} \rightarrow {}^4E_g({}^4D)$ ($\square 2$), and ${}^6A_{1g} \rightarrow {}^4T_{1g}({}^4P)$ ($\square 3$) Respectively. The values of Dq , B and C have been computed using the equation suggested by Figgis and the values are 1850, 750 and 3000 respectively.

Cobalt (ii) mixed ligand complex

The magnetic moment of different types of $\text{Co}(\text{ii})$ complex lie in the range (i) 2.1-2.9 BM for square planer (ii) 4.2-4.8 BM for high spin five coordinated complexes. The observed magnetic moment for $\text{Co}(\text{ii})$ complex is 4.67 B.M which is used as a criterion to determine the type of geometry for $\text{Co}(\text{ii})$ complex. The electronic spectra of $\text{Co}(\text{ii})$ complex shows two band at 17860 and 18520cm^{-1} . These two bands are assigned to ${}^4T_{1g}(\text{F}) \rightarrow {}^4A_{2g}(\text{F})(\nu_2)$ and ${}^4T_{1g}(\text{F}) \rightarrow {}^2t_{2g}(\text{F})(\nu_3)$ transition respectively in an octahedral environment. The band ν_1 could not be observed due to the limited range of the instrument. However ν_1 would be calculated using band fitting procedures. The octahedral geometry is further supported by the values of ligand field parameter like Dq, B, C which are found as 949, 824, 0.85 respectively.

Ni(ii) mixed ligand Complex –

Six coordinated $\text{Ni}(\text{ii})$ ion bying $3d^8$ electronic configuration should exhibit a magnetic moment higher than expected for two unpaired electrons in hegral $2.98\text{-}3.22\text{BM}$ and tetrahedral $3.40\text{-}4.21\text{BM}$ complexes are as its square planer complexes would be diamagnetic. This increase in magnetic moment values from that of spin only value veen considered by Nyholm to be due to some mixing in upper via orbit coupling. The paramagnetism observed for complex is 2.88 BM at room temperature which is consistent with octahedral symmetry.

In a cubic field, the $3f$ ground stae of $\text{Ni}(\text{ii})$ ion split into levels, the orbital singlet $3A_2$ and the orbital triplet $3T_1$ and the first excited term of the free $\text{Ni}(\text{ii})$ ion $3P$ transition as under cubic symmetry.



Therefore, three spin allowed transitions $\square 1 [^3A_{2g}(F) \text{ ----- } ^3A_{2g}(F)]$, $\square 2 [^3A_{2g}(F) \text{ ----- } ^3A_{2g}(F)]$ $\square 3 [^3A_{2g}(F) \text{ ----- } ^3T_{1g}(P)]$ have been observed in present octahedral Ni(ii) complex appearing at 8180, 14200, 23925 cm⁻¹ respectively which are well established for the pority of octahedral Ni(ii) complex while the shoulder at 8500 near ν_1 and 15900 ν_2 are due to geometrical distortions non-identical donor atoms which cause departures from tahedral symmetry. However, the observed spin allowed trasnsitions agree well with these predicted by Liehr and allhausen energy level diagram for Ni (ii) ion in a ligand field of octahedral stereochemistry.

The value of B for the complex calculated from ν_1, ν_2 and ν_3 and energies and using diagonal sum rule $15B = \nu_2 + \nu_3 - 3\nu_1$ fall at 902cm⁻¹ (as against the free gaseous ion value of 1040 cm⁻¹). It has been shown that for Ni (ii) complex with an octahedral symmetry as $10Dq$ increase configurationalinterion between the high spin $3f1g(F)$ excited states generally lowers the ratio ν_2/ν_1 from the theoretical value of 1.80 to 1.50. the value ν_2/ν_1 for present complex comes out to be confirming octahedral symmetry for the complex.

CU(ii) mixed ligand Complex-

The cuprie ion has $3d^9$ configuration having one unpaired electron. Its complexes usually have simple square planer to tetragonally distorted octahedral stereochemistry. However, respectively of hesterechem,istryinvoved, the magnetic-moment has been found to be (with spin-orbit coupling of 550 cm⁻¹) about 1.92 BM. Genrally, octahedrallycooridinated Cu(ii) complexes have magnetic moments in the range of 1.90-2.20BM nad the value for Cu (ii) complex is 1.92 suggesting the distorted octahedral geometry.

The Cu(ii) complex shows board, asymmetric band at 16390 cm⁻¹. The broadness of the band may be due to dynamics John-Teller distortion. The observations suggest that the complex has distorted octahedral structure. The Dq value comes to be 1538.

Fungicidal Activity-

All the mixed ligand complexes tested for their antifungal activity phews that Cu(ii) complexes is active fungicides. The fungicidal action of Cu(ii) complex may be explained due to inactivation of enzymes. The other metal complexes are however not much fungi toxi for the particular fungi. Generally fungi toxicity enhanced with increase in the dose of complex. However a correlation between toxicity of mtels and their



ability to form stable chelates revealed the following order $Fu(ii) > Ni(ii) = Co(ii) > Mn(ii)$. It is evident from the toxicological data that toxicity of $Ni(ii)$ and $Co(ii)$ complexes is most equal $Cu(ii)$ complex possess maximum fungi toxicity.

References

- (1) Mrs. L.N. Sharda, M.C. Gauarkar and N. RawaRao. *J. India chev sec* 72 (1995) 439
- (2) J.chakraborty and RN patel *J.IndianChem sec* 73 (1996) 191
- (3) P.chattopadhyay, BK Dolui and C.swtu, *India J chem* 36A (1997)419
- (4) J.K. Nag and B.B De Das *J.Indiachev sec* 75 (1998) 496
- (5) A.knzietal *J.Indiachem sec* 77 (2000) 83
- (6) I.Kuboetal *PRio-os Med Chem sec* 77 (2004) 5343
- (7) Q. Zhavg.etal *J.Indiachem*, 18 (2002) 10
- (8) A.K alowi, A. Mauourni, G. Bisen out P.kefalas *food chem* 89(2005)27



KNOWLEDGE MANAGEMENT THROUGH DATA MINING

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ABSTRACT

Data mining is one of the most important steps of the knowledge discovery in databases process and is considered as significant subfield in knowledge management. Research in data mining continues growing in business and in learning organization over coming decades. This review paper explores the applications of data mining techniques which have been developed to support knowledge management process.

INTRODUCTION

There are various concepts of knowledge management. In this paper we use the definition of Knowledge Management by McInerney (2002):

“Knowledge management (KM) is an effort to increase useful knowledge within the organization. Ways to do this include encouraging communication, offering opportunities to learn, and promoting the sharing of appropriate knowledge artifacts”.

The discussion on the findings is divided into 4 topics:

- (i) Knowledge resource;
- (ii) Knowledge types and/or knowledge datasets;
- (iii) Data mining tasks; and
- (iv) Data mining techniques and applications used in knowledge management.

Applications of Data Mining have been widely used in various enterprises ranging from public health-care, construction industry, Food Company, retailing to finance. Each field can be supported by different data mining techniques which generally include classification, clustering, and dependency modelling.



In organization, knowledge is an important resource. Management of knowledge resources has become a strong demand for development. Discovering the useful knowledge has also significant approach for management and decision making.

In information era, knowledge is becoming a crucial organizational resource that provides competitive advantage and giving rise to knowledge management (KM) initiatives. Many organizations have collected and stored vast amount of data. However, they are unable to discover valuable information hidden in the data by transforming these data into valuable and useful knowledge. Managing knowledge resources can be a challenge. Many organizations are employing information technology in knowledge management to aid creation, sharing, integration, and distribution of knowledge. Knowledge management is a process of data usage. The basis of data mining is a process of using tools to extract useful knowledge from large datasets; data mining is an essential part of knowledge management. Wang & Wang (2008) point that data mining can be useful for KM in two main manners: (i) to share common knowledge of business intelligence (BI) context among data miners and (ii) to use data mining as a tool to extend human knowledge. Thus, data mining tools could help organizations to discover the hidden knowledge in the enormous amount of data.

DATA MINING

Data mining is an essential step in the knowledge discovery in databases (KDD) process that produces useful patterns or models from data. The terms of KDD and data mining are different. KDD refers to the overall process of discovering useful knowledge from data. Data mining refers to discover new patterns from a wealth of data in databases by focusing on the algorithms to extract useful knowledge.

Data Mining Tasks

Fayyad et.al. (1996) define six main functions of data mining:

1. Classification is finding models that analyze and classify a data item into several predefined classes.
2. Regression is mapping a data item to a real-valued prediction variable.
3. Clustering is identifying a finite set of categories or clusters to describe the data.
4. Dependency Modelling (Association Rule Learning) is finding a model which describes significant dependencies between variables.
5. Deviation Detection (Anomaly Detection) is discovering the most significant changes in the data.
6. Summarization is finding a compact description for a subset of data.

Data mining has two primary objectives of prediction and description. Prediction involves using some variables in data sets in order to predict unknown values of other relevant variables (e.g. classification, regression, and anomaly detection) Description involves finding human understandable patterns and trends in the data (e.g. clustering, association rule learning, and summarization).

KNOWLEDGE MANAGEMENT

This definition emphasizes the interaction aspect of knowledge management and organizational learning. Knowledge management process focuses on knowledge flows and the process of creation, sharing, and distributing knowledge. Each of knowledge units of capture and creation, sharing and dissemination, and acquisition and application can be facilitated by information technology.



As technologies play an important role in KM, technologies stand to be a necessary tool for KM usage. Thus, KM requires technologies to facilitate communication, collaboration, and content for better knowledge capture, sharing, dissemination, and application.

THE APPLICATIONS OF DATA MINING IN KNOWLEDGE MANAGEMENT

The reviews of previous articles has discussed on the applications of data mining to organizational knowledge management for effective capturing, storing and retrieving, and transferring knowledge. We divided the reviewed articles into four main groups: (i) knowledge resource; (ii) knowledge types and/or knowledge datasets; (iii) data mining tasks; and (iv) data mining techniques and applications used in KM.

Knowledge Resources

In the study, we divided knowledge resources into eight groups as that which knowledge object to be stored and manipulated in KM and how data mining aids.

1. Health Care Organization: this domain was a use of the disease knowledge management system (KMS) of the hospital case study. Data mining tool was used to explore diseases, operations, and tumours relationships. This tool used to build KMS to support clinical medicine in order to improve treatment quality.
2. Retailing: this was customer knowledge from household customers for product line and brand extension issues; data mining can help and propose suggestions and solutions to the firm for product line and brand extensions. This doing by extracting market knowledge of customers, brands, products, and purchase data to fulfil the customers' demands behaviour.
3. Financial/Banking: the domain knowledge covered financial and economic data; data mining can assist banking institutions making decision support and knowledge sharing processes to an enterprise bond classification.
4. Small and Middle Businesses (food company and food supply chain): there were two methods and processes to obtain knowledge resources: knowledge seeding-the relative knowledge to the problems; knowledge cultivating-the process to find the key knowledge from knowledge seeding. Data mining and knowledge management integrated can help making better decisions. As Death-On-Arrival (DOA) problem encountered in food supply chain networks (FSCN), Li et al. (2010) aimed to build Early Warning and Proactive Control (EW&PC) systems to solve such problems. Knowledge Base was an important part of EW&PC systems. It contained data analysis by managers and organizes in an appropriate way for other managers. Data mining methods were helpful for the EW&PC systems.
5. Entrepreneurial Science: the knowledge resource was research assets in a knowledge institution; there were three types of the research assets: research products, intellectual capital, and research programs. Data mining facilitated for knowledge extraction and helped guiding managers in determining strategies on knowledge-oriented organization competition.
6. Business: data collected from questionnaire, an intensive literature review, and discussions with four KM experts. Data mining can discover hidden patterns between KM and its performance for better KM implementations.



7. Collaboration and Teamwork: Worker's log and documents were analyzed each worker's referencing behaviour and construct worker's knowledge flow. Data mining techniques can mine and construct group-based knowledge flows (GKFs) prototype for task-based groups.
8. Construction Industry: a large part of this enterprise information was available in the form of textual data formats. This leads to the influence of text mining techniques to handle textual information source for industrial knowledge discovery and management solutions.

Data Mining Techniques/Applications Used in Knowledge Management

Within the context of articles reviewed, applications of data mining have been widely used in various enterprises ranging from public health-care, construction industry, Food Company, retailing to finance. Each field can be supported by different data mining techniques which generally include classification, clustering, and dependency modelling. We provided a brief description of the four most used data mining techniques including its common tools used and some references as follows:

Classification: Classification is one of the most common learning in data mining. This task aims at mapping a data item into one of several predefined classes. Examples of classification methods used as part of knowledge management include the classifying of the patients from primary health-care centers to specialists; the combination of the data mining and decision support approaches in planning of the regional health-care system; and the implementation of visualization method to facilitate KM and decision making processes. In the financial company, Cheng, Lu & Sheu (2009) implemented an ontology-based approach of KM and knowledge sharing in financial knowledge management system (FKMS) and applied the hybrid SOFM/LVQ classifier of clustering and classification data mining techniques to classify corporate bonds. For small and middle businesses: food company domain, data mining can improve decision-making by knowledge cultivating method namely Extenics and Extension data mining (EDM). This method was the integration of data mining and knowledge management, to develop a decision support system platform for better decisions. To solve the death-onarrival (DOA) in food supply chain networks, corporate manager selected variables that might have influence on DOA by using "decision tree" of data mining method; and used "neural network" to monitor potential DOA for prediction. In the business organizations with a large volume of works, such companies wanted to better understand what the hidden patterns between the KM and its performance, using the combination of data mining techniques: Bayesian Network (BN) classifier and Rough Set Theory (RST) in their business could help companies producing the KM to be performed effectively and achieve higher efficacy resulted. Common tools used for classification are decision trees, neural network, Bayesian network and rough set theory.

Clustering: This involved seeking to identify a finite set of categories and grouping together objects that are similar to each other and dissimilar to the objects belonging to other clusters. This technique has been applied in many fields, for example:

- **Healthcare:** clustering categories and attributes used in analyzing the similarities between community health centers.
- **Retailing:** clustering the segmentation for possible product line and brand extension to identify market to customer clusters;
- **Financial/Banking:** identifying groups of corporate bond clusters according to the industry and a specific segment within an industry; then tuning cluster data for each industry as a template for predicting rating changes.



- **Construction Industry:** clustering textual data to discover groups of similar access patterns.
- **Collaboration and Teamwork:** identifying groups of workers with similar task-related information needs based on the similarities of workers' knowledge flow.

Dependency Modeling: This concerned with finding a model that describes significant relationships between attribute sets. For example, it is widely used in healthcare to develop clinical pathway guidelines and provide an evidence-based medicine platform. In medical records management, it is helpful for clinical decision making. It could give better results in knowledge refinement through a use of this technique on the construction industry dataset; this technique used to mine customer knowledge from household customers. Common tools for dependency modeling are Apriori association rules and sequential pattern analysis.

CONCLUSION:

In organization, knowledge is an important resource. Management of knowledge resources has become a strong demand for development. Discovering the useful knowledge has also significant approach for management and decision making. As data mining is a main part of KM, this paper has identified ten articles related to data mining applications in KM, published between 2007 and 2012. This aims to give a research summary on the application of data mining in the KM technologies domain.

In this paper, we have shown that data mining can be integrated into KM framework and enhanced the KM process with better knowledge. It is clear that the data mining techniques will have a major impact on the practice of KM, and will present significance challenges for future knowledge and information systems research.

References:

1. Data Mining and Its Applications for Knowledge Management: Tipawan Silwattananusarn and Assoc.Prof. Dr. KulhidaTuamsuk.
2. www.ejkm.com/issue/download.html
3. www.sciencedirect.com/science/article/pii/S0167923600001238
4. www.ijser.org/researchpaper
5. <https://pdfs.semanticscholar.org/ecbd/ae0708257f25778c2f3b667d0215590c205f.pdf>
6. https://www.researchgate.net/.../264897841_Data_Mining_and_Knowledge_Management
7. www.em-dmkm.eu



EFFECT OF CUTTING PARAMETERS ON SURFACE FINISH AND NOISE PATTERNS FOR MACHINING OF EN-24 STEEL WITH TiAlN COATED TUNGSTEN CARBIDE INSERTS IN 3-AXIS VERTICAL END MILLING OPERATION

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1. Introduction

CNC machines are found to be very effectively beneficial and profitable in modern production floors and can be used for number of operations like end milling, face milling. One of them is EN-24 alloy steel which is employed for the manufacturing of axles and axle components, arbors, pinions and shafts, shafts and wheel. In industries surface finish is an important aspect of the end products produced. During this process of machining an unwanted sound (noise) is produced. There are different types of noise sources in industries. Some of them are noise arising during unloading and loading of material, transportation noise for the period when materials are moved from one shop to another, and most important and seriously affecting machining noise. When the operators work on the shop floor where a number of machines are simultaneously creating a humming sound. This annoying sound affects the health of the worker it causes insomnia as well as restlessness. Not only this but after some period of time when the workers get habituated to these noise levels then they become ineffective to these levels which can be dangerous to them in any emergency conditions. The parameters employed later in the further study are discussed below. The optimization of surface finish was done by varying different machining parameters and geometric cutting conditions on different materials.

The effect of usage of different coating inserts on tool wear and surface roughness was studied by **Medicus et al. [1]**. Also, **Silva et al. [2]**, **Siow et al. [3]** and **Fratila et al. [4]** performed milling operation on different material under different cutting conditions to investigate which cutting conditions give best surface finish. The effectiveness of different enclosures on machines to reduce the machining noise and reduction of 4-5dB was achieved by **Lai et al. [5]**

2. Materials and Methods

In this research, RMS statistical design was employed to validate the surface roughness effects of machined workpieces with noise parameters. The factors employed in the design for the validation were cutting speed (V), axial depth of cut (a_e) and radial depth of cut (a_d) as shown in table 1. Each factor's three levels were represented by '-1', '0', '1'. End milling operation was performed on the same cutting parameters on CNC 3-axis vertical milling machine with **Tungsten Carbide inserts** along with the **Titanium Aluminium Nitride (TiAlN) coating**.

**Table 1. Factors and Levels Selected For Machining Operation**

Factors	Levels		
	-1	0	1
Cutting speed (V) (m/min)	150	170	190
Axial depth of cut (a_e) (mm)	0.5	1	1.5
Radial depth of cut (a_d) (mm)	1	1.5	2

The matrix formed as a design of experiment through Response Surface Methodology Technique using MiniTab software as shown table 2.

Table 2. Matrix of Experimental Design

Block	Run Order	Std. Order	V <i>m/min</i>	a _e <i>mm</i>	a _d <i>mm</i>
1	1	8	190	0.5	1.0
1	2	18	170	1.0	1.0
1	3	13	190	1.0	1.5
1	4	2	170	1.0	1.5
1	5	6	190	1.5	1.0
1	6	1	170	1.0	1.5
1	7	7	170	1.0	1.5
1	8	10	170	1.0	1.5
1	9	16	150	0.5	1.0
1	10	12	170	1.0	1.5
1	11	3	190	0.5	2.0
1	12	4	170	0.5	1.5
1	13	9	170	1.0	1.5
1	14	14	150	1.0	1.5
1	15	15	170	1.0	2.0
1	16	17	150	1.5	1.0
1	17	11	150	0.5	2.0
1	18	19	190	1.5	2.0
1	19	5	170	1.5	1.5
1	20	20	150	1.5	2.0

The above table contains the sets of different combinations and each combinations represents one trial. There are 6sets of trials which are being repeated, but all the trials were performed so total 20 sets of experiments were executed.



2.1 Workpiece material

The material here used was En-24. The American AISI/SAE name of EN-24 is 4340. The material was hardened upto 45-50 HRC or (450±5 HV) from its actual hardness of 25/33HRC or (255/311HV) through case hardening on overall dimension. The dimension of the workpiece taken was 100*135*25(length*width*height) in mm. The mechanical properties and the chemical composition of EN-24 observed after spectroscopy results are shown in table 3 and 4, respectively.

Table 3: Mechanical Properties of En-24 alloy steel

Hardness	Melting point	Density	Tensile Strength	Yield Strength	Elastic modulus
25-33HRC	1427°C	7.85g/cc	75MPa	470MPa	190-210GPa

Table 4: Chemical composition of En-24 alloy steel

Chemical Compound	Percentage
Carbon, C	0.394
Iron, Fe	96.98
Manganese, Mn	0.650
Silicon, Si	0.215
Sulphur, S	0.015
Phosphorous, P	0.013
Chromium, Cr	1.015
Molybdenum, Mo	0.271
Vanadium, V	0.025
Copper, Cu	0.000
Tin, Sn	0.000
Titanium, Ti	0.000
Tungsten, W	0.000
Cobalt, Co	0.000
Aluminium, Al	0.000

2.2 Cutting Tools and Machining Centre



The set of experiments were performed on the 3-axis vertical CNC milling machine with the continuous flow of lubricant or cutting fluid. The tool is kept constant and the work table is moving in X- and Y- axis. The tool movement is controlled through Z-axis. The feed was given in positive y-axis to give different radial depth of cuts. Similarly, feed in Z-axis is given to give different axial depth of cuts.

The details of **Sandvik Coromant tool** used during end milling are given below in table 5. In the sets of milling experiments only this tool was used and to tool holder used was from **Birla Kennametal**. Since mainly surface roughness and noise co-relation is studied therefore similar inserts were again and again used under different cutting conditions.

Table 5: Technical Information regarding Milling Cutter used

Items	Cutter Description
Tool Holder	Hydro-Grip Adapter T40-SHYD20-095M
Inserts	Tungsten Carbide
Coating Material	Titanium Aluminium Nitride (Ti-Al-N) Coating
Tool Holder Diameter	20mm
Number of Tooth	2
Inserts Dimensions(l*w*h)	11*6*3 (in mm)

3. Experimental Procedure

3.1. Noise Measurements: The noise level was recorded through Sound Level Meter (SLM) i.e. **SC-310**. The sound level meter used in this study is SC-310 (make: CESVA) and it consists of the following specifications as mentioned in table 6.

Table 6: Specification of Sound Level Meter

Specifications	Parameters
Modules	Spectral Analyser module in 1/1 octave band(31.5Hz-16kHz) and 1/3-octave bands(25Hz-10kHz), FFT analysis(20-1000Hz)
Sound level meter mode	A-, Z-, C- frequency weightings (0-160dB), Percentiles with A-weighting
Dimension	341x82x19 mm
Weight	550gm
Resolution	0-1dB
Minimum frequency range	0.5Hz

3.2. Surface Roughness Measurement: The surface roughness tester used to measure different parameters like Ra, Rz, Rq was **MITUTOYO SJ-400** surface roughness tester. It is a contact type surface



roughness and evaluated results can be easily measured on a touch-panel LCD Monitor. The specification of surface roughness tester is depicted in table-7.

Table-7: Specifications of Surface Roughness Tester

SPECIFICATIONS	PARAMETERS
Measuring Method	Skidless/ Skid Measurement
Cut-off length	0.08, 0.25, 0.8, 2.5, 8mm
Measuring Speed	0.05, 0.1, 0.5, 1.0mm/s
Returning Speed	0.5, 1.0, 2.0 mm/s
Measuring Range	800μm, 80μm, 8μm
Detection method	Differential inductance method
Minimum resolution	0.000125μm
Stylus tip	Corn 90°, Radius 5μm, Diamond
Measuring force	4mN
Skid force	Less than 400mN

4. Results and Discussion

The correlation between noise levels and surface roughness is done along with the analysis and statistical modelling of average surface roughness R_a using response surface methodology. As discussed in chapter 3, the set of experiments were performed, the required effect of different machining parameters like velocity V , axial cut depth a_e and radial cut depth a_d on surface roughness parameters is optimised as well as correlation between noise and surface roughness parameters is also examined. The analysis was done on EN-24 an alloy steel using tungsten carbide inserts with TiAlN coating on 3-axis vertical CNC milling centre to obtain the 1/1 octave band frequency spectrum using sound level meter SC-310 and also the average surface roughness parameter with the help of SJ-400.

4.1. Analysis of Noise Levels

The investigation of sound level was carried on different levels of velocity (150, 170 & 190 m/min), axial cut depth (0.5, 1 & 1.5 mm), radial cut depth (1, 1.5 & 2 mm).

The observations regarding equivalent sound level of different weighting were recorded. Along with this surface roughness values were also acquired for all the levels. The data of sound level and surface roughness of different weighting are presented in table 8 and 9, respectively.



The values of A-weighting sound level were corrected using background correction factor as done by Altinas and Chan [6]. The background correction factor was employed only if difference between sound level with and without machining were lesser than 10dB. If not then correction factor was not employed. For correction factor equation 4.1 was employed.

$$L_{Ac} = 10 \times \log \left(10^{(L_A/10)} - 10^{(L_{AWM}/10)} \right) \quad 4.1$$

Table 8: Mean values of A-Weighting Sound Level

Std. Order	V m/min	a_e mm	a_d mm	R_a μm	L_{AWM} $dB A$	L_A $dB A$	Δ $(dB A)$	L_{Ac} $dB A$
8	190	0.5	1.0	0.0933	70.0	81.7	11.7	81.7
18	170	1.0	1.0	0.1079	72.7	81	8.3	80.3
13	190	1.0	1.5	0.116	72.7	84	11.3	84
2	170	1.0	1.5	0.1230	70.0	75.9	5.9	74.6
6	190	1.5	1.0	0.1234	70.0	77.1	7.1	76.1
1	170	1.0	1.5	0.1285	72.8	80.9	8.1	80.1
7	170	1.0	1.5	0.1314	72.8	85	12.2	85.0
10	170	1.0	1.5	0.1367	70.0	74.7	4.7	72.9
16	150	0.5	1.0	0.1450	72.7	81	8.3	80.3
12	170	1.0	1.5	0.1477	72.7	73.8	1.1	67.3
3	190	0.5	2.0	0.1490	72.8	82.5	9.7	82.0
4	170	0.5	1.5	0.1550	70.0	82.7	12.7	82.7
9	170	1.0	1.5	0.1575	72.8	77.5	4.7	75.7
14	150	1.0	1.5	0.1670	72.7	82.8	10.1	82.8
15	170	1.0	2.0	0.1764	72.7	82.9	10.2	82.9
17	150	1.5	1.0	0.1780	72.7	83.6	10.9	83.6
11	150	0.5	2.0	0.1950	72.7	78.3	5.6	76.9
19	190	1.5	2.0	0.1986	72.7	74.4	1.7	69.5
5	170	1.5	1.5	0.2043	72.8	81.2	8.4	80.52
20	150	1.5	2.0	0.2832	72.7	78.6	5.9	77.3

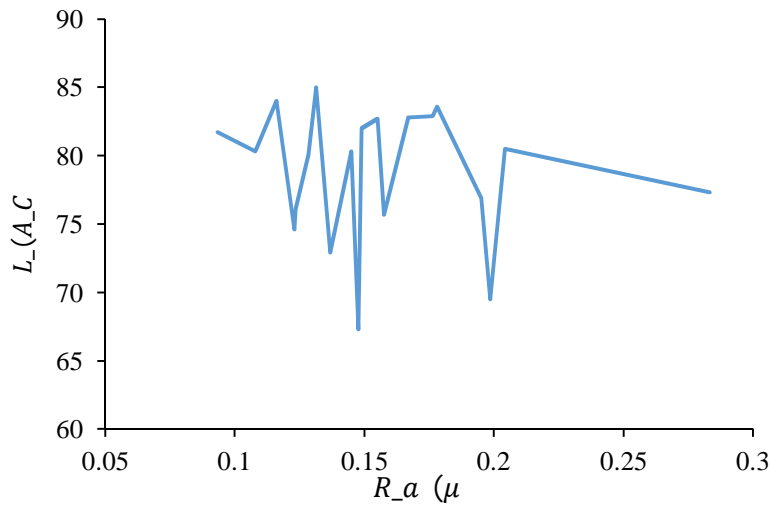


Figure 1 : Plot between L_{A_C} and R_a

Similarly background correction factor were applied for Z-weighting sound level L_Z . The Z-weighting sound level is also correlated with the average surface roughness as Z-weighting sound level gives the absolute values of sound level. After that final graph was drawn between them. To get the final values with Z-weighting corrected values equation 4.2 was used.

$$L_{Z_C} = 10 \times \log \left(10^{(L_{Z_M}/10)} - 10^{(L_{Z_{WM}}/10)} \right) \quad 4.2$$

Table 9: Values Regarding Z-Weighting Sound Level

Std. Order	V (m/min)	a_e (mm)	a_d (mm)	R_a (μm)	$L_{Z_{WM}}$ (dBZ)	L_{Z_M} (dBZ)	Δ (dBZ)	L_{Z_C} (dBZ)
8	190	0.5	1	0.0933	71.6	82.6	11.0	82.6
18	170	1	1	0.1079	74.1	86.0	11.9	86.0
13	190	1	1.5	0.1160	74.1	86.1	12.0	86.1
2	170	1	1.5	0.1230	71.6	78.2	6.6	77.1
6	190	1.5	1	0.1234	71.6	78.4	6.8	77.4
1	170	1	1.5	0.1285	76.2	88.4	12.2	88.4
7	170	1	1.5	0.1314	76.2	86.0	9.8	85.5
10	170	1	1.5	0.1367	71.6	77.2	5.6	75.8
16	150	0.5	1	0.1450	74.1	85.6	11.5	85.6
12	170	1	1.5	0.1477	74.1	76.5	2.4	72.8
3	190	0.5	2	0.1490	76.2	83.0	6.8	81.9
4	170	0.5	1.5	0.1550	71.6	84.6	13	84.6
9	170	1	1.5	0.1575	76.2	79.8	3.6	77.3



14	150	1	1.5	0.1670	74.1	86.1	12	86.1
15	170	1	2	0.1764	74.1	85.6	11.5	85.6
17	150	1.5	1	0.1780	74.1	76.5	2.4	72.8
11	150	0.5	2	0.1950	74.1	83.0	8.9	82.4
19	190	1.5	2	0.1986	74.1	75.9	1.8	71.2
5	170	1.5	1.5	0.2043	76.2	86.4	10.2	86.4
20	150	1.5	2	0.2832	74.1	80.0	5.9	78.7

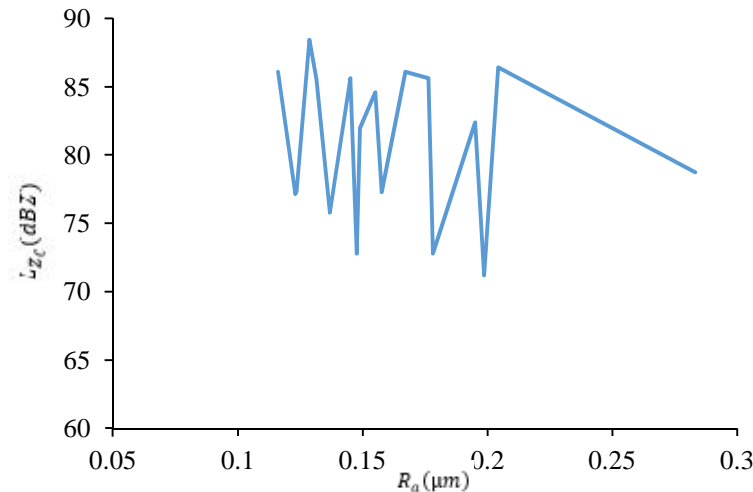


Figure 2: Plot between L_{ZC} and R_a

It could be deduced from the above graphs as shown in figure 1 and 2 that no direct relationship exist between L_{ZC} and R_a . To evaluate the relationship between average surface roughness R_a parameter and A-weighting L_{AC} as well as Z-weighting L_{ZC} sound level, Pearson correlation in Minitab software was employed. The results obtained from the software were:-

- i. Pearson correlation of R_a and L_{AC} = -0.152
- ii. Pearson correlation of R_a and L_{ZC} = -0.214

The above results indicated that sound level and surface roughness values have small correlation between them. The negative sign designated that the values were inversely proportional to each other.

4.2.ANOVA Table

Since no such perfect relationship was derived from the plots of average surface roughness parameter R_a along with the sound levels. Therefore, statistical modelling was done to optimize the average surface roughness parameter and to determine its effect on different machining parameters. The statistical data of ANOVA for surface roughness is presented in table 10 and R-square value came out to be 95%.

Table. 10: Data for analysis of variance of $R_a(\mu\text{m})$

Source	DOF	Seq SS	Adj SS	Adj MS	F	P
Regression	9	0.033682	0.003742	0.003742	32.27	0.000
Linear	3	0.027123	0.000708	0.000236	2.04	0.173
Square	3	0.005573	0.005573	0.001858	16.01	0.000



Interaction	3	0.000987	0.000987	0.000329	2.84	0.092
Residual Error	10	0.001160	0.001160	0.000116		
Lack-of-Fit	5	0.000327	0.000327	0.000065	0.39	0.836
Pure Error	5	0.000833	0.000833	0.000167		
Total	19	0.034842				

Regression analysis was applied on the above generated values of average surface roughness values R_a so that percentage contribution of different machining parameters on surface roughness can be comprehended as shown in table11. Along with that, the regression equation to find the coefficients associated with the parameters was also derived.

The regression equation is presented below:

$$R_a = 0.073 + 0.00157V - 0.204a_e + 0.106a_d - 0.000006V^2 - 0.0070a_d^2 + 0.143a_e^2 + (0.0374 a_d \times a_e) - (0.000519a_e \times V) - (0.000304 a_d \times V)$$

Table.11: Contribution of each factor on Surface Roughness

S No.	Source	Seq. SS	Percent contribution
1	V	0.008289	25
2	a_e	0.00626	19
3	a_d	0.012574	37
4	V^2	0.001622	5
5	a_d^2	0.000435	1
6	a_e^2	0.003516	10
7	$V \times a_e$	0.000215	1
8	$V \times a_d$	7.38E-05	0
9	$a_d \times a_e$	0.000698	2

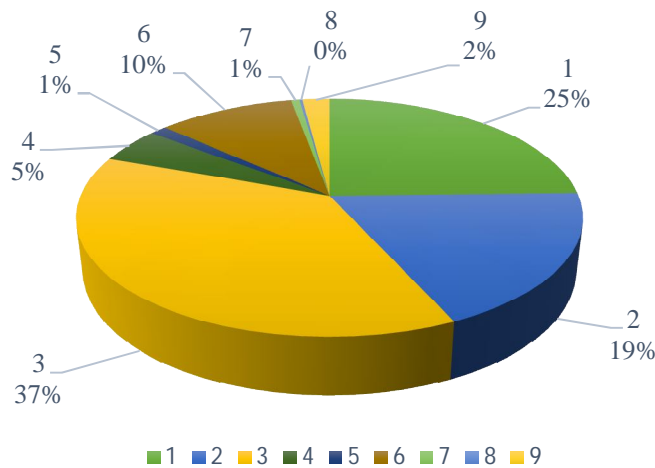




Figure3 : Pie-Chart of Contribution of Different Parameters

Perusal of figure 3 inferred that the contribution of radial depth of cut contribution was maximum on the surface roughness followed by velocity, axial cut depth and other interaction factors.

The following trend of radial cut depth was observed as rise in radial cut depth leads to the high extent of material removal rate and also vibrations increase surface roughness of the material.

Due to increase in velocity the surface roughness decreased because at low spindle speed built-up-edges were formed or chip fracture which yielded poor surface finish. Whereas, if the cutting speed was increased built-up-edges (BUE) would vanish along with the decrease in chip fracture. The third factor axial cut depth also had substantial effect upon the surface quality. If depth of cut was increased cutting resistance also increased along with the amplitude of vibrations and cutting temperature. Due to this quality of the work-piece degraded.

The main plots of velocity, axial cut depth, and radial cut depth with respect to surface roughness parameter R_a were also evaluated as shown in figure 4 (a,b,c).

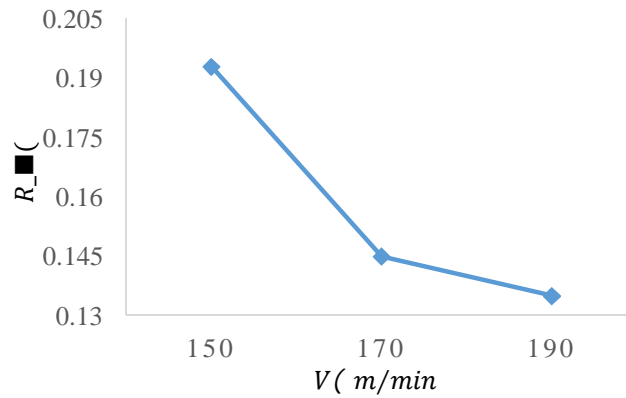


Figure 4a : Effect of velocity on surface roughness

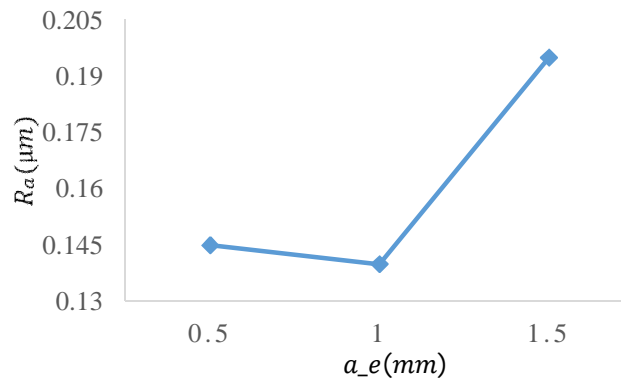


Figure 4b : Effect of axialcut depth on surface roughness

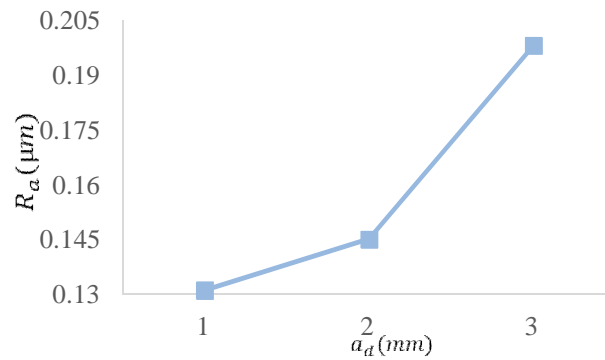


Figure 4c : Effect of radialcut depth upon surface roughness

Interaction of dual factors of each parameter on surface roughness values were also observed. The observation made from figure 5 indicated that the surface roughness was minimum or best surface finish was at velocity 190m/min and 1mm axial cut depth.

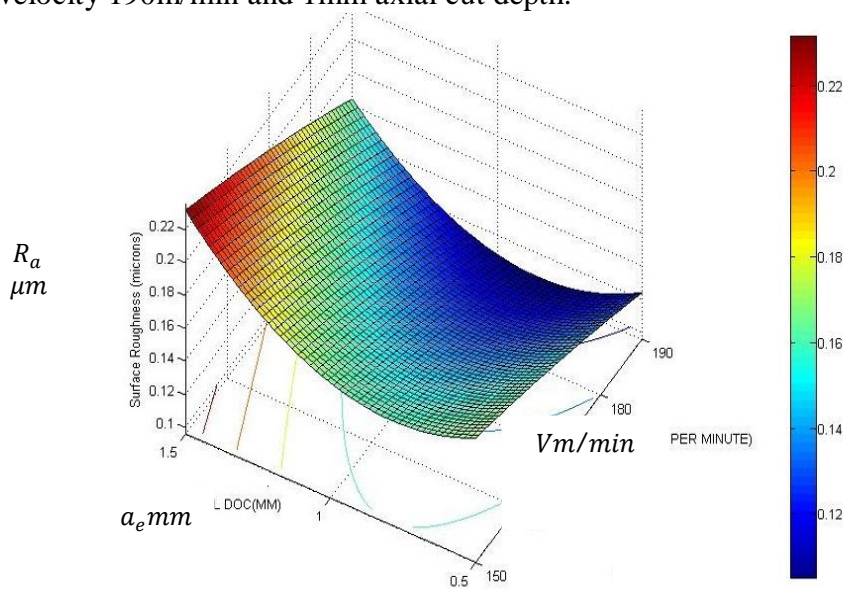


Figure 5 : Dual effect of axial depth of cut (a_e) and velocity (V) on average surface roughness (R_a)

From Figure 6 it was observed that surface roughness was minimum or best surface finish was at radial cut depth at 1mm and 1mm axial cut depth.

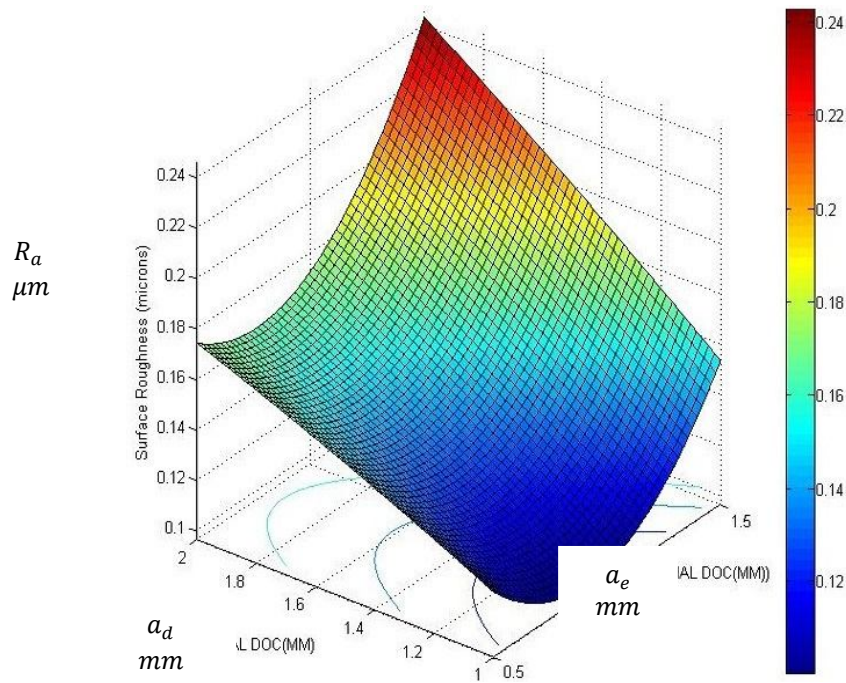


Figure 6: Dual effect of axial depth of cut (a_e) and radial depth of cut (a_d) on surface roughness (R_a)

It could be observed from the figure7 that surface roughness was minimum or best surface finish was at radial cut depth at 1mm and velocity 190m/min.

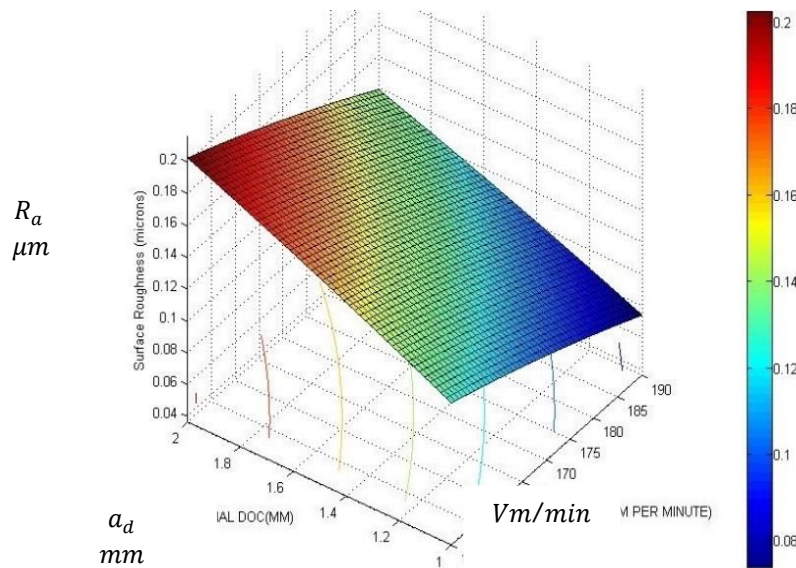


Figure 7 : Dual effect of radial depth of cut (a_d) and velocity (V) on average surface roughness (R_a)



The graphs presented in figure 4 to7 highlighted that minimum surface roughness could be obtained at velocity 190m/min, axial cut depth 1mm and radial cut depth 1mm.

The best surface roughness value as shown in table 12 obtained was 0.0933 μm which was achieved at 190m/min velocity, 1mm radial cut depth, 0.5mm axial cut depth but noise level was quite high 81.7dBA. This much noise is frequently noticed on busy urban roads. On the other hand the minimal sound level 67.3dBA was achieved at 170 m/min velocity, 1.5mm radial cut depth, 1mm axial cut depth with average surface roughness of 0.1477 μm .

Table .12: Surface Roughness Values

Std. Order	a_d (mm)	V (m/min)	a_e (mm)	R_a (μm)	L_{Ac} (dBA)
18	1	170	1	0.1079	80.3
8	1	190	0.5	0.0933	81.7
4	1.5	170	0.5	0.155	82.7
2	1.5	170	1	0.123	74.6
1	1.5	170	1	0.1285	80.1
7	1.5	170	1	0.1314	85
10	1.5	170	1	0.1367	72.9
12	1.5	170	1	0.1477	67.3
9	1.5	170	1	0.1575	75.7
13	1.5	190	1	0.116	84

In the above selected range of minimum surface roughness and less noise level occurred at standard order 8 and 12. Along with this optimal parameters investigated through statistical modelling were also measured. The readings are depicted in table 13.

Table 13: Optimized values of machining parameters

a_d	V	a_e	R_a	L_{Ac}
1.0	190	1.0	0.1367	76.2
1.5	170	1.0	0.1866	67.3
1.0	190	0.5	0.1587	77.0

Now it could be verified from the table 13 that the minimum surface roughness values was obtained at 190m/min velocity, 1mm radial cut depth, 1mm axial cut depth with the 76.2dBA sound level. Since the surface finish obtained was best that mainly desired by the industries and sound level was also in the range set by the INDIAN STANDARDS as stated by Pathak et al [7]. According from the Indian Standards the sound level in industrial area should be 75dBA during day time from 6:00 am to 10:00 pm and 70dBA during night time from 10:00 pm to 6:00 am.



In these selected set of readings as shown in table 13 for machining velocity ranged from $170\text{m}/\text{min}$ to $190\text{m}/\text{min}$ only at 1.5mm radial cut depth the various values of surface roughness were observed in the range of $0.0933\ \mu\text{m}$ to $0.1575\ \mu\text{m}$ which was found in a significant range for the industries.

At the same time the sound level observed at $170\text{m}/\text{min}$ velocity, 1.5mm radial cut depth, 1mm axial cut depth was 63.7dBA and found to be quite less compared to sound level observed in other set of values.

So it was concluded that since the surface roughness values were not varying much according to the industrial point of view so the best values could be obtained from $170\text{m}/\text{min}$ - $190\text{m}/\text{min}$ velocity, 1mm - 1.5mm radial cut depth and 0.5mm - 1mm axial cut depth.

From the above discussion it can be concluded that if online condition monitoring is required for EN-24 alloy steel being machined by tungsten carbide using TiAlN coating on 3-axis CNC milling centre then these optimized values of machining parameters can be used with less health hazards to the operators.

On contrary if surface roughness near about $0.15\ \mu\text{m}$ is acceptable then machining parameters ranging $170\text{m}/\text{min}$ velocity, 1mm axial cut depth, 1.5mm radial cut depth can also be employed. The operators working in such environment will also be less affected with health problems generated due to high noise levels.

5. CONCLUSIONS

1. No perfect relationship was derived from the plots of surface roughness parameter along with the sound levels.
2. The radial cut depth was revealed increase in radial cut depth that leads to the high extent of material removal rate and vibrations increased the surface roughness of the material.
3. Increased velocity decreased the surface roughness because at low spindle speed built-up-edges were formed or chip fracture which yielded poor surface finish.
4. Axial cut depth had significant effect on the surface quality.
5. It is concluded that the minimum surface roughness obtained was at $190\text{m}/\text{min}$ velocity, 1mm axial cut depth and 1mm radial cut depth and the sound level recorded was also 76.2dBA which was under bearable according to the INDIAN STANDARDS.

6. REFERENCES

1. K. M. Medicus, M. A. Davies, B. S. Dutterer, C. J. Evans, and R. S. Fielder, "Tool Wear And Surface Finish In High Speed Milling Of Aluminum Bronze", Operations, Materials And Manufacturing Processes, vol. 05, pp 255-268, 2011
2. R. B. Da Silva, J. M. Vieira, R. N. Cardoso, H. C. Carvalho, E. S. Costa, A. R. Machado, and R. F. De Avila, "Tool wear analysis in milling of medium carbon steel with coated cemented carbide inserts using different machining lubrication/cooling systems", Wear, vol. 271(9–10), pp2459–2465,2011.
3. P. C. Siow, S. Dayou, and W. Y. H. Liew, "Investigation of the Tool Wear and Surface Finish in Low-Speed Milling of Stainless Steel Under Flood and Mist Lubrication", Journal of. Machining Science and Technology, vol. 15(3), pp 284–305, 2011.



4. D. F. Fratila and C. Caizar, "Assessment of Cooling Effect and Surface Quality to Face Milling of AlMg3 Using Several Cooling Lubrication Methods", *Journal of Material and Manufurture Processes*, vol. 27(3), pp 291–296,2011.
5. J.C.S. Lai, C. Speakman, H. M. Williamson, "Control of shear cutting noise - effectiveness of enclosures", *Applied Acoustics*, vol.58, pp 69-84, 1999.
6. Y. Altinas and P. K.Chan, "In-process detection and suppression of chatter in milling.", *Journal of Machine Tools and Manufacture*, vol. 32(3), pp 329-347, 1992.
7. A. Al-Habaibeh and N. Gindy, "A new approach for systematic design of condition monitoring systems for milling processes", *Journal of Materials Processing Technology*, vol.107, pp 243-251, 2000.



DESIGN OF HYBRID RENEWABLE ENERGY SYSTEMS FOR REMOTE VILLAGES

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ABSTRACT

With the technological and economical advancement India is perceptive an extraordinary growth all told aspects. but development of rural regions remains a region of concern. nearly 75th of population of the country lives in these regions and usually face the matter of electricity shortage. This greatly affects their development potential thereby promoting migration to cities . The paper discusses how hybrid renewable energy systems may be viewed as a promising answer to those issues.

I. INTRODUCTION

Energy has always been the crucial factor for technology as well as economic upleftment of developing country like India. Electricity is not a luxury good reserved only for rich countries, but an essential precondition for fulfilling basic human needs. However, in India almost 71% of population living in rural areas. Now a days it has become gravely look for the solutions outside from the conventional sources and dependence on national grid. Conventional sources are costly, causes for numerous disease, affect natural climate and have various reasons to avoid conventional sources. Consequently, with all concern it is essential to introduce HE. HE reduces dependency on fossil fuel and provide clean and green energy which is environment free. This paper give emphasis to establish a reliable autonomous hybrid system using renewable energy sources system with the optimization of the components size and the improvement of the capital cost. This hybrid energy system consists of PV and diesel-electric generator accompanied with battery and diesel generator for emergency backup considering uncertain availability of these weather dependent sources. A rural village in India has been taken as the case study. As a first step, have done some field survey and conclude with availability of renewable sources, life style, demographic statistics, solar radiations, waste management etc. Then, the entire scheme is simulated in HOMER.



HYBRID POWER SYSTEM MODEL

THE need for energy-efficient electric power sources in remote locations is a driving force for research in hybrid energy systems. Power utilities in many countries around the world are diverting their attention towards more energy efficient and renewable electric power sources. Reasons for this interest include the possibilities of “taxes” or other penalties for emissions of greenhouse gases as well as other pollutants plus the finite supply of fossil fuels. The use of renewable energy sources in remote locations could help reduce the operating cost through the reduction in fuel consumption, increased system efficiency and reduced noise and emissions. Hybrid power systems are often more cost effective than utility grid extensions mainly due to the high cost of transmission lines. In this model PV, wind and other renewable sources of energy are being integrated with DEGs to help reduce the fuel consumed by the DEGs. This paper presents a model based on an existing hybrid electric power system for a remote location. The remote terminal unit allows for remote data collection and system control while also providing information necessary for modeling the hybrid power system. The RTU and the model can be used to optimize the performance of the hybrid power system. MATLAB Simulink™ is used to model the system and apportion the electrical production between the PV and diesel electric generator. Simulations are performed for three cases: 1) diesel only, 2) diesel-battery, and 3) PV. The results of the simulations are used to perform an economic analysis and predict the environmental impacts of integrating a photovoltaic (PV) array into diesel-electric power systems for remote villages. The economics part of the model calculates the fuel consumed, the kilowatt-hours (kWhrs) obtained per gallon of fuel supplied, and the total cost of fuel. The environmental part of the model calculates the CO₂, particulate matter (PM), and the NO_x emitted to the atmosphere. These results are then utilized to calculate the energy payback, the simple payback time for the PV module, and the avoided costs of CO₂, NO_x, and PM.

Background & Previous Work

In this section previous literature related to micro grids renewable scenario is described. The baseline of government report describe condition of isolated villages to understand socioeconomic conditions, recommended a proper drinking water supply system, irrigation facility, and electricity coverage either through the national grid or renewable energy for isolated villages. As per Rural Energy Policy :

- To reduce dependency on traditional energy and conserve the environment by increasing access to clean and cost effective energy in rural areas.
- To increase employment and productivity through
- the development of rural energy resources.
- To increase the living standards of the rural population by integrating rural energy with social and economic activities.



DESIGN OF HYBRID RENEWABLE ENERGY SYSTEMS

A. technology selection and unit sizing In this designing stage, the system's configuration is synthesized, i.e. which types of generation technologies will be allocated and integrated to build a hybrid system. This is very crucial aspect in the design, since there are usually many alternative possibilities related to which individual components will be included in a hybrid energy system

For a given hybrid energy system, this design stage would be to determine:

- The type of renewable energy system to be included.
- The number and capacity of renewable energy units to be installed.
- Whether a back-up unit, such as diesel generator, fuel cell etc. would be included in the system.
- Whether energy storage would be integrated into the system.

The selection of the technology depends on the availability of renewable resources for particular site where the system is to be installed in which the local weather conditions play an important role for taking decision. Based on the weather statistics (hourly data), a feasibility study for different possible combinations of renewable sources is studied using optimization techniques to get the optimum configuration. Then the number and size of the selected components is optimized in order to get an economical, efficient, and reliable system. Component sizing is important and widely and extensively studied. Several factors or constraints directly influence the sizing of the system components e.g. system economics, greenhouse emission requirements, and system reliability. Over sizing of the components may lead to high system cost and therefore, the system may become economically unviable. On the other hand, under sizing will reduce the initial cost but one has to compromise with system reliability. Design of hybrid energy systems has been extensively studied and numerous optimization techniques, such as linear programming, Genetic algorithms, etc. have been employed for the optimum economic and reliable design of hybrid systems. Recently, many software packages, such as HOMER, RETScreen, Hybrid, and HOGA have been developed for the proper selection of suitable generation technologies and their sizes. These software packages have made the study of hybrid systems interesting and easier. Some of studies address only the reliability analysis for the design of hybrid systems while others consider various types and sizes of the available generation resources for the reduction of investment costs, fuel costs, and to improve system operations.

B. Integration scheme *IB. Stand-alone hybrid systems* Various possible configurations may be used for integration of the energy sources that form hybrid system are shown in fig. 1.

□ Series hybrid system, this can be of two forms centralized dc-bus and centralized ac-bus. In centralized dc-bus, all the energy sources, storage devices, and loads are connected to a dc-bus through appropriate electronic devices as shown in fig.1 (a). The dc-bus eliminates the need for frequency and voltage controls of individual sources connected to the bus and the power supplied to the load is not interrupted when



diesel generator starts DC loads can be directly connected to the dc-bus which reduces the harmonics from the power electronic devices. DC-bus configuration has low efficiency limitation because in case of both source and load are AC, the power passing through two stage conversions. Another limitation, the inverter must be rated for the peak load requirements and in case of inverter failure results in complete power loss to the load. In centralized ac-bus, all the energy sources, storage devices, and loads are connected to an ac-bus through appropriate electronic devices as shown in fig.1 (b). It is modular configuration, which facilitates the growth to manage the increasing energy needs. It offers major constraint in the synchronization of the inverters and ac sources to maintain the voltage and frequency of the system. The undesired harmonics introduced into the system by the use of inverters increases the level of power quality problems.

□ Parallel hybrid system, in this configuration the ac sources and loads are directly connected to ac-bus. While the dc sources and loads are directly connected to dc-bus. Bidirectional converter connects both the buses to permit the power flow between them. The inverter rating required is less than that of series configuration and the efficiency is higher. In addition, for the same inverter rating as that used in series configuration, the power supplying capacity of the parallel configuration is much more [Solanki]. Thus, Such configuration arrangement increases the system reliability and ensure the supply continuity.

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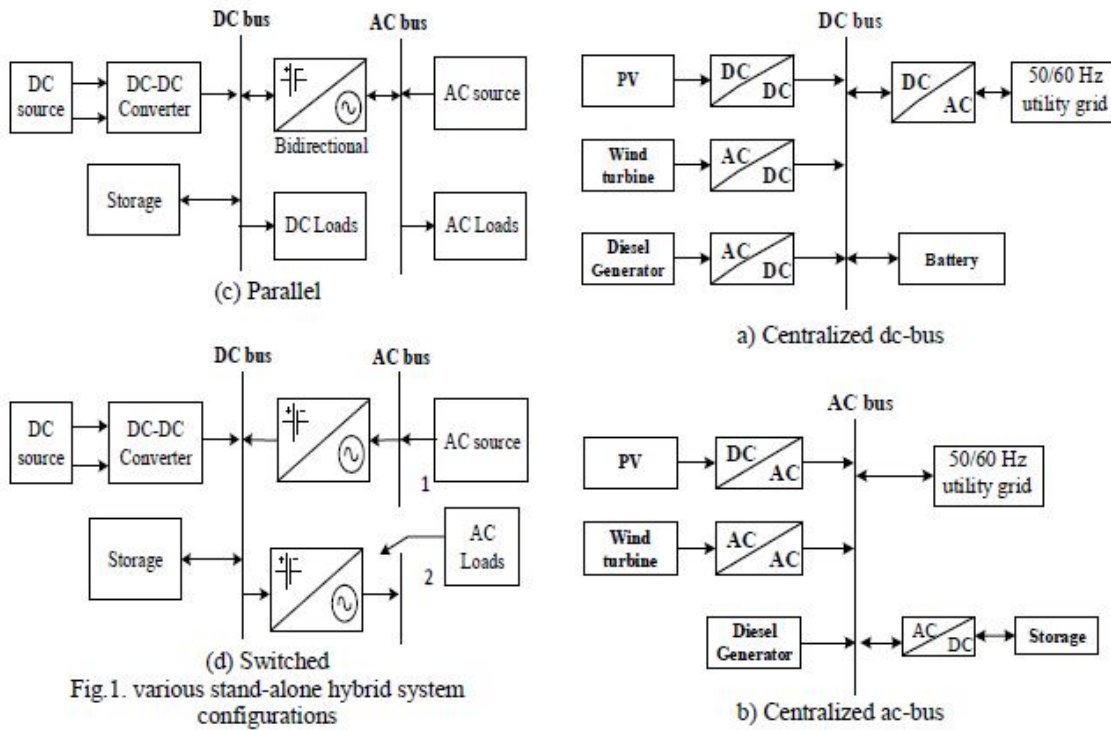


Fig. 1. various stand-alone hybrid system configurations

However, synchronization between the output voltage of the inverter and ac bus is needed. Switched hybrid system as shown in fig.1 (c), in which the ac sources, such as diesel generator, can directly be connected to the load leading to higher efficiency and synchronization in not needed. This configuration, although popular, has several limitations that only one of the sources is connected to the load at a given instance. Furthermore, during switching between the sources, the power is interrupted.

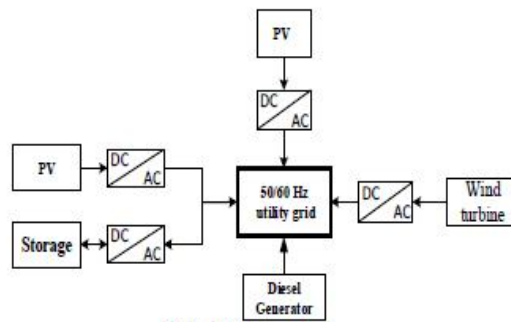
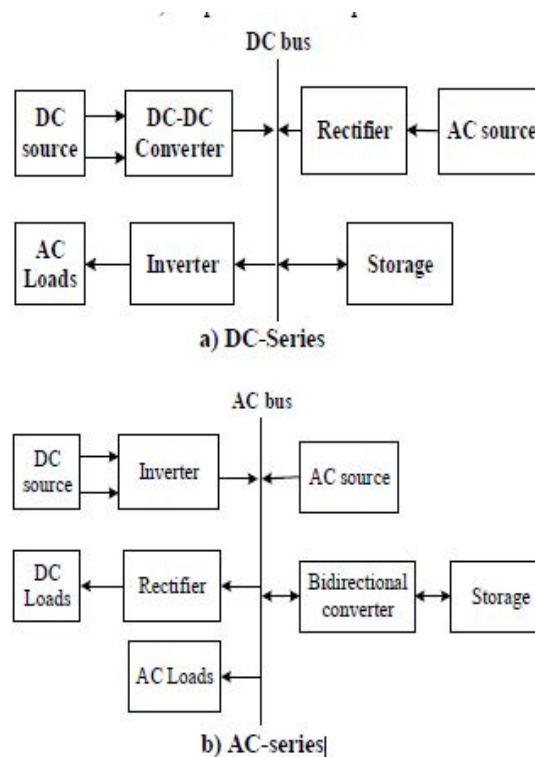


Fig. 2. various stand-alone grid connected hybrid system configurations.

IIB. Grid connected systems Different grid connected configurations are shown in fig. 2. The choice of the layout for particular location depends upon geographical, economical, and technical factors.



- Centralized dc-bus architecture shown in Fig. 2(a). The ac energy sources, such as wind and diesel generator, firstly deliver their power to rectifiers to be converted into dc before being delivered to the main dc bus bar. An inverter, main, takes the responsibility of feeding the ac grid from this dc bus.
- Centralized ac-bus architecture shown in Fig. 2(b), the sources and the battery all are installed in one place and are connected to a main ac bus bar, through appropriate power electronic devices, before being connected to the grid. This system is centralized in the sense that the power delivered by all the energy conversion systems and the battery is fed to the grid through a single point.
- Distributed ac-bus architecture shown in Fig. 2(c), the power sources do not need to be installed close to each other, and they do not need to be connected to one main bus. The sources are distributed in different geographical locations and connected to the grid separately. The power produced by each source is conditioned separately to be identical with the form required by the grid.



ADVANTAGES OF HYBRID SYSTEMS

A hybrid energy system can make use of the complementary nature of various sources, which increases the overall efficiency of the system and improve its performance (power quality and reliability). For instance, combined heat and power operation, e.g. MT and FC, increases their overall efficiency & or the response of an energy source with slower dynamic response (e.g. wind or FC) can be enhanced by the addition of a storage device with faster dynamics to meet different types of load requirements.



- 2- Lower emissions: hybrid energy systems can be designed to maximize the use of renewable resources, resulting in a system with lower emissions.
- 3- Acceptable cost: hybrid energy systems can be designed to achieve desired attributes at the lowest acceptable cost, which is the key to market acceptance.
- 4- They provide flexibility in terms of the effective utilization of the renewable sources.

ISSUES WITH HYBRID RENEWABLE ENERGY SYSTEMS

Though a hybrid system has a bundle of advantages, there are some issues and problems related to hybrid systems have to be addressed:

- 1- Most of hybrid systems require storage devices which batteries are mostly used. These batteries require continuous monitoring and increase the cost, as the batteries life is limited to a few years. It is reported that the battery lifetime should increase to around years for the economic use in hybrid systems.
- 2- Due to dependence of renewable sources involved in the hybrid system on weather results in the load sharing between the different sources employed for power generation, the optimum power dispatch, and the determination of cost per unit generation are not easy.
- 3- The reliability of power can be ensured by incorporating weather independent sources like diesel generator or fuel cell.
- 4- The stability issue. As the power generation from different sources of a hybrid system is comparable, a sudden change in the output power from any of the sources or a sudden change in the load can affect the system stability significantly.
- 5- Individual sources of the hybrid systems have to be operated at a point that gives the most efficient generation. In fact, this may not occur due to that the load sharing is often not linked to the capacity or ratings of the sources. Several factors decide load sharing like reliability of the source, economy of use, switching require between the sources, availability of fuel etc. Therefore, it is desired to evaluate the schemes to increase the efficiency to as high level as possible.

CONCLUSION

This paper provides a summary of available approach and those currently under research for optimal design of hybrid RE/AE energy systems. Different approach for system configuration of hybrid system are presented. Current status and future trends of RE power generation technologies have been discussed. The comprehensive list of references at the end of paper is included at the end of the paper for further research.

REFERENCES

- [1]. Ministry of Finance report 2015
- [2]. India Infrastructure report 2008



- [3]. Chedid R, El Khoury H. Design of a Hybrid Wind-PV-Fuel Cell System for Powering a Desalination Plant. 2007 IEEE Power Engineering Society General Meeting [Internet]. Institute of Electrical & Electronics Engineers (IEEE); 2007 Jun; Available from: <http://dx.doi.org/10.1109/pes.2007.385440>
- [4]. IEEE Power and Engineering Society-General Meeting Feb.9.2011,Arpa-E,Doe USA,MSE Italy, European Commission-Energy-Caffese plan and Consortium
- [5]. Elistratov V.V, Hybrid system of Renewable Energy Sources with Hydro Accumulation
- [6]. Sreeraj, E.S. et al., “Design of isolated renewable hybrid power systems”. Sol. Energy (2010).
- [7] Reliability Criteria in Optimal Sizing of Stand-alone Hybrid Wind-PV- Battery bank System.
- [8] Rahman S, Kwa-sur T. A feasibility study of photovoltaic-fuel cell hybrid energy system. IEEE TransEnergy Convers 1988; 3(1):50–5
- [9] Optimization methods applied to renewable and sustainable energy: A review



A SECURITY AWARE SERVICE DISCOVERY FRAMEWORK IN PERVASIVE COMPUTING ENVIRONMENTS

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ABSTRACT

In today's Web surroundings, computerized world is seeing the introduction of a progressive processing worldview called inescapable or pervasive registering that guarantees to profoundly affect the way clients connect with PCs, gadgets, physical spaces, and different clients. Inescapable processing is intended to take out time and place hindrances by making administrations accessible to clients at whatever time and anyplace. Due to the various quantities of administrations which are accessible in unavoidable situations, the nearness of administration revelation is a need to help clients to find and use their fancied administrations. Be that as it may, handling security issues such as saving exchanged data solid and private, in administration disclosure prepare in unavoidable conditions is a requesting undertaking. In this paper, we propose a safe system to bolster benefit disclosure in inescapable processing conditions. The proposed system can bolster productively security with various used aspects of the pervasive security.

Keywords: Security, Pervasive Computing, Authentication, privacy , Service discovery

I. Introduction

Amid the most recent decade of second thousand years another thought was presented in software engineering and advanced world. This thought was called later, Pervasive Computing. Pervasive or Inescapable registering has been examining since 1993[1].



From the earliest starting point of the new thousand years, this idea has been realized more than past and turned out to be more sensible than a fantasy. The consider Pervasive Computing was distributed by American researcher Mark Weiser in his book "The PC for the 21st Century" in 1991. He specified in his book [1] making the PC vanish from the eyes of the general population, in a way that individuals can't feel the nearness of PC is the point of unavoidable figuring. In the other words, one of a definitive objectives of unavoidable registering is the acknowledgment of figuring individuals situated. The primary distinction of inescapable conditions contrasted and the customary ones is the propelled registering idea of individuals situated and omnipresent.

Additionally, benefit disclosure as key process in such situations to offer sought administration as per clients' inclinations ought to be gone to. As specified in [2], "Benefit disclosure is the way toward finding suppliers promoting administrations that can fulfill an administration ask determined by an administration purchaser". What's more, as indicated by [3], benefit revelation is the way toward finding a reasonable benefit for a given undertaking. To be sure, the employment of administration disclosure is finding and associating with administrations. It can be broken down into the undertakings of depiction, spread, determination, furthermore, association. Also, attributable to the nature and vision of inescapable figuring some key difficulties and issues exist which some of them are recorded as expressed in [4,5,6,8], for example, the broadened registering limit, adjusting non intrusiveness what's more, security quality, setting mindfulness, protection and security issues, and portability, dynamism, and flexibility. In this paper, we concentrate on security issues which unavoidable situations are confronted with them. In administration disclosure handle, without considering security, everybody can abuse any accessible administrations gave by administration suppliers. Be that as it may, now and then, offered administrations are significant and vital for specialist co-ops and approved clients just ought to utilize them. In this way, we propose a structure to bolster some security procedures, for example, verification and approval (as a piece of responsibility prepare) in administration revelation to address the specified issue. Along these lines, approved clients just in light of validation framework can utilize exhibited administrations considering their predefined benefits as far as approval framework.

To accomplish this structure, the current systems identified with administration disclosure and good with inescapable registering situations has been explored and broke down. For this situation, we have attempted to get helpful purposes of them and utilized in the proposed structure. Moreover, for verification and



approval parts, the state-of the craftsmanship arrangements which are good with unavoidable situations are used.

The indication of this paper is organized as takes after: first of all, some foundation data of related issues is given. From that point forward, in the Section 3 as specialized center of this paper, the proposed structure is talked about. Taking after this, in Section 4 the execution procedure of the proposed system is portrayed. In the following segment, related works furthermore, examination are introduced. At last, this paper is closed with a conclusion and future work.

II. PRELIMINARIES

This part tries to give more clarifications and points of interest concerning essential bearings of this examination specifically inescapable processing, benefit disclosure and validation what's more, approval ideas.

a) Pervasive Computing Respects to the advances in innovation, unavoidable processing has turned into a hot and vitalize field of PC science. Unavoidable registering, likewise called omnipresent processing, underlines especially on the amalgamation of processing ability and human's living conditions [7]. Besides, the worldview of inescapable figuring speaks to pervasive registering conditions which make accessible at whatever time and anyplace access to data administrations while making the nearness of the framework imperceptible to the client. Inescapable processing imagined by Mark Weiser risen at the conjunction of innovative work in a number of zones which incorporate implanted gadgets and frameworks, remote correspondences, and dispersed, portable what's more, setting context aware processing [9].

In addition, as indicated by [10], inescapable processing can be characterized as technique for correcting PC use by making numerous PCs accessible all through the physical condition, yet making them adequately undetectable to the client. Making of central client and application arranged registering condition is a noteworthy nature of omnipresent registering. Considering this, inescapable processing gives an intriguing vision for next registering era. As it is expressed in [5,9], the significant elements of such conditions can be recorded as takes after:

- I. Extending registering limits
- II. Invisibility and non-intrusiveness
- III. Creating smart and sentient aware spaces
- IV. Context mindfulness



V. Mobility and flexibility

B. Service Discovery

The idea of heterogeneity in unavoidable figuring is a standout amongst the most vital criteria which without this, the universal figuring get to be distinctly futile. Since there are heaps of heterogeneous gadgets in unavoidable situations, as well as they can't impart together through same arrangement, it appears they have to one instrument to actualize interoperability idea among heterogeneous gadgets. This idea is known as Service Discovery. As computerized world

move toward unavoidable conditions, benefit revelation ended up to a basic component to get to network benefits in inescapable situations since individuals day by day life may be soaked with several different installed computational gadgets and administrations which give data to them without requiring their dynamic consideration. Concerning issue, Weiser M. called attention to in his book: "Administration disclosure is essential to unavoidable figuring since administrations in a inescapable condition may not generally be discernable to the client through traditional means; including physical faculties what's more, virtual area. At its center, inescapable processing endeavors to give administrations while being as unpretentious as possible"[11].

Subsequently, the objective of administration disclosure is to give the best benefit choices, of the numerous that might be accessible, to the element fancying the administrations and help in correspondence with those services[3]. As per the exhibited benefit revelation structure in the last reference, each administration revelation handle disintegrated into four nuclear segments included:

I. Service Description

II. Service Location

III. Service Selection

IV. Service Interaction

There are loads of endeavors that endeavor to illuminate the administration disclosure issue in inescapable situations by presenting a few plans from different viewpoints. As it is expressed in [12], the creators sorted administration revelation models based on security and protection highlights. They are characterized into two classifications included secure and non secure administration revelation models as takes after:

I. Service revelation models without security

II. Secure administration revelation models



- III. Infrastructure-based security
- IV. Infrastructure-less security
- V. Smart space subordinate security
- VI. Hardware upheld security

The proposed structure can be arranged in the first class of secure administration revelation models.

C. Verification and Authorization

Verification and approval as two imperative parts of the procedure of responsibility to bolster security in administration disclosure process ought to be considered. The short definition as it said in [13,14] for verification and approval are given in this segment.

At the point when a personality required approving, it is obligation of a procedure which checks and test that claim. This procedure called Authentication. It requires that the subject gives extra data that must precisely relate to the character demonstrated. Once a subject is validated, its get to must be approved. The procedure of approval ensures that the asked for movement or protest get to is conceivable given the rights and benefits relegated to the verified character. Moreover, the undertaking of approval is to show who is trusted to perform particular operations.

Moreover, Matsumiya K. et al. [15] wrote in their paper: "Registering condition encompassing individuals are getting to be distinctly inescapable and omnipresent populated with versatile gadgets and different machines. With the utilization of these gadgets, clients can get to computational assets with expanded portability. In such a situation, clients need to confirm and approve themselves to different frameworks as they move." Due to this reality, the confirmation and approval prepare necessities to finish inside a certain timeframe to support portability of the clients. Moreover, to diminish their weight, it ought to require just a little measure of contribution from them. In this way, a dynamic verification and approval system that decreases the weight of the clients is required.

III. THE PROPOSED FRAMEWORK

As it is expressed before, this examination established as far as three headings as takes after:

- I. Pervasive Computing
- II. Service Discovery
- III. Authentication and Authorization as a security viewpoint



Hence, the proposed structure with respect to secure benefit disclosure in inescapable registering situations is displayed in this segment. In the first place, building configuration is talked about as for administration revelation and security issues. Next, segments of the proposed system are given. Furthermore, execution prepare with respect to the recommended configuration is displayed in Section IV.

A. Framework Design

The point of the building configuration is to accomplish a protected benefit revelation in inescapable processing situations. Considering this reality, the plan gets motivation from two models in particular Splendor [16] and PKASSO [17]. In expansion, to fulfill the plan and make it more thorough, the Context Aware Role Based Access Control (CA-RBAC) [18], is proposed to be utilized as a part of the model. The valuable qualities of both outlines are utilized to enhance the proposed outline. Presenting an intermediary in administration disclosure is the reason that Splendor is being abused in the outline. In addition, PKASSO presents another and productive innovation for Public Key Infrastructure (PKI) rather than customary one to use in unavoidable processing conditions. The compositional outline of the proposed system is represented in Figure. 1.

With respect to issues of displayed design, they can be characterized in two classifications as takes after which are talked about in detail along these lines:

1) Service Discovery Issues

Considering administration revelation part, there are three segments: Directory, Service Proxy and Third-party Server. During the time spent administration disclosure in inescapable figuring situations, registry is a basic segment furthermore, assumes a key part. Administrations enlist with registries and customers inquiry registries, so that, indexes give administrations to customers. At that point, registries reserve benefit data and answer customers' questions. Once coordinated administration records get from indexes, customers select and contact administrations, a great many that begin off to utilize administrations. Also, outsiders servers can be accustomed to outsourcing the administration. Up until now, security issues are not considered in this circumstance and each administration can be asked and utilized by everybody. Without a doubt, benefit intermediary is presented in administration disclosure in support of security issues which are talked about top to bottom in the accompanying segment.

2) Security Issues

To give security, confirmation and approval are vital for framework clients. Consequently, benefit intermediary used to empowering administrations to do them effectively through conveying with



validation and approval segments. In addition, common confirmation between each combine correspondence, privacy, trustworthiness, non-disavowal and administration approval are considered as security issues in plan. In expansion, in support of secrecy, uprightness and nonrepudiation, encryption and computerized signature systems are connected.

All interchanges with administrations ought to be finished through administration intermediaries and in the wake of setting up a safe correspondence amongst customer and administration, customer can use offered benefit specifically. To accomplish these security issues, a blend of different open and symmetric key advancements are connected. since symmetric key encryption is significantly speedier than open key encryption, open key systems are connected for computerized signature and key administration. While symmetric key strategies are executed for information encryption and information honesty. Subsequently, there are two arrangements of open keys for each part as takes after:

- I. One for encryption and decryption use
- II. One for marking and confirmation utilize

B. Segments of Proposed Framework

As it is delineated in Figure 1, there are a few segments in the proposed system. Truth be told, each of said segments performs predefined errand which will be portrayed in the accompanying:

I) Directory

It is a fundamental part for service discovery in pervasive environments that administration revelation in inescapable situations that without thinking of it as, customer can't know and advise about various offered benefits in inescapable situations. Moreover, index is a committed part that keeps up administration data, inquiries of procedures and declarations and answer customer's inquiries. It may report its open testament too and therefore customers and administrations can utilize it to check and verify registry. Also, index can give extra usefulness, for example, secure declarations what's more, questions and confirm customers' and administrations' characters.

II) Service Proxy

It is a trusted server for administrations which request that it handle enrollment, verification and approval for them. Considering administration intermediary, once registries declare themselves to administrations, they forward this declaration to intermediary for confirmation. Besides, when indexes are questioned by the customers, they may get a few administrations spoken to by administration intermediary. Thus,



customers need to reach benefit intermediary at first and afterward contact to the administration. One might say that safe administration disclosure in unavoidable registering situations can't be accomplished barring administration intermediary.

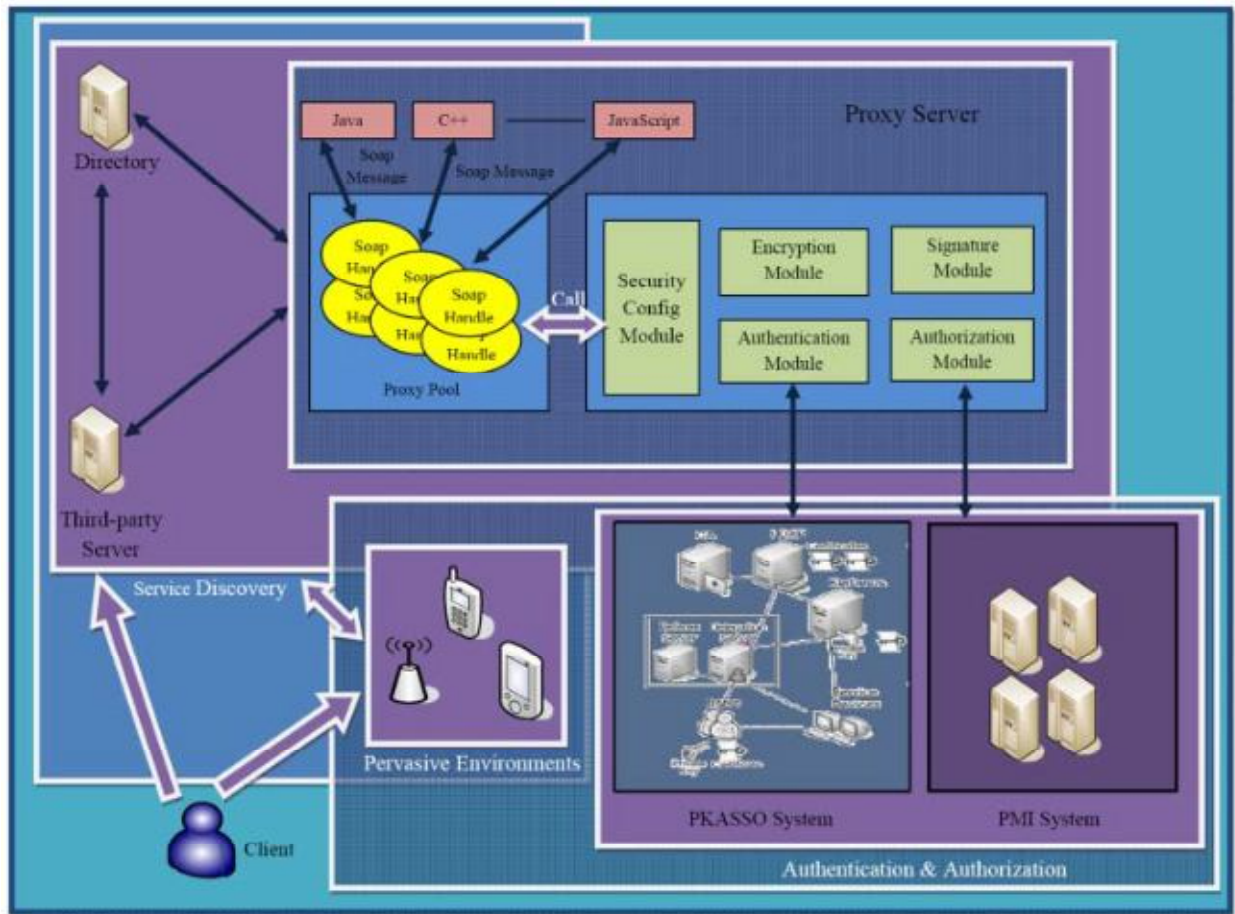


Figure 1: Framework Design

III) Third-party Server

With a specific end goal to give security in big business situations servers might be utilized to store and look after client data. In this manner, framework clients ought to be confirmed what's more, approved to utilize benefits through connecting with those servers. For a few conditions, for example, shopping centers where clients don't have accounts on the frameworks, outsider server might be connected to verify commonly between each correspondence combine included customer benefit, customer catalog, benefit intermediary, customer intermediary and intermediary catalog. Actually, outsider servers are accustomed



to outsourcing the administration. What's more, they might be trusted or untrusted servers and with regard to other criteria, they can be on the web or disconnected.

IV) PKASSO

Regarding giving an undeniable security arrangement customized for pervasive situations, it is expected to apply new security innovations. The confirming part which is utilized as a part of the proposed design depends on new what's more, enhanced PKI framework, in particular, PKASSO. It is improved with the single sign-on (SSO) and appointment innovation which is utilized specifically for inescapable registering conditions where have cell phones with limited calculation control. The point of PKASSO is offloading the common verification and the affirmation approval stage from a customer, particularly cell phone, to the framework [17]. As indicated by the correlation amongst PKASSO and other accessible arrangements is finished by creators of PKASSO, it is the most perfect PKI innovation concerning inescapable figuring nature. Diminishing the dormancy time and supporting all security administrations "i.e." single sign-on, verification, computerized signature, non-denial and secure key dissemination are the reasons that PKASSO is utilized as a part of the outline.

5) PMI

The last segment to support of security which has been utilized as a part of the suggested configuration is Privilege Management Framework (PMI). It can be founded on Context-Aware Role Based Access Control (CA-RBAC) [18] which is good with inescapable situations. Benefit intermediary can characterize a few security strategies, for example, what part can call the administration, when the customer can call the administration et cetera and appoint get to levels to customer through PMI too. Moreover, benefit approval depends on the benefit levels and versatile benefits just keep a few levels. If there should arise an occurrence of changing the strategy, it will be influenced just on intermediary's side and no arrangement synchronization is important at the administration's side.

IV RELATED WORK AND DISCUSSION

In both industry and the scholarly world, a few examines on benefit disclosure have been finished. In this manner some administration disclosure conventions have been proposed which can be displayed as related work as follows:

"Bluetooth Service Discovery Protocol (SDP)" [21] is a some portion of the Bluetooth particular which empowers close devices to speak with each other effortlessly and low control utilization. Bluetooth Security characterizes a profile for benefit disclosure applications and administration data is just presented



to a gadget that shares a typical mystery with the administration. In unavoidable registering situations, it might be badly arranged or even infeasible that two gatherings require sharing a mystery in advance.

"General attachment and play (UPnP)" [22,23] is from Microsoft Corporation and it is a gadget situated administration disclosure convention. UPnP Security characterizes collaborations not just among PCs additionally among PCs, individuals, what's more, surroundings. In addition, it bolsters numerous approval strategies because of UPnP Security is intended for heterogeneous gadgets and administrations.

"Secure Service Discovery Service (SSDS)"[24], is a brought together security arrangement which bolsters verification, approval, information and administration protection, and uprightness.

Catalogs known as Service Discovery Service servers are trusted. They are confirmed by customers and administrations for benefit queries and declarations, individually. SSDS is useful for big business situations where clients and administrations will open data to focal registries.

Besides, "Wonder" [16] is tag-based area mindful benefit revelation convention which underpins roaming clients and benefits out in the open conditions. It stresses on security for example, common verification and administration approval and underpins security.

Be that as it may, our approach contrasted with different arrangements, is more perfect with inescapable conditions due to utilizing the new PKI-based validation convention "i.e." PKASSO as opposed to a traditional PKI which is talked about in area III-B. As an occasion, the SSO and appointment innovation which is utilized specifically for inescapable figuring situations can't be seen in above related works.

Furthermore, security and protection bolster in existing administration disclosure conventions are still in initial phases of research and every single related work said above can't meet new security components and determinations of unavoidable registering situations. This happened attributable to condition changing and considering this reality, the traditional arrangements and advancements won't have the capacity to handle such condition issues. Accordingly, it is expected to thoroughly consider the new correction of existing arrangements which are good with unavoidable conditions highlights.

VI CONCLUSION and FUTURE WORK

In this paper, progressing take a shot at the advancement of a secure administration disclosure approach in unavoidable registering situations has been condensed. Firstly, the meaning of inescapable processing, benefit revelation and confirmation furthermore, approval (as security viewpoint) are displayed.

From that point forward, the proposed system has been presented. The key commitment of this examination can be expressed as takes after: 1) Focusing on the administration intermediary and examines



interior structure of it in light of the administration intermediary as an essential part to bolster security issues in system outline. 2) Empowering PKASSO as a moved forward PKI innovation as a confirmation procedure for pervasive conditions to give common confirmation with respect to the secure system outline. 3) Empowering PMI in view of context aware part based get to control as approval process particularly in unavoidable situations.

In any case, shortcomings are unavoidable in a plan and numerous ranges talked about in this paper would profit by facilitate endeavors. Along these lines, a few bearings can be considered as future works for this examination as takes after: 1) Proposing a foundation less structure configuration to be more good and near inescapable registering ideas.

2) Enhancing the security issues of plan through applying trusted based arrangements and systems to security parts of outline. 3) Applying administration arrangements and semantic Web administrations to administration revelation part and researching the security contemplations and issues.

Also, usage of the proposed structure as a model is at present under scrutiny and we are wanting to execute and approve it in view of a contextual pervasive investigation

REFERENCES

- 1] M. Weiser, "Hot topics-ubiquitous computing", *Computer*, 1993, 26 (10):71–72.
- [2] I. Constantinescu, W. Binder, and B. Faltings, "Service Composition with Directories", *SC 2006*, Springer LNCS 4089. 163–177, 2006.
- [3] M.S. Thompson, "Service discovery in pervasive computing environments", PhD thesis, Virginia Polytechnic Institute and State University, 2006.
- [4] Roshan K. Thomas and Ravi Sandhu, "Models, Protocols, and Architectures for Secure Pervasive Computing: Challenges and Research Directions", *Proceedings of the Second IEEE Annual Conference on Pervasive Computing and Communications Workshops (PERCOMW'04)*, 2004.
- [5] Roy Campbell, Jalal Al-Muhtadi, Prasad NaldurgGeetanjaliSampemane, and M. Dennis Mickunas, "Towards Security and Privacy for Pervasive Computing", *Springer LNCS 2609* 1-15,2003.



- [6] Y.V. Reddy, “Pervasive Computing: Implications, Opportunities and Challenges for the Society”, West Virginia University, Morgantown, WV 26508, USA,2006.
- [7] W. Xu, Y. Xin, and G. Lu, “A System Architecture for Pervasive Computing”, Third International Conference on Natural Computation (ICNC 2007) Volume 5 : 772 – 776, 24-27 Aug. 2007.
- [8] G. Robert, et al., “A system architecture for pervasive computing”, in Proceedings of the 9th workshop on ACM SIGOPS European workshop: beyond the PC: new challenges for the operating system. 2000, Kolding, Denmark: ACM.
- [9] Stan Kurkovsky, “Pervasive computing: past, present and future”, ITI 5th International Conference, 16-18 Dec. 2007, 65-71.
- [10] Hua Wang, Yanchun Zhang, and Jinil Cao, “Access control management for ubiquitous computing”, ScienceDirect Future Generation Computer Systems 870-878, August 2007.
- [11] Mark Weiser, “The Computer for the 21st Century”, Scientific American, September 1991, 265 (3):94 – 104.
- [12] Sh. Ahamed and M. Sharmin, “A Trusted-based Secure Service Discovery (TSSD) model for pervasive computing”, Computer Communication Journal, Elsevier, August 2008.
- [13] S. Harris, “All-In-One, CISSP Certification”, Third edition, McGraw- Hill, Sep.2005.
- [14] J. M. Stewart, E. Tittel, and M. Chaaple, “Certified Information Systems Security Professional”, Third edition, SEBEX, 2005.
- [15] K. Matsumiya, S. Aoki, M. Murase, and H. Tokuda, “Active Authentication for pervasive computing environments”, Springer LNCS 2609.28-41, 2003.
- [16] F. Zhu, M. Mutka, and L. Ni, “Splendor: A secure, private, and location-aware service discovery protocol supporting mobile services”, Proceedings of the First IEEE International Conference on Pervasive Computing and Communications (PerCom 2003), 23-26 March 2003, 235 – 242.



- [17] K. Park, S. Lim and, K. Park, “Computationally Efficient PKI-Based Single Sign-On Protocol”, PKASSO for Mobile Devices, IEEE Transactions, 57(6): 821 – 834, June 2008.
- [18] D. Kulkarni and A. Tripathi, “Context-aware Role-based Access Control”, (SACMAT08) ACM, June 2008.
- [19] T. Imamura, B. Dillaway, and Ed. Simon, “XML
- [20] Ackerman, M. S., Cranor, L. F. and Reagle, J. (1999). Privacy in e-commerce: examining user scenarios and privacy preferences. In proceedings of the 1st ACM conference on Electronic commerce, ACM Press, New York, NY. p. 1-8.
- [21] Ackerman, M.S. (2000). The intellectual challenge of CSCW: The gap between social requirements and technical feasibility. Human-Computer Interaction, 15, 179-203.
- [22] Adams, A. (2015). Users' perception of privacy in multimedia communication. In proceedings Vol 2 of the ACM Conference on Human factors in computing systems, ACM Press. p. 53-54.



RESOURCES OF PV – WIND HYBRID POWER SYSTEM IN INDIA - A STUDY

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ABSTRACT

Electricity is an essential part of the developing of culture and Industrial growth and it is very relevant for the future growth of the economy. There is tremendous use of the Electricity in overall development of Industrial and domestic section and it must be supplied on a continuous basis in order to cover the daily requirements of all aspects. This paper presents a study undertaken for finding out resources available for erection of HPS in India. Thrust from government policies, regulations, and solar technology advancements have brought rapid rise in installed capacity of off-grid and grid-connected Solar Hybrid Power Systems(HPS) in India. The analysis will potentially serve as a feasibility study report for erection of HPS projects in India.

Keywords: Hybrid Power System(HPS); distributed generation (DG); wind power generation; photovoltaic

I. INTRODUCTION

India is a country with more than 1.2 billion people accounting for more than 17% of world's population. It is the seventh largest country in the world with total land area of 3,287,263 sq kilometers. India measures 3214 km from north to south and 2993 km from east to west. It has a land frontier of 15,200 km and coastline of 7,517 km. India has 29 states and 7 union territories. It faces a formidable challenge in providing adequate energy supplies to users at a reasonable cost. In the last six decades, India's energy use has increased 16 times and the installed electricity capacity by 84 times. India as a country suffers from significant energy poverty and pervasive electricity deficits. In recent years, India's energy consumption



has been increasing at a relatively fast rate due to population growth and economic development, even though the base rate may be somewhat low. With an economy projected to grow at 8-9% per annum, rapid urbanization and improving standards of living for millions of Indian households, the demand is likely to grow significantly. As per the estimates made in the Integrated Energy Policy Report of Planning Commission of India, 2006, if the country is to progress on the path of this sustained GDP growth rate during the next 25 years, it would imply quadrupling of its energy with a six-fold increase in the requirement of electricity and a quadrupling in the requirement of crude oil. The supply challenge is of such magnitude that there are reasonable apprehensions that severe shortages may occur.

Climatic conditions determine the availability of solar energy at a given site. In other words, availability of solar PV power is influenced by topography and weather conditions at a site respectively. Because of its location between the Tropic of Cancer and the Equator, India has an average annual temperature that ranges from 25°C – 27.5 °C. This means that India has huge solar potential. The sunniest parts are situated in the south/east coast, from Calcutta to Madras.

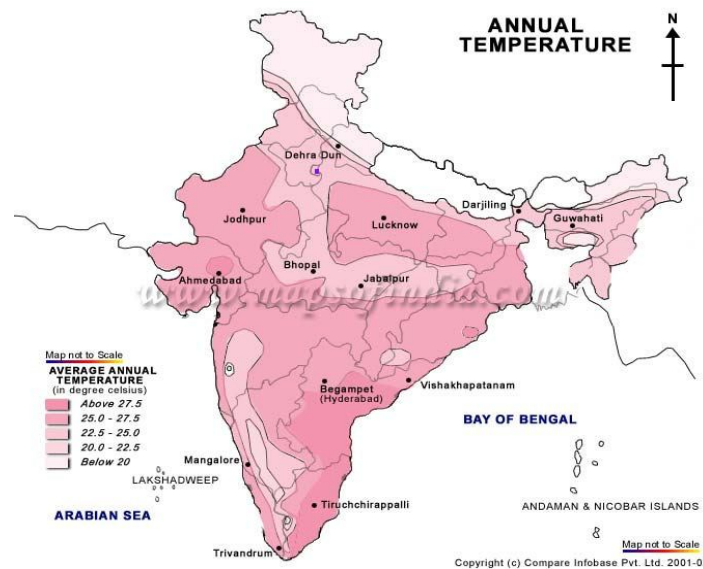


Fig. 1 Annual temperature India

Solar energy has several applications: photovoltaic (PV) cells are placed on the roof top of houses or commercial buildings, and collectors such as mirrors or parabolic dishes that can move

and track the sun throughout the day are also used. This mechanism is being used for concentrated lighting in buildings. Photovoltaic (PV) cells have a low efficiency factor, yet power generation systems using photovoltaic materials have the advantage of having no moving parts. PV cells find applications in individual home rooftop systems, community street lights, community water pumping, and areas where the terrain makes it difficult to access the power grid. The efficiency of solar photovoltaic cells with single



crystal silicon is about 13 % - 17%. High efficiency cells with concentrators are being manufactured which can operate with low sunlight intensities

II. MINISTRY OF NEW AND RENEWABLE ENERGY

The role of new and renewable energy has been assuming increasing significance in recent times with the growing concern for the country's energy security. Energy self-sufficiency was identified as the major driver for new and renewable energy in the country in the wake of the two oil shocks of the 1970s. The sudden increase in the price of oil, uncertainties associated with its supply and the adverse impact on the balance of payments position led to the establishment of the Commission for Additional Sources of Energy in the Department of Science & Technology in March 1981. The Commission was charged with the responsibility of formulating policies and their implementation, programmes for development of new and renewable energy apart from coordinating and intensifying R&D in the sector. In 1982, a new department, i.e., Department of Non-conventional Energy Sources (DNES), that incorporated CASE, was created in the then Ministry of Energy. In 1992, DNES became the Ministry of Non-conventional Energy Sources. In October 2006, the Ministry was re-christened as the Ministry of New and Renewable Energy. Since its formation, the Ministry has launched one of the world's largest and most ambitious programs on renewable energy. Based on various promotional efforts put in place by MNES, significant progress is being made in power generation from renewable energy sources. The key drivers for renewable energy are the following:

- i. The demand-supply gap, especially as population increases
- ii. A large untapped potential
- iii. Concern for the environment
- iv. The need to strengthen India's energy security
- v. Pressure on high-emission industry sectors from their shareholders
- vi. A viable solution for rural electrification

III. SOLAR SUBSIDY IN INDIA

The Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The broad aim of the Ministry is to develop and deploy new and renewable energy for supplementing the energy requirements of the country. By 2022, the Ministry has a target of increasing renewable energy generation capacity in India by 5 times to 1,75,000 MW. Therefore, in a effort to exceed targets and create an India powered by clean energy, the MNRE Ministry provides various subsidies for setting up solar power projects. In this article, we review the major solar subsidy in India provided by the Ministry of New and Renewable Energy (MNRE).



A . JAWAHARLAL NEHRU NATIONAL SOLAR MISSION

The objective of the Jawaharlal Nehru National Solar Mission (JNNSM) under the brand ‘Solar India’ is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. In order to facilitate grid connected solar power generation in the first phase, a mechanism of “bundling” relatively expensive solar power with power from the unallocated quota of the Government of India (Ministry of Power) generated at NTPC coal based stations, which is relatively cheaper, has been proposed by the Mission. This “bundled power” would be sold to the Distribution Utilities at the Central Electricity Regulatory Commission (CERC) determined prices which are subsidized.

To be eligible for the scheme the project capacity must be at least 5 MW in case of Solar PV Projects and the maximum capacity of the Project can be up to 20 MW. A Company, including its Parent, Affiliate or Ultimate Parent-or any Group Company may submit application for a maximum of three projects at different locations subject to a maximum aggregate capacity of 50 MW.

B. SCHEME FOR LARGE SCALE GRID CONNECTED ROOF TOP POWER GENERATION

Acute power shortages in India are making most of the commercial and office establishments to have diesel generator backup. By setting up the grid interactive solar power plants on the rooftops would help reduce the consumption of fossil fuels during the day time when grid power is not available. If the grid power is continuous, the solar power generated will be utilized along with the grid power and the power generator would be compensated for the exported power as per policy by the State.

All buildings of the Government, PSUs, commercial establishments, hospitals, cold storages, warehouses, industries and educational institutions are eligible under this Scheme. Solar power generation with project size between 100 kW to 500 kW is eligible. The building owner in which the solar roof top system is setup would be required to meet 70% of the project cost in lieu of benefit of electricity at free of cost. MNRE provides subsidy of 30% of the system cost to the developer to whom the project has been allocated.

C. SCHEME FOR DEVELOPMENT OF SOLAR PARKS & ULTRA MEGA SOLAR PROJECTS

The scheme for development of solar parks and ultra mega solar power projects aims to provide a huge impetus to solar energy generation by acting as a flagship demonstration facility to encourage project



developers and investors, prompting additional projects of similar nature, triggering economies of scale for cost-reductions, technical improvements and achieving large scale reductions in GHG emissions.

All the States and Union Territories are eligible for benefitting under the scheme. The solar parks will be developed in collaboration with the State Governments and their agencies. Solar Energy Corporation of India (SECI) would be MNRE's Agency for handling this Scheme. Under this scheme, Central Financial Assistance of Rs.25 lakhs per solar park is provided for the Detailed Project Report preparation, conducting surveys , etc., Further, Central Financial Assistance of up to Rs.20 lakhs or 30% of the project cost, including grid-connectivity cost, whichever is lower is provided by the MNRE fore each MW.

D. SCHEME FOR SETTING UP 300 MW OF SOLAR POWER PROJECTS BY DEFENCE ESTABLISHMENTS

The scheme for setting up of over 300MW of grid-connected and off-grid solar PV power projects by Defence Establishments aims to promote ecologically sustainable growth and to utilise available land/rooftop of Defence sector for achieving energy security. The solar power plants setup under this scheme will need to be domestic manufactures in order to boost indigenous production of solar cells and modules.

The 300MW of Solar PV Power Project can be setup by various establishments of Ministry of Defence i.e., Establishments of Army, Navy, Air Force, Ordnance Factory Board, Defence Laboratories and Defence Public Sector Undertakings. Para Military Forces coming under the Ministry of Home Affairs are also covered under this scheme. Each project capacity shall be atleast 1MW and the maximum capacity of the Project shall be upto 20MW. The scheme envisages a provision of viability gap funding support of Rs.750 crores for setting up of grid connected solar PV power projects in developer mode or EPC mode.

E. SCHEME FOR SETTING UP 1000MW SOLAR PV POWER PROJECTS BY CENTRAL PUBLIC SECTOR UNDERTAKINGS

The scheme for setting up of over 1000MW of grid-connected solar PV power projects by Central Public Sector Undertakings and Government of India Organizations aims to setup power projects under Government of India Organizations.

Under this scheme, Central Public Sector Undertakings and Government of India organizations can setup grid-connected solar PV power projects under various model including Central/State Scheme, Self-Use, 3rd part sale or merchant sale. The solar projects setup under this scheme are mandatorily required to



procure cells and modules which are domestically manufactured. For this scheme, central financial assistance in the form of viability gap funding at a fixed rate of upto Rs. 1 crore per MW would be provided.

IV. RENEWABLE ENERGY: INDIAN SCENARIO

India is giving a strong push to renewable energy in line with its commitment to cut carbon emissions by 35% and increase the use of renewable energy sources to generate at least 40% of its power needs by 2030. In line with the Paris Climate Agreement, Ministry of New & Renewable Energy, Government of India announced the renewable energy target of installing 175GW capacity by 2022, India has already installed 6GW of utility scale solar capacity and 740MW of rooftop capacity. 25GW of projects are under different stages of development. It added 3019MW of solar power in 2015 which has been an increase of 142% as compared to 2014. With expected new capacity addition of 5.4GW in 2016, India will become the fourth largest solar market globally this year, overtaking the UK, Germany and France. A rapid reduction in costs and increased demand for solar installation has fanned tremendous growth over the past 12 months in India.

Installing the HPSs will not cause any significant changes towards the landscape at the power station sites and therefore these systems are safe to be implemented at those locations. Figure 2 shows the position of India in the world potential renewable energy.

A. SOLAR ENERGY

India added 3,713MW of solar power in 2015-16 which has been an increase of 142% as compared to 2014. Based on the estimate by India's National Institute of Solar Energy, India has a solar potential of around 750GW (based on the assumption that 3% of waste land in each state can be used for solar power projects, plus an assessment of the potential for roof top solar). Solar power in India has witnessed impressive growth in a short span of time—from just 35MW as of March 2011 to 7,457MW as of March 2016. The steep growth in the last five years has come on the back of a favorable policy environment, particularly Jawaharlal Nehru National Solar Mission (JNNSM). In the last two years, capital cost per MW has fallen from Rs.14 crore per MW to less than Rs.8crore. Consequently, average solar tariff rates have declined from Rs.15 per kWh to Rs.8 per kWh.

As on 31st March 2016, total installed power capacity from renewable energy sources (excluding Hydro Power) was 43.7GW. This accounts for ~14% of the total installed power capacity

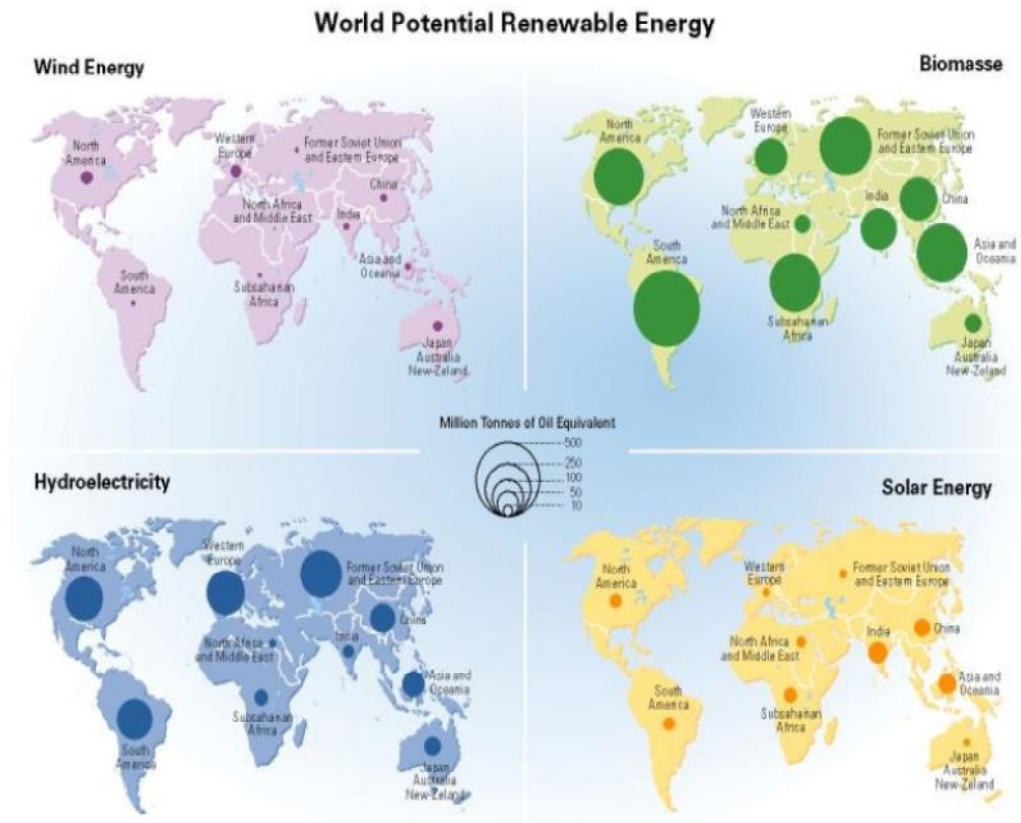


Fig. 2 Position of India in the world potential renewable energy

B. WIND ENERGY

Wind power has the highest share in the installed capacity of renewable energy in India . India has a substantial wind power potential , estimated by India’s National Institute of Wind Energy at around 302GW for on shore wind turbine installations with a hub height of 100 meters. The most promising sites are in the west and south , with around 90 % of the potential in the states of Tamil Nadu , Andhra Pradesh , Madhya Pradesh , Karnataka , Maharashtra and Gujarat. Wind power generation is projected to increase strongly , with installed capacity rising from 26.9 GW to 142GW in 2040. Year 2015 – 16 saw the highest ever capacity addition of 3515 MW

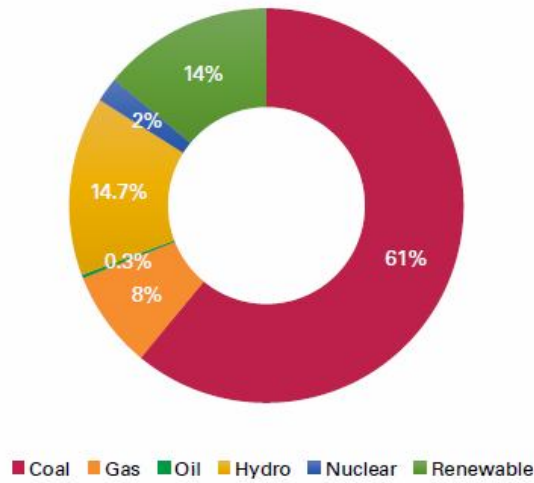


Fig. 3 Break-up of installed power generation capacity

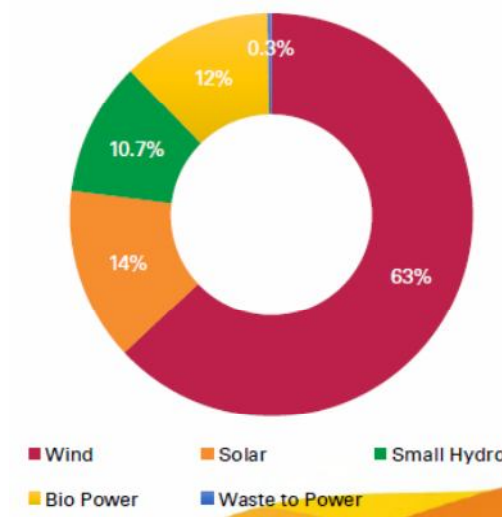


Fig. 4 Installed capacity of renewable energy in India



V CONCLUSION

In recent years, India has emerged as one of the leading destinations for investors from developed countries. This attraction is partially due to the lower cost of manpower and good quality production. The expansion of investments has brought benefits of employment, development, and growth in the quality of life, but only to the major cities. This sector only represents a small portion of the total population. The remaining population still lives in very poor conditions. India is now the eleventh largest economy in the world, fourth in terms of purchasing power. It is poised to make tremendous economic strides over the next ten years, with significant development already in the planning stages. This report gives an overview of the renewable energies market in India. We look at the current status of renewable markets in India, the energy needs of the country, forecasts of consumption and production, and we assess whether India can power its growth and its society with renewable resources.

However, the cost for installation and optimization of HPSs is still quite high. The cost of a hybrid power system depends on two factors: the size of the individual component and the dispatch strategy. The installation of the hybrid power systems (HPSs) can give economic advantages especially at the rural area. This is due to the facts that the source for generating HPSs was a renewable energy sources (RESs), that is environmental friendly with no operation cost. Hence, an electrical power can be provided with lower prices.

REFERENCES

1. www.mnre.gov.in
2. www.geni.org
3. www.vibrantgujrat.com



BODY MOBILE CHARGER

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INTRODUCTION

Humans are a living energy source. We produce body heat, we walk, and our blood flows throughout our body. All of these energy sources from our body can be used to generate electricity. So why have we not taken advantage of those sources, and used them, especially for people do not have access to electricity? So why waste readily available energy that is available to every human? This solution converts body heat into electricity, and makes electricity available to anyone. Now, this was quite the challenge, because your body generates a small amount of heat, and is a small temperature differential compared to air. Each thermo-electric generator, or peltier, only generates 0.1 volts when placed against your skin. In order to increase that voltage, I did two things. First, I wired three-four peltiers in a series circuit, so that together they generate-0.4 volts (sodium acetate body warmer) increase temperature difference up to 20-30 degree which increase voltage up to 1.0 volt. From there, I used a joule thief circuit to boost up the voltage to power a light, as a joule thief can take in voltages down to 0.3 volts! If you were using this for a body heat powered USB charger, you would just use a voltage step up module to step up the voltage to 4.2 volts (sodium acetate body warmer).A battery that can convert your body heat into electricity could lead to mobile phones capable of charging themselves while in your pocket.Researchers at the Massachusetts Institute of Technology have developed a button sized self-charging battery that can scavenge energy from low temperature sources of heat.The device can charge itself at temperatures between 20°C(68°F) and 60°C (140°F), far lower than other heat-harvesting



technologies. My objective in my project was to create voltage that runs charging solely on the heat of the human body. Using four Peltier tiles and the temperature difference between the body and ambient air, I designed a charger that provides voltage to phone a without batteries or moving parts. My design is ergonomic, thermodynamically efficient, and only needs a 20-30 degree temperature difference to work and produce up 1000mAh and 4.3 volts. I chose to investigate the aspect of human energy when I found out that we are like walking 100-Watt light bulbs. The goal of my project became a charger powered solely from the heat of the human body. I decided to use Peltier tiles. If one side of these tiles is heated, and the other is cooled, electricity is produced. For my charger, I would be heating one side with the wrist (with sodium acetate body warmer), and cooling the other side of the tile with a heat sink. I calculated that our bodies radiate 5.7 mW/cm², but only 4.3 volts is needed to charge mobile phone. I characterized both Peltier devices. Both produced power, but only a 1000 miliamhere. I need 4.5V . I had to convert my DC input to AC, and then run it through a oscillator circuit with a stepup transformer .My final circuit had only 4 parts and produced a step up ratio of 100:1. So for 50 mV DC from each Peltiers I obtained 5 Volts AC which was sufficient is-sufficient- fo booter circiuit. The final design included mounting the Peltiers on a aluminum plates which was ambient air to cool. The wrist -wrapped around peltiers with sodium acetate solution warmed the tiles. The result was at 20-30 degree Celcius of Peltier differential. The charger worked!

Human Body Temperature:- Normal human body temperature, also known as normothermia or eutheria, depends upon the place in the body at which the measurement is made, the time of day, as well as the activity level of the person. Nevertheless, commonly mentioned typical values are:

Oral (under the tongue): 36.8±0.4 °C (98.2±0.72°F) Internal (rectal, vaginal): 37.0 °C (98.6 °F)

We required temperature difference between the body and our atmosphere to generates the voltage difference. Different parts of the body have different temperatures. A rectal or vaginal measurement taken directly inside the body cavity is typically slightly higher than oral measurement, and oral measurement is somewhat higher than skin measurement. Other places, such as under the arm or in the ear, produce different typical temperatures. While some people think of these averages as representing normal or ideal measurements, a wide range of temperatures has been found in healthy people.



The body temperature of a healthy person varies during the day by about 0.5 °C (0.9 °F) with lower temperatures in the morning and higher temperatures in the late afternoon and evening, as the body's needs and activities change. Other circumstances also affect the body's temperature. The core body temperature of an individual tends to have the lowest value in the second half of the sleep cycle; the lowest point, called the nadir, is one of the primary markers for circadian rhythms. The body temperature also changes when a person is hungry, sleepy, sick, or cold.

The normal core body temperature of a healthy, resting adult human being is stated to be at 98.6 degrees fahrenheit or 37.0 degrees celsius. Room temperature is a colloquial expression for the typical or preferred indoor (climate- controlled) temperature to which people are generally accustomed. It represents the small range of temperatures at which the air feels neither hot nor cold, approximately 70 °F (21 °C). There is 16°C temperature difference between our body and room temperature which is very useful and sufficient to generate potential difference.

Thermoelectric Effect:-This effect can be used to generate electricity, measure temperature or change the temperature of objects. Because the direction of heating and cooling is determined by the polarity of the applied voltage, thermoelectric devices can be used as temperature controllers. The thermoelectric effect is the direct conversion of temperature differences to electric voltage and vice versa. A thermoelectric device creates voltage when there is a different temperature on each side. Conversely, when a voltage is applied to it, it creates a temperature difference. At the atomic scale, an applied temperature gradient charge carriers in the causes material to diffuse from the hot side to the cold side.

This effect can be used to generate electricity, measure temperature or change the temperature of objects. Because the direction of heating and cooling is determined by the polarity of the applied voltage, thermoelectric devices can be used as temperature controllers. The term "thermoelectric effect" encompasses three separately identified effects: the Seebeck effect, Peltier effect, and Thomson effect. Textbooks may refer to as the Peltier–Seebeck effect. This separation derives from the independent discoveries of French physicist Jean Charles Athanase Peltier and Baltic German physicist Thomas Johann Seebeck Joule heating, the heat that is generated whenever a current is passed



through a resistive material, is-related,-though-it. The Seebeck effect is the conversion of heat directly into electricity at the junction of different types of wire. It is named for the Baltic German physicist Thomas Johann Seebeck. Seebeck, in 1821, discovered that a compass needle would be deflected by a closed loop formed by two different metals joined in two places, with a temperature difference between the joints. This was because the electron energy levels in each metal shifted differently and a voltage difference between the junctions created an electrical current and therefore a magnetic field around the wires. Seebeck did not recognize there was an electric current involved, he called the phenomenon the thermomagnetic effect. so Danish physicist Hans Christian Ørsted rectified the oversight and coined the term "thermoelectricity". The Seebeck effect is a classic example of an electromotive force (emf) and leads to measurable currents or voltages in the same way as any other emf. forces modify Ohm's Electromotive law by generating currents even in the absence of voltage differences (or vice versa); the local current density is given by

$$\mathbf{J} = \sigma(-\nabla V + \mathbf{E}_{\text{emf}})$$

where V is the local voltage and σ is the local conductivity. In general, the Seebeck effect is described locally by the creation of an electromotive field

$$\mathbf{E}_{\text{emf}} = -S\nabla T$$

where S is the Seebeck coefficient (also known as thermopower), property of the local a material, and ∇T is the gradient n temperature.

The Seebeck coefficients generally vary as function of temperature, and depend strongly on the composition of the conductor. For ordinary materials at room temperature, the Seebeck coefficient may range in value from $-100 \mu\text{V/K}$ to $+1,000\mu\text{V/K}$. Joule Thief:-A joule thief is a minimalist Armstrong self-oscillating voltage booster that is small, low-cost, and easy to build, typically used for driving small loads. This circuit is also known by other names such as blocking oscillator, joule ringer, vampire torch.

It can use nearly all of the energy in a single-cell electric battery, even far below the voltage where other circuits consider the battery fully discharged (or "dead"); hence the name, which suggests the notion that



the circuit is stealing energy or "joules" from the source. The term is a pun on the expression "jewel thief": one who steals jewelry or gemstones.

The circuit is a variant of the blocking oscillator that forms an unregulated voltage boost converter. The output voltage is increased at the expense of higher current draw on the input, but the integrated (average) current of the output is lowered and brightness of a luminescence decreased.

Peltier Tiles:- Peltier tiles work on the basis of thermoelectric effect. When there is a temperature difference across something, electrons will move from the hot to the cold. So one side there will be more electrons, so it will be negatively charged, and on the other side, because electrons leave, it will be positively charged. So there will be a charge separation, and this is like in a battery, which has a positive terminal and negative terminal. And so this charge separation causes current to flow. They utilize the thermoelectric effect. When a temperature difference exists across a material, charge carriers will start to diffuse from hot to cold. The separation of charges causes a potential difference across the material.

The magnitude of the thermoelectric effect depends on the material. Semiconductors can be doped to have electron mobility or hole mobility (this is n- and p-doping, respectively). This makes sure that either negative or positive charge carriers primarily diffuse.

As of now, more efficient devices exist for converting heat difference to electricity. Part of the attractiveness of thermoelectric devices is their compactness and the elimination of moving parts

Heat Sink:-Heat sink is an electronic device that incorporates either a fan or a peltier device to keep a hot component such as a processor cool. They utilize the thermoelectric effect. When a temperature difference exists across a material, charge carriers will start to diffuse from hot to cold. The separation of charges causes a potential difference across the material.

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As of now, more efficient devices exist for converting heat difference to electricity. Part of the attractiveness of thermoelectric devices is their compactness and the elimination of moving parts. For example, the Voyager space probes use thermoelectric generators that are heated by a radioactive isotope. That said, they certainly can be used to generate meaningful amounts of electricity- it's just a question of what scale is defined as meaningful.

Booster Circuit:-A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output and input. Power for the boost converter can come from any suitable DC sources, such as batteries, solar panels, rectifiers and DC generators. A process that changes one DC voltage to a different DC voltage is called DC to DC conversion. A boost converter is a DC DC converter with to output voltage greater than the source voltage. A boost converter isean times called a som step-up converter since it "steps up" the source voltage. Since power ($=PVI$ Step-up) must be conserved, the output current is lower than the source current. Battery power systems often stack cells in series to achieve higher voltage. However, sufficient stacking of cells is not possible in many high voltage applications due to lack of space. Boost converters can increase voltage and reduce the number of Two battery-powered the cells. applications that use boost converters are used in hybrid electric vehicles (HEV) and lighting systems.

The NHW20 model Toyota Prius HEV uses a 500 V motor. Without a boost converter, the Prius would need nearly 417 cells to power the motor. However, a Prius actually uses only 168 cells and boosts the battery voltage from 202 V to 500 V. Boost converters also power devices at smaller scale applications, such as portable lighting systems. A white LED typically requires 3.3

V to emit light, and a boost converter can step up the voltage from a single 1.5 V alkaline cell to power the lamp. Boost converters can also produce higher voltages to operate cold cathode fluorescent tubes (CCFL) in devices such as LCD backlights and some flashlights.

An unregulated boost converter is used as the voltage increase mechanism in the circuit known as the 'Joule thief'. This circuit topology is used with low power battery applications, and is aimed at the ability



of a boost converter to 'steal' the remaining energy in a battery. This energy would otherwise be wasted since the low voltage of a nearly depleted battery makes it unusable for a normal load. This energy would otherwise remain untapped because many applications do not allow enough current to flow through a load when voltage decreases. This voltage decrease occurs as batteries become depleted, and is a characteristic of the ubiquitous alkaline battery.

Since the equation for power is (PV^2/R) , and R tends to be stable, power available to the load goes down significantly as voltage decreases.

Joule Thomson Effect:- In thermodynamics, the Joule–Thomson effect (also known As the Joule–Kelvin effect, Kelvin–Joule effect, or Joule–Thomson expansion) describes the temperature change of a real gas or liquid (as differentiated from an ideal gas) when it is forced through a valve or porous plug while kept insulated so that no heat is exchanged with the environment. This procedure is called a throttling process or Joule–Thomson process. At room temperature, all gases except hydrogen, helium and neon cool upon expansion by the Joule–Thomson process; these three gases experience the same effect but only at lower temperatures.

The throttling process is commonly exploited in thermal machines such as refrigerators, air conditioners, heat pumps, and liquefiers.

Throttling is a fundamentally irreversible process. The throttling due to the flow resistance in supply lines, heat exchangers, regenerators, and other components of (thermal) machines is a source of losses that limits the performance.

APPLICATION:-

Thermoelectric Generator:-The Seebeck effect is used in thermoelectric generators, which function like heat engines, but are less bulky, have no moving parts, and are typically more expensive and less efficient. They have a use in power plants for converting waste heat into additional electrical power (a form of energy recycling) and in automobiles as automotive thermoelectric generators (ATGs) for increasing fuel efficiency. Space probes often use radioisotope thermoelectric generators with the same mechanism but using radioisotopes to generate the required heat difference. Recent uses include body heat powered lighting.



The Peltier effect can be used to create a refrigerator that is compact and has no circulating fluid or moving parts. Such refrigerators are useful in applications where their advantages outweigh the disadvantage of their very low efficiency.

Temperature measurement:- Thermocouples and thermopiles are devices that use the Seebeck effect to measure the temperature difference between two objects. Thermocouples are often used to measure high temperatures, holding the temperature of one junction constant or measuring it independently (cold junction compensation). Thermopiles use many thermocouples electrically connected in series, for sensitive measurements of small temperature difference.

Thermal cyclers for polymerase chain reaction:- The Peltier effect is used by many thermal cyclers, laboratory devices used to amplify DNA by the polymerase chain reaction (PCR). PCR requires the cyclic heating and cooling of samples to specified temperatures. The inclusion of many thermocouples in a small space enables many samples to be amplified in parallel.

LTC3108 :- The LTC3108 is a highly integrated DC/DC converter ideal for harvesting and managing surplus energy from extremely low input voltage sources such as TEGs (thermoelectric generators), thermopiles and small solar cells. The step-up topology operates from input voltages as low as 20mV. The LTC3108 is functionally equivalent to the LTC3108-1 except for its unique fixed VOUT options.

Using a small step-up transformer, the LTC3108 provides a complete power management solution for wireless sensing and data acquisition. The 2.2V LDO powers an external microprocessor, while the main output is programmed to one of four fixed voltages wireless transmitter or sensors. The power good indicator signals that the main output voltage is within regulation. A second output can be enabled by the host. A storage capacitor provides power when the input voltage source is unavailable. Extremely low quiescent current and high efficiency design ensure the fastest possible charge times of the output reservoir capacitor.

Research:- I couldn't find any idea specific to my topic of the body charger at all, except for a website called the Joule Thief. The website was dedicated to low voltage transistor oscillator circuits. I also found one other source that really made me believe that my battery-free charger was indeed possible. Step 1 in



my procedure, involved much research, as I decided to calculate how much heat per cm² we radiate in our body, where we normally hold a wear to wrist. I found that an average human dissipates around 350,000 Joules per hour, or 97 watts¹. The average surface area of the human skin³ is 1.7m² or 17,000 cm², so the heat lower than the battery itself. This lets you take advantage of low voltage power sources such as thermoelectric generators, small turbines, and individual solar cells.

Physical charger Design:-I decided to make the charger with dimensions of 500mm long. Four of the large Peltier tiles covered 16cm², and four of the smaller tiles had a combined area of 5.4cm². Tiles were mounted on a milled area of 25mm aluminium plates, and placed inside a larger PVC pipe, insulated from it by air. The circuit was mounted in the front, and the LED was centered in the middle of the tube. The PVC pipe was wrapped with insulating foam.

Conclusion:-The Body Charger is a revolutionary device that enhances the bioelectrical and biochemical functions of cells by saturating them with energy. When the body has optimal energy, the natural cellular function is restored, empowering the body to restore. This gives the body the ability to identify and remove damaged or improper cells by replacing them with the original design that is encoded in our DNA.

Research has shown that the quality of health parallels the body's frequency of vibration. A healthy body vibrates between 60 - 70 MHz. If the frequency falls to 59/58 MHz you may experience a common cold, and if your body continues to lower its frequency you may experience greater health issues.

The Body Charger is designed to complement the principles of The Heal Process - an energy medicine modality based on raising the body's frequency.

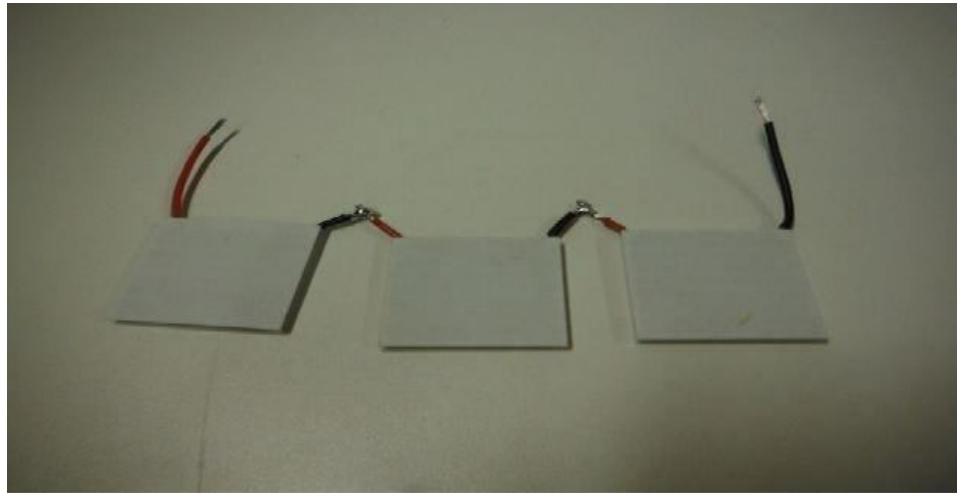
From the experimental investigation it may be concluded that technical advancement in the charging our mobile phone at anywhere in any season. It is easy to carry and cost effective.

We tested this charger in many formats on way all the tests very well. After the tests we come to the conclusion that using this technology in today's charging, is possible anywhere and to save more and more electricity.

We can also come on the conclusion that on the same up to 57% of the mobile phone which loses battery backup and used recent charging without this technology. We can carry it during travelling and charging our mobile phones.



Today our life is very fast and we cannot wait for charging our mobile phones.



Reference

- [1]. Kelly GS (March 2007). "Body temperature variability (Part 2): masking influences of body temperature variability and a review of body temperature variability in disease". *Altern Med Rev* 12 (1): 49–62. PMID 17397267.
- [2]. Marx, John (2006). *Rosen's emergency medicine: concepts and clinical practice*. Mosby/Elsevier. p. 2239. ISBN 978-0-323-02845-5.
- [3]. Karakitsos D, Karabinis A (September 2008). "Hypothermia therapy after traumatic brain injury in children". *N. Engl. J. Med.* 359 (11): 1179–80.
- [4]. E. McKenzie, D.W. Osgood, Validation of a new telemetric core temperature monitor, *Journal of Thermal Biology*, Volume 29, Issues 7–8, October–December 2004, Pages 605–611, ISSN 0306-4565, doi 10.1016/j.jtherbio.2004.08.020.
- [5]. Rowe, D. M., ed. (2006). *Thermoelectrics Handbook: Macro to Nano*. Taylor & Francis. ISBN 0-8493-2264-2.
- [6]. P.M. Jack (2003). "Physical Space as a Quaternion Structure I: Maxwell Equations. A Brief Note.". Toronto, Canada arXiv:math-ph/0307038v1
- [7]. Besançon, Robert M. (1985). *The Encyclopedia of Physics (Third ed.)*. Van Nostrand Reinhold Company. ISBN 0-442-25778-3.
- [8]. Ioffe, A.F. (1957). *Semiconductor Thermoelements and Thermoelectric Cooling*. Infosearch Limited. ISBN 0-85086-039-3.



HYBRID SOLAR PANEL

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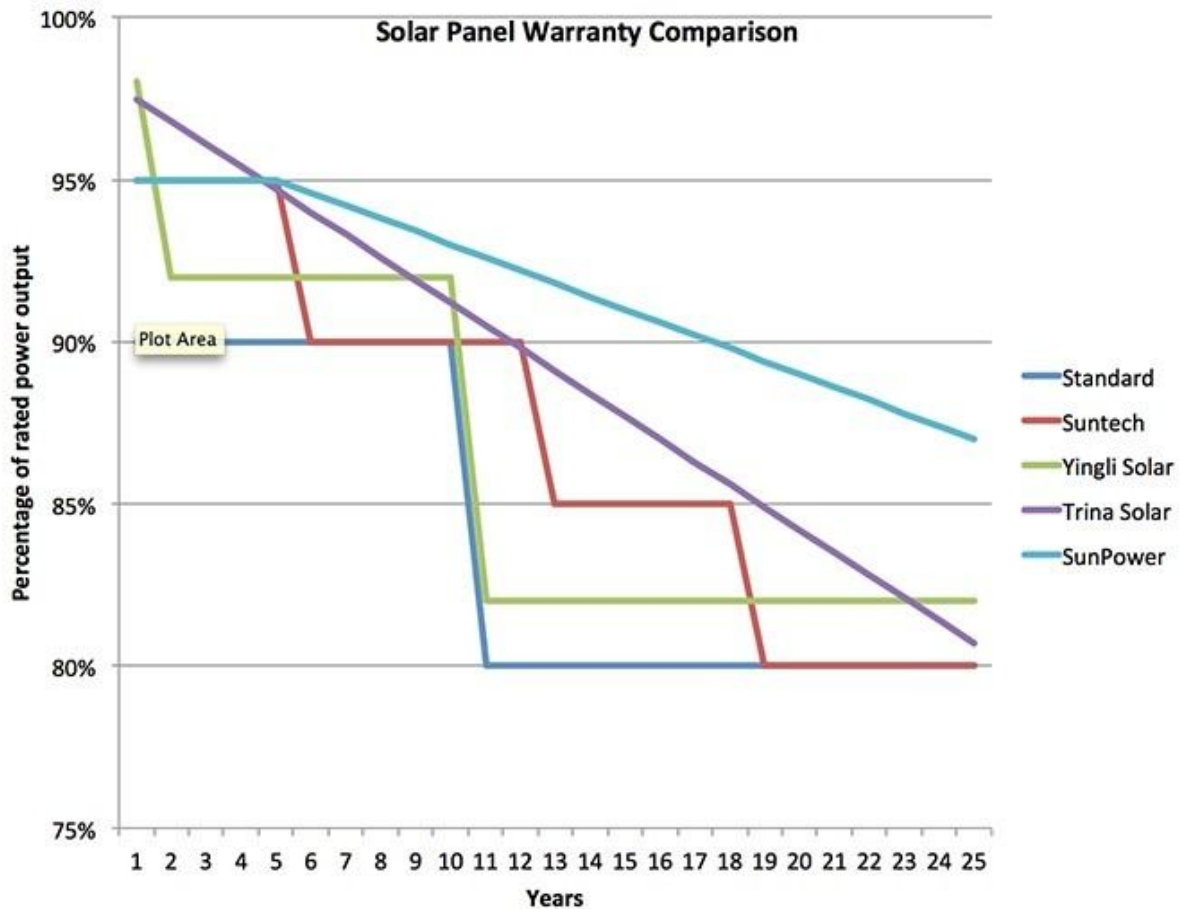
INTRODUCTION

Introduction:-The present invention is particularly directed to an improved thermal or solar energy storage system employing a supercool-able medium for storage of thermal as well as solar energy. Solar cell efficiencies could increase by 30 percent or more with new hybrid materials that make use of the infrared portion of the solar spectrum, researchers say. Visible light accounts for under half of the solar energy that reaches Earth's surface. Nearly all of the rest comes from infrared radiation. However, solar infrared rays normally passes right through the photovoltaic materials that make up today's solar cells. Now scientists at the University of California, Riverside, have created hybrid materials that can make use of solar infrared rays. The energy from every two infrared rays they capture is combined or "up converted" into a higher-energy photon that is readily absorbed by photovoltaic cells, generating electricity from light that would normally be wasted. The hybrid materials are combinations of inorganic semiconductor nano-crystals , which capture the infrared photons, and organic molecules, which help combine the energy from these photons together into an up converted photon. In experiments, lead selenide nano-crystal captured near-infrared photons, and the organic compound rubrene emitted visible yellow- orange photons.

The researchers noted that lead selenide nanocrystal and rubrene were relatively inefficient at up conversion. However, in experiments with a hybrid material made of cadmium selenide nanocrystal and the organic compound di-phenylanthracene, which absorbs green light and emits violet light, the investigators could boost up conversion up to a thousand fold by coating the nanocrystal with anthracene,



a component of coal tar. This suggests that similar coatings on lead selenide nanocrystal might boost their up conversion efficiency as well.



The scientists added that the ability to up convert two low energy photons into one, high- energy photon has potential applications in biological imaging, high-density data storage, and organic light-emitting diodes (OLEDs).

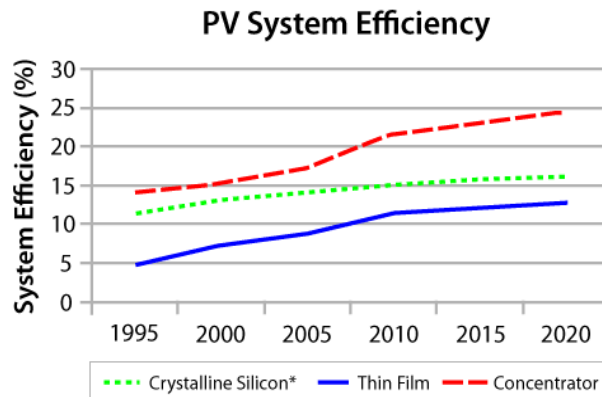
The silicon solar cells that currently dominate the world market suffer from three fundamental limitations. A promising new way of making high-efficiency solar cells, using perovskites instead of silicon, could address all three at once and supercharge the production of electricity from sunlight. The first major limitation of silicon photovoltaic (PV) cells is that they are made from a material that is rarely found in nature in the pure, elemental form needed. While there is no shortage of silicon in the form of



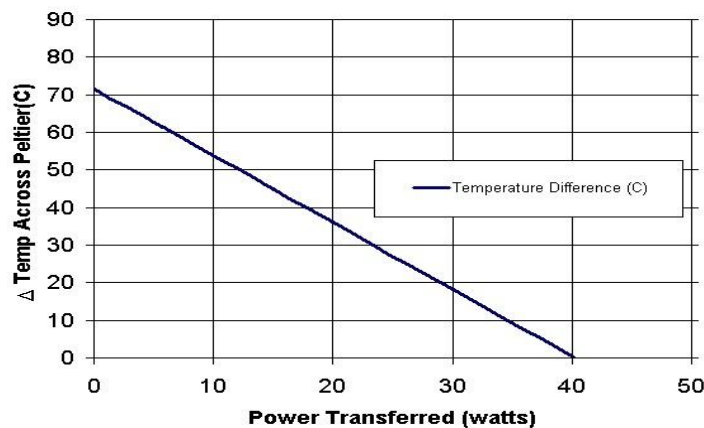
silicon dioxide (beach sand), it takes tremendous amounts of energy to get rid of the oxygen attached to it. Typically, manufacturers melt silicon dioxide at 1500–2000 degrees Celsius in an electrode arc furnace. The energy needed to run such furnaces sets a fundamental lower limit on the production cost of silicon PV cells and also adds to the emissions of greenhouse gases from their manufacture maintenance costs, especially for large-scale installations Thermoelectric power generation from waste heat is attracting more and more attention. Potential fuel efficiency enhancement by recovering the waste heat is beneficial for automobiles and many other applications. In addition, solar thermoelectric generator provides an alternative route to convert solar energy into electrical power besides the photovoltaic conversion . Thermoelectric generator (TEG) can be regarded as a heat engine using electrons/holes as the energy carrier. The conversion efficiency of a TEG is related to the Carnot efficiency and the material's average thermoelectric figure of merit ZT .

Approximately 90 percent of the world's electricity is generated by heat energy. Unfortunately, electricity generation systems operate at around 30 to 40 percent efficiency, meaning around two thirds of the energy input is lost as waste heat. Despite this, the inefficiency of current thermoelectric materials that can convert waste heat to electricity has meant their commercial use has been limited. Now researchers have developed a thermoelectric material they claim is the best in the world at converting waste heat into electricity, potentially providing a practical way to capture some of the energy that is currently lost. The new material, which is based on the common semiconductor telluride, is environmentally stable and is expected to convert from 15 to 20 percent of waste heat to electricity. The research team, made up of chemists, material scientists and mechanical engineers from Northwestern University and Michigan State University, say the material exhibits a thermoelectric figure of merit (or "ZT") of, which they claim is the highest reported to date.

$$\eta = \left(\frac{T_H - T_C}{T_H} \right) \cdot \frac{\sqrt{1 + ZT_{\text{avg}}} - 1}{\sqrt{1 + ZT_{\text{avg}}} + (T_C / T_H)}$$





The higher material's ZT, the more efficient it is at converting heat to electricity. While there's no theoretical upper limit to ZT, no known materials exhibit a ZT higher than 3. The researchers believe with a ZT of 2.2, the new material is efficient enough to be used in practical applications and could usher in more widespread adoption of thermo electrics by industry. "Our system is the top-performing thermoelectric system at any temperature," said Mercouri G. Kanatzidis, who led the research. "The material can convert heat to electricity at the highest possible efficiency. At this level, there are realistic prospects for recovering hightemperature waste heat and turning it into useful energy." With the huge potential for thermo electrics to recover some of the heat energy that is currently lost, they have been the focus of much research that has seen them improve significantly in recent years. So much so that the Mars rover Curiosity features lead tellurid thermo electrics, although its system only has a ZT of BMW is also testing systems to harvest the heat from the exhaust systems and combustion engines of its cars.





Aside from capturing some of the wasted heat energy emitted through a vehicle's tailpipe, the new material could be used in heavy manufacturing industries, including glass and brick making, refineries, and coal-and-gas-fired power plants, and on large ships and tankers, where large combustion engines operate continuously. Such applications are seen as ideal as the waste heat temperatures in these areas can range from 400 to 600 degrees Celsius (750 to 1,100 degrees Fahrenheit), which is the sweet spot for thermoelectrics use.

	Monocrystalline Panels	Polycrystalline Panels	Thin Film Panels
Type			
Efficiency	14% - 18% cell efficiency	12% - 14% cell efficiency	5% - 6% cell efficiency
Temperature Tolerance	0% +5%	-5% +5%	-3% +3%
Life Time	25-30 year life span	20-25 year life span	15-20 year life span
Durability	Hail resistant 25 year P & M	25 year P & M warranty	25 year P & M warranty

where $ZT = (S^2\sigma/\kappa)T$, and S , σ , κ , and T are Seebeck coefficient, electrical conductivity, thermal conductivity, and absolute temperature, respectively. Pursuing high ZT has been the focus of the entire thermoelectric community by applying various phonon engineering via nano structuring approaches to reduce the thermal conductivity, or by exploring new compounds with intrinsically low thermal conductivity, such as compounds having complex crystalline structure, local rattlers, liquid-like sublattice, and highly distorted lattice. However, for practical applications, efficiency is not the only concern, and high output power density is as important as efficiency when the capacity of the heat source is huge (such as solar heat), or the cost of the heat source is not a big factor (such as waste heat from automobiles, steel industry, etc.). The output power density ω is defined as the output power W divided by the cross-sectional area A of the leg, i.e., $\omega = W/A$, which is related to power factor $PF = S^2\sigma$ by the following:



Seebeck coefficient

$$I = 0 \Rightarrow f_1 [E_C(0) + \Delta_n] = f_2 [E_C(0) + \Delta_n] \quad E_{F2} = E_{F1} - q\delta V$$

$$\frac{1}{1 + e^{\frac{(E_C + \Delta_n - E_{F1})}{k_B T_{L1}}}} = \frac{1}{1 + e^{\frac{(E_C + \Delta_n - E_{F1} + q\delta V)}{k_B T_{L2}}}}$$

$$\frac{(E_C + \Delta_n - E_{F1})}{k_B T_{L1}} = \frac{(E_C + \Delta_n - E_{F1} + q\delta V)}{k_B T_{L2}}$$

$$\delta V = \frac{E_C(0) + \Delta_n - E_{F1}}{q T_{L1}} \delta T_L = -S_n \delta T_L$$

$$\delta V = -S_n \delta T_L$$

$$S_n = -\frac{[E_C(0) + \Delta_n - E_{F1}]}{q T_{L1}}$$

$$S_n = -\frac{[E_J - E_{F1}]}{q T_{L1}}$$

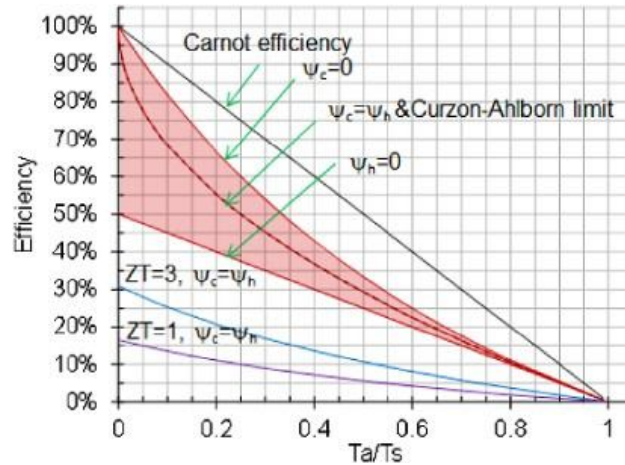
(by convention, S is negative for n-type semiconductors.)

contains two main parts: square of the temperature difference divided by leg length, and material power factor $PF = S^2\sigma$. Clearly, to achieve higher power density for a given heat source, we have to either increase the power factor PF or decrease the leg length. However, decreasing the leg length could cause severe consequences such as increase of large heat flux that will increase the cost of the heat management at the cold end, increase of percentage of contact resistance in the device that will increase the parasitic loss and consequently decrease the energy conversion efficiency, increase of the thermal stress due to the larger thermal gradient leading to device failure, etc. Therefore, it is better to increase the power factor PF. because PF is a pure material parameter, we can use it as a criterion in searching for new thermoelectric materials for high output power.

A useful thermoelectric material should possess high ZT value for high efficiency, and also very importantly high PF for high output power. Ideally, temperature-independent ZT and PF over the whole temperature range from cold side to hot side are desired. However, both the ZT and PF of all materials show strong temperature dependency, usually increasing first with temperature and then decreasing when bipolar effect starts to play a role. The working temperature of thermoelectric materials is limited by the band energy gap E_g ; e.g., Bi₂Te₃, a well-known thermoelectric material for applications below 200 °C, has an E_g of ~0.13 eV. PbTe and associated materials have much higher peak ZT in the temperature range of 400–600 °C due to its larger E_g of 0.32 eV. However, the toxicity of lead, poor mechanical properties, and thermal instability above 400 °C seriously limit the application of Pb-based thermoelectric



materials. Even though Mg₂Si, skutterudites, and half-Heuslers are promising for thermoelectric power generation at up to 500 °C [Mg₂Si and skutterudites



or 600–700 °C, the ZT values of these materials below 400 °C is relatively low ($ZT < 1$). Other materials, such as n-type In₄Se_{3-δ}, n-type Ba₈Ga₁₆Sn₃₀, and p-type Zn_{4-δ}Sb₃ have higher average ZT values below 400 °C. However, the low power factors make them unsuitable for power generation applications below 400 °C. Because both efficiency and output power are equally important, new n- and p-type materials that can work up to 400 °C are more desirable for thermoelectric power generation. Here, we report a new Mg₂Sn-based n-type thermoelectric material that shows promise to work below 400 °C for power generation due to the narrow band gap of ~0.26 eV. Historically, Mg₂Sn material has been investigated less than its analogous compound Mg₂Si for thermoelectric applications due to its lower ZT. Most of the research has been focused on the alloy of Mg₂Si-Mg₂Sn with a peak ZT value of ~1 at 500 °C. Recently, different groups have improved the peak ZT value to 1.1–1.3 by adjusting the x value in the Mg₂Si_{1-x}Sn_x solid solution. The challenges in preparing and handling these materials were the high vapor pressure and chemical activity of Mg. Methods of direct melting with subsequent annealing, and solid-state reaction with subsequent annealing and Bridgman method were reported to synthesize Mg₂Si-Mg₂Sn alloys. Powder metallurgy route, e.g., ball milling plus hot pressing, was widely used to fabricate a variety of high-performance thermoelectric bulk materials such as Bi₂Te₃, PbTe, PbSe, and skutterudites CoSb₃. In fact, ball milling was reported to synthesize Mg₂Si and its alloys Mg₂Si-Mg₂Sn. However, the reported ZT was lower than 0.7, which may be due to the difficulty in avoiding oxidization of Mg. Here, we report a successful synthesis of an Sn-dominated composition Mg₂Sn_{0.75}Ge_{0.25} through ball milling and hot pressing to achieve a ZT of 1.4 at 450 °C and power



factor PF of $55 \mu\text{W}\cdot\text{cm}^{-1}\cdot\text{K}^{-2}$ at 350°C . Calculations show that these could yield a leg efficiency η of 10.5%, and output power density ω of $6.6 \text{ W}\cdot\text{cm}^{-2}$ at $T_h = 400^\circ\text{C}$ and $T_c = 50^\circ\text{C}$, which will be very useful for the vast amount of waste heat sources at up to 400°C and concentrated solar energy conversion applications.

Self cleaning:-

solar panels would be especially effective in large installations. The desert environments where many of these installations reside often challenge the panels with dust storms and little rain. Currently, only about 4 percent of the world's deserts are used in solar power harvesting. Conventional methods of cleaning solar panels usually involve large amounts of water which is costly and scarce in such dry areas. Self

Cleaning Technique:-

The self-cleaning technology was developed by Boston University professor Malay K. Mazumder and his colleagues, in association with the National Aeronautics and Space Association, and was originally intended for use in rovers and other machines sent to space missions to the moon and to Mars. The technology involves the deposition of a transparent, electrically sensitive material on glass or on a transparent plastic sheet that cover the panels. Sensors monitor dust levels on the surface of the panel and energize the material when dust concentration reaches a critical level. The electric charge sends a dust-repelling wave cascading over the surface of the material, lifting away the dust and transporting it off of the screen's edges. Within two minutes, the process removes about 90 percent of dust on a solar panel. The mechanism reportedly requires only a small amount of the electricity generated by the panel for it to work. Coating the surface of solar cells can increase their efficiency and reduce maintenance costs, especially for large-scale installations. Self cleaning solar panels would be especially effective in large installations. The desert environments where many of these installations reside often challenge the panels with dust storms and little rain. Currently, only about 4 percent of the world's deserts are used in solar power harvesting. Conventional methods of cleaning solar panels usually involve large amounts of water which is costly and scarce in such dry areas.

Robotic Vacuum Cleaner:-

This system is implemented using two subsystems namely a Robotic Vacuum Cleaner and a Docking Station.. The robot uses a two stage cleaning process to remove dust effectively from the solar panels. A



rolling brush is placed in front to disperse the dust towards the vacuum cleaner. A high speed motor capable of creating suitable suction is used for removing dust from the panels. It traverses the solar panel using a pre-defined path controlled by the accelerometers and ultrasonic sensor. It is designed to work on inclined and slippery surfaces. A control strategy is formulated to navigate the robot in the required path using an appropriate feedback mechanism. The battery voltage of the robot is determined periodically and if it goes below ,it returns to the docking station and charges itself automatically using power drawn from the solar panels. It is robust, commercially viable product which provides a simple, cost-effective solution to the clean small solar panels. Motor fitted to solar panel and periodically a jerk can be given to panels, so dust slides down. Nano work Spotlight) Graphene-based nano materials have many promising applications in energy-related areas. In particular, there are four major energy-related areas where grapheme will have an impact: solar cells, super capacitors, lithium-ion batteries, and catalysis for fuel

cells ("Graphene-based nanotechnology in energy applications"). The extremely high electron mobility of graphene – under ideal conditions electrons move through it with roughly 100 times the mobility they have in silicon – combined with its superior strength and the fact that it is nearly transparent (2.3 % of light is absorbed; 97.7 % transmitted), make it an ideal candidate for photovoltaic applications. It could be a promising replacement material for indium tin oxide (ITO), the current standard material for transparent electrodes used for electrodes in LCD displays, solar cells, iPad and smart-phone touch screens, and organic light-emitting diode (OLED) displays for televisions and computer monitors. Just yesterday, for instance, there was a report ("Nanotechnology researchers make major leap towards graphene for solar cells") that shows that graphene retains its impressive set of properties when it is coated with a thin silicon film. These findings pave the way for entirely new possibilities to use in thin-film photovoltaics. A new review in *Advanced Energy Materials* ("Graphene-Based Materials for Solar Cell Applications") by a team of scientists from Nanyang Technological University, led by Prof. Hua Zhang, provides an overview of the recent research on graphene and its derivatives, with a particular focus on synthesis, properties, and applications in solar cells. Current solar cells cannot convert all the incoming light into usable energy because some of the light can escape back out of the cell into the air. Additionally, sunlight comes in a variety of colors and the cell might be more efficient at converting bluish light while being less efficient at converting reddish light. Lower energy light passes through the cell unused. Higher energy light does excite electrons to the conduction band, but any energy beyond the



band gap energy is lost as heat. If these excited electrons aren't captured and redirected, they will spontaneously recombine with the created holes, and the energy will be lost as heat or light.

Nanotechnology Improves the Solar Cell

Present available nanotechnology solar cells are not as efficient as traditional ones, however their lower cost offsets this. In the long term nanotechnology versions should both be lower cost and, using quantum dots, should be able to reach higher efficiency levels than conventional ones. To coat the nanoparticles with quantum dots tiny semiconductor crystals. Unlike conventional materials in which one photon generates just one electron, quantum dots have the potential to convert high-energy photons into multiple electrons. Quantum dots work the same way, but they produce three electrons for every photon of sunlight that hits the dots. Electrons moves from the valance band into the conduction band The dots also catch more spectrums of the sunlight waves, thus increasing conversion efficiency to as high as 65 percent. Another area in which quantum dots could be used is by making so-called a hot carrier cells. Typically the extra energy supplied by a photon is lost as heat, but with a hot carrier cells the extra energy from the photons result in higher-energy electrons which in turn leads to a higher voltage. The transport of electrons across the particle net-work is the major problem in achieving higher photo conversion efficiency in nanostructured electrode. Utilization of CNT network support to anchor light harvesting semiconductor particles by assisting the electron transport to the collecting electrode surface in DSSC. Charge injection from excited CdS into SWCNT excitation of CdS nanoparticle. When CNTS attached in Cdse & CdTe can induce charge transfer process under visible light irradiation. The enhanced interconnectivity between the titanium dioxide particles and the MWCNTs in the porous titanium dioxide film was concluded to be the cause of the improvement in short circuit current density. Nanotechnology might be able to increase the efficiency of solar cells, but the most promising application of nanotechnology is the reduction of manufacturing cost. Chemists at the University of California, Berkeley, have discovered a way to make cheap plastic solar cells that could be painted on almost any surface. These new plastic solar cells achieve efficiencies of only 1.7 percent; however, Paul Alivisatos, a professor of chemistry at UC Berkeley states, "This technology has the potential to do a lot better. There is a pretty clear path for us to take to make this perform much better". These new plastic solar cells utilize tiny nanorods dispersed within in a polymer. The nanorods behave as wires because when they absorb

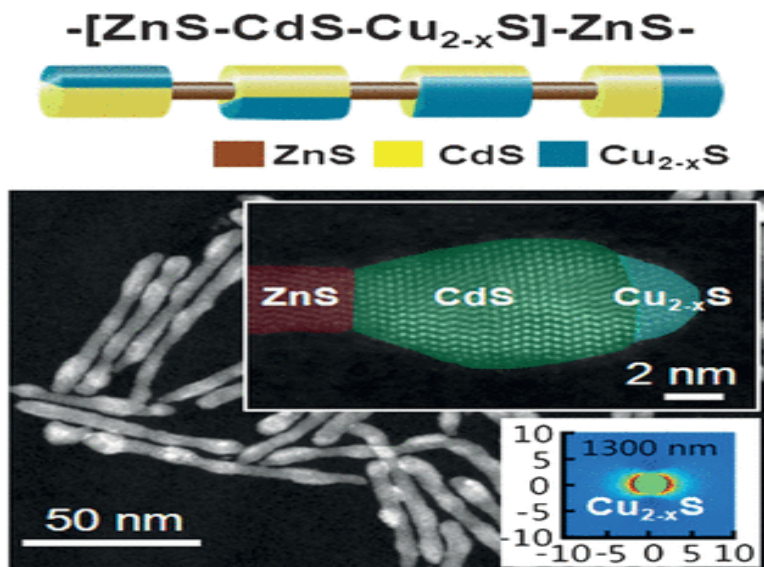


light of a specific wave-length they generate electrons. These electrons flow through the nanorods until they reach the aluminium electrode where they are combined to form a current and are used as electricity GaAs (thin film) with Peltier' s tiles connected on the base of GaAs thin film for use of extra energy from sun. Hybrid solar have used 30% more efficient than normal PV cell.Heat energy Effects the PV cell and decrease efficiency of PV cell but heat on solar cell absorbed by the peltier connected in series with aluminium heat sink at colder side produced potential difference which increase the efficiency of solar panel and provides long age of panel.

Results:-

The results prove my hypothesis, that even with all the thermal and voltage conversion losses, increases the efficiency of hybrid solar panel.

Picture of a solar cell, which utilizes nanorods to convert light into electricity, is shown in fig.



These new plastic solar cells utilize tiny nanorods dispersed within in a polymer. The nano-rods behave as wires because when they absorb light of a specific wave-length they generate electrons. These electrons flow through the nanorods until they reach the aluminium electrode where they are combined to form a current and are used as electricity GaAs (thin film) with Peltier' s tiles connected on the base of GaAs thin film for use of extra energy from sun. Hybrid solar have used 30% more efficient than normal



PV cell. Heat energy affects the PV cell and decreases the efficiency of PV cell but heat on solar cell absorbed by the peltier connected in series with aluminium heat sink at colder side produced potential difference which increases the efficiency of solar panel and provides long life of panel.

Results:-

The results prove my hypothesis, that even with all the thermal and voltage conversion losses, increases the efficiency of hybrid solar panel. Heat from sun 70-80% heat used which increases efficiency and life of solar cell.

REFERENCE

1. The Semiconductor Physics: An Introduction, Karlheinz Seeger.
2. G. Jeffrey Snyder, "Thermoelectrics". <http://www.its.caltech.edu/~jsnyder/thermoelectrics>.
3. Nanosolar Ships First Panels from Nanosolar Blog
4. <http://www.greentechmedia.com/articles/read/Nanosolar-Thin-Film-Solar-Hype-Firm-Officially-Dead>
5. <http://www.siliconbeat.com/2013/07/15/the-growing-cigs-graveyard-nanosolar-liquidation-auction>
6. <http://www.siliconbeat.com/2013/07/15/the-growing-cigs-graveyard-nanosolar-liquidation-auction>
7. "<http://www.gizmag.com/lumen-flashlight/39893/>
8. "<http://www.gizmag.com/lumen-flashlight/39893/>
9. Ulanoff, L. Elon Musk and SolarCity unveil 'world's most efficient' solar panel, Mashable, October 2, 2015, accessed June 28, 2016
10. Milestone in solar cell efficiency achieved: New record for unfocused sunlight edges closer to theoretic limits. Wilson da Silva. Science Daily. May 17, 2016
11. University of New South Wales. "Milestone in solar cell efficiency achieved: New record for unfocused sunlight edges closer to theoretic limits." ScienceDaily, 17 May 2016.
12. Li, Wei; Rubin, Tzameret H.; Onyina, Paul A. (2013-05-01). "Comparing Solar Water Heater Popularization Policies in China, Israel and Australia: The Roles of Governments in Adopting Green Innovations". Sustainable Development. 21 (3): 160–170. doi:10.1002/sd.1547. ISSN 1099-1719.
13. Morgan Baziliana; et al. (17 May 2012). Re-considering the economics of photovoltaic power. UN-Energy (Report). United Nations. Retrieved 20 November 2012.
14. KING, R.R., et al., Appl. Phys. Letters 90 (2007) 183516.
15. "SunPower e20 Module".
16. "HIT Photovoltaic Module" (PDF). Sanyo / Panasonic. Retrieved 25 November 2016.
17. Photovoltaic Solar Resource of the United States, http://www.nrel.gov/gis/images/map_pv_national_lo-res.jpg
18. Seebeck Coefficient, Electronics Cooling.com (accessed 2013-Feb-01).



THERMAL ANALYSIS OF VAPOUR COMPRESSION REFRIGERATION CYCLE

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ABSTRACT

This project presents results through a thermodynamic analysis of R22 and two of its alternative refrigerants (R134a, R407c) for A/C and refrigeration purposes operating under various outdoor temperatures, represented by the condenser temperatures as well as evaporating temperature.

As the refrigerant, R-22 is the major contributor to the ozone depletion; therefore in this thesis refrigerant R-134a and R-407c are studied comparatively, which are considered as a leading candidate to replace R-22. These two are compared with R22 on the basis of coefficient of performance, volumetric refrigerant capacity and mass flow rate. The result obtained indicates that R-22 can be replaced by R-134a and R-407c, without any significant loss in overall system performance. And out of these two (R-134a & R-407c) R-407c shows the better performance and environment friendly.

The second part of the project deals with the design of capillary tube for all the refrigerants used. The diameter and the length of capillary tube selected such that the compressor and the capillary tube achieve the balanced point at the desired evaporator temperature. A tube longer than the design (calculated) value is installed with the expected result that evaporating temperature will be lower than expected. The tube is shortened until the desired balance point is achieved. Also with the help of Secop Capillary Tube Selector Software the dimensions of capillary tube along with mass flow rate of all the refrigerants with respect to condensing temperature and evaporating temperature.

INTRODUCTION

In thermodynamic analysis, we apply the principle of conservation of mass, conservation of energy (first-law of thermodynamics). In the first-law analysis of vapor-compression refrigeration cycles, the main purpose is to determine, from the specific enthalpies of the refrigerant at the various state points in the cycle, the mass flow of the refrigerant, the heat flow and the flow of rotary shaft work for each piece of equipment. As a criterion of performance, the coefficient of performance of the cycle is calculated. The scope of the first-law analysis for the basic vapor-compression refrigeration cycle can be summarized by the following equations, which exemplify the concepts of the conservation of mass and energy

$$\text{Mass flow: } m = Q_{\text{evap}} / \Delta h_{\text{evap}} \quad (1.1)$$



Heat rejection: $Q = m(\Delta h)_{\text{cond}}$ (1.2)

Compressor Work:

$$W_{\text{comp}} = m(\Delta h)_{\text{comp}} \quad (1.3)$$

Energy balance:

$$Q_{\text{evap}} + W_{\text{comp}} = Q_{\text{cond}} \quad (1.4)$$

Coefficient of Performance:

$$\text{COP} = Q_{\text{evap}}/W_{\text{comp}} \quad (1.5)$$

It should be noted that the first-law of thermodynamics does not distinguish between the heat and work; and thus can not be used on its own to identify the sources of thermodynamic losses in a thermodynamic cycle. On the other hand, second-law of thermodynamics may be used in identifying and quantifying thermodynamic losses in any thermodynamic cycle.

In analyzing vapor-compression refrigeration cycles, the concepts of the reversible process are basic to the application of the second law of thermodynamics. From the basic concepts, the performance of a thermal system may be expressed in terms of component irreversibility rates, which provides a convenient method for optimizing the cycle. The irreversible loss in any thermodynamic process can be defined as the difference between the reversible work and the actual work.

The refrigeration cycles which are analyzed in this thesis are defined in terms of temperature and pressure of the refrigerant at various state points in the cycle, as well as the temperature of the refrigeration load and the environment.

WORKING FLUID OF REFRIGERATION CYCLE

REFRIGERANT :

A refrigerant is a fluid that absorbs heat by evaporating at a low temperature and pressure and gives up that heat by condensing at a higher temperature and pressure.

Most of the commonly used refrigerants exist in a gaseous state under ordinary atmospheric pressure and temperatures. To change these gases to liquid form, it is necessary to compress and cool them as is done by the condensing unit on a refrigeration system.

THERMODYNAMIC PROPERTIES OF REFRIGERANT

PRESSURE CHARACTERISTICS:

* Pressure at evaporating conditions should be above atmosphere, to avoid inward leakage of air.



* The compressor discharge pressure should not be excessive, so that extra strength high side equipment is required..

* A low compression ratio is required, since compression power increases directly with the compressor ratio.

* The compressor discharge pressure must not be above the critical pressure of the refrigerant, as the refrigerant could not be condensed.

TEMPERATURE CHARACTERSTIC

* The evaporating temperature must not below the freezing temperature of the refrigerant.

REFRIGERANTS USED

R-22

R-22 is the most popular refrigerant in the world. It is classified as an A1 (lower toxicity – no flame propagation) HCFC. In the United States, the EPA is phasing out R-22 in 2010. No single refrigerant will replace R-22. Different refrigerants will each take a piece of the broad market that R-22 was used in. For air conditioning applications, R-134a, R-407C and R-410A will replace the bulk of applications R-22 is currently used in. It has the largest installed inventory available for reclamation. As new technologies are developed and tested, the owner can move away from R-22.

R-134a

R-134a is the work horse refrigerant of foreseeable future. In large tonnage systems (over 100 tons) it will shortly replace R-22 as the most popular refrigerant in the world. R-134a is classified as an A1 (lower toxicity – no flame propagation) HFC. It is the refrigerant of choice for the automotive and appliance industries. All second generation screw and centrifugal chillers have been based on R-134a. The big four air conditioning manufacturers have followed McQuay's lead and now offer a R-134a centrifugal chiller and are now converting their screw chiller products over to it as well. There is no phase out date for R-134a by either the Montreal Protocol or the Kyoto Protocol.

R-407C

This refrigerant is HFCs and classified as A1 (lower toxicity – no flame propagation) by ASHRAE Standard 34, Designation and Safety Classification of Refrigerants. R-407C is a close "drop in" refrigerant to R-22. It can be used in a R-22 system without major modifications. It does have an 8°F glide, which effectively rules out flooded evaporator applications such as York's large tonnage R-22 centrifugal chillers.

Efficiency tends to drop from an R-22 design. R-407C allows field retrofits and current product offerings to be converted to an HFC refrigerant. The equipment manufacturer should be consulted for their advice and concerns regarding a retrofit. Performance in product lines that have been converted should be monitored but if the EERs or kW/ton are acceptable, then R-407C is a possible solution to avoiding HCFCs.



PERFORMANCE OF THE REFRIGERANTS.

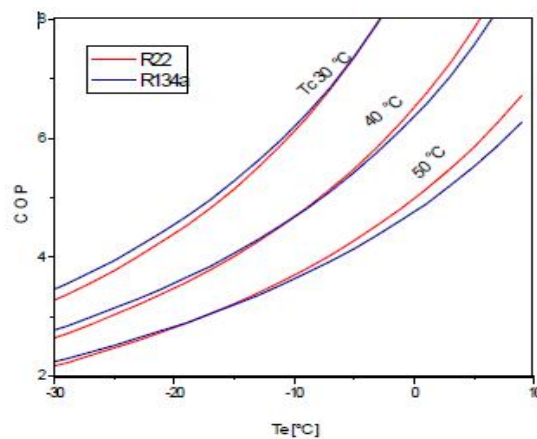
The calculations were performed for two alternatives refrigerants to R22, as well as

R22, under three different condensing temperatures, and investigating the effect of the evaporator temperatures on the coefficient of performance, the volumetric refrigerating capacity and the compressor discharge temperature and the mass flow rate.. The analysis considered two new refrigerants, namely R134a and R407C.

VARIATION OF THE COEFFICIENT OF THE PERFORMANCE (COP).

The variation of the COP with various evaporating temperatures. Ranging from -30°C to 10°C , and for three condensing temperatures (30°C , 40°C , 50°C), for the alternatives refrigerants considered, as well for the R22. It can be seen from these figures that the COP varies linearly with the evaporator temperature for all the cases studied. R134a seems to be similar to R22, except for $T_c=50^{\circ}\text{C}$, (COP decreases for a value of 5%), while R407c, exhibits a slightly higher values of the COP, except a Low T_{ev} , where it becomes closer to R22. Values are clearly greater than those obtained for R22, which suggest that for similar refrigerating duties, The refrigerant R407c exhibits better values for the COP.

Variation of the COP with T_e , and T_c



[a]



VARIATION OF THE VOLUMETRIC REFRIGERATING CAPACITY.

The effect of the evaporating temperatures on the volumetric

refrigerating capacity (VRC) for three condensing temperatures (30°C, 40°C, 50°C) for the refrigerants studied as well as R22. R134a exhibits an important volumetric refrigerating capacity, compared to R22, due to its high vapour pressure, while R134a possesses low values for VRC, which have very low critical temperatures, show high values for VRC, however, as the condensing temperatures increase, the VRC decreases faster than the R22.

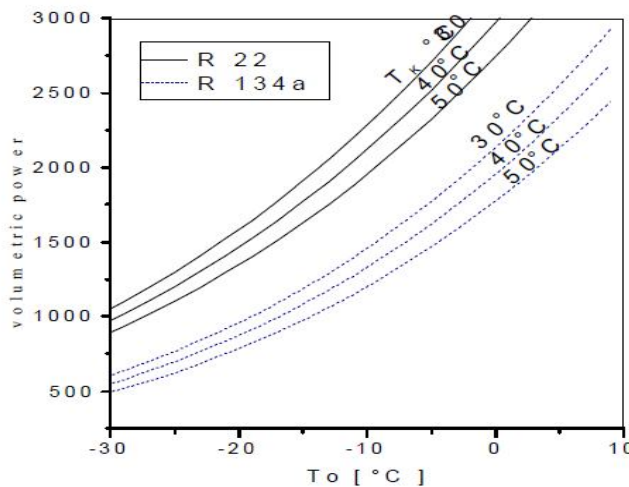
For example, for $T_c=30^\circ\text{C}$ and $T_{ev}= 3^\circ\text{C}$, it is observed an improvement of 43% , and 8.8% respectively for . while for a similar evaporating temperature

($T_{ev}=3^\circ\text{C}$) and $T_c= 50^\circ\text{C}$, there is an increase of 36% for the . ,R 407C which have a critical temperature below 10°C , exhibit values of VRF very close to the R22 values

Refrigerant	R22					
	T_{ev}	-15	-10	-5	0	5
Length(m)		1.82	2	2.25	2.61	3.13
Diameter(mm)		0.6	0.6	0.6	0.6	0.66

for the three condensing temperatures considered. It is necessary to avoid high condensing temperatures, in order to avoid lower values for VRC. .,

These results suggest that . requires smaller and cheaper compressors, than those required for R134a





CAPILLARY TUBE SELECTION

* The diameter and the length of capillary tube have to be selected such that the compressor and the capillary tube achieve the balanced point at the desired evaporator temperature.

* A tube longer than the design (calculated) value is installed with the expected result that evaporating temperature will be lower than expected.

M.F.R(l/min)	5.7	5.4	5.1	4.7	4.3
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Table: M.F.R & Capillary Tube Dimensions w.r.t Tcond.=35°C&Tev

Refrigerant	R134a				
T _{ev}	-15	-10	-5	0	5
Length(m)	2.18	2	1.82	1.63	1.45
Diameter(mm)	0.9	0.9	0.9	0.9	0.9
M.F.R(l/min)	14.3	14.9	15.6	16.5	17.5

Refrigerant	R407c				
T _{ev}	-15	-10	-5	0	5
Length(m)	1.8	1.84	1.78	1.88	2.02
Diameter(mm)	1.8	1.84	1.78	0.7	0.7
M.F.R(l/min)	8.7	8.6	8.4	8.2	7.9

CONCLUSION

The thermodynamic analysis has shown that

- * R134a seems to be similar to R22, except for T_c=50°C, (COP decreases for a value of 5%).
- * R134a possesses low values for VRC.
- * It is a non flammable, none explosive and non toxic refrigerant.
- * However R134a is considered to be less harmful towards the environment despite the fact that its use, will result with more CO₂ emission.
- * R134a is now being recommended to substitute R22, as it can be used in AC equipment, as well as in domestic apparatus.
- * R134a requires a less mass flow rate than R22.
- * R407c, exhibits a slightly higher values of the COP, except a Low T_{ev}, where it becomes closer to R22.
- * R407C shows high values for VRC, however, as the condensing temperatures increase, the VRC decreases faster than the R22.
- * R407c requires a lower mass flow rate than R22.
- * R407C has a zero ODP, and GWP similar to R22, is a non flammable refrigerant, and therefore can be considered as a potential substitute to R22, particularly for AC applications.
- * For same value of COP R407c gives the optimum length of capillary tube than R22 & R134a.

REFERENCES



1. B.O. Bolaji, M.A. Akintunde, and T.O. Falade :Journal of Sustainable Energy & Environment 2 (2011) 61-64
2. G Venkatarathnam and S Srinivasa Murthy : General article (2012 feb)
3. Engler, L R Oellrich, S Srinivasa Murthy, G Venkatarathnam, and A R Balakrishnan, Refrigerant mixtures as alternatives to HCFC22 and R502, Forschungsberichte des DKV, No.54, 1996.
4. C.Gage., Reducing refrigerant emissions, ASHRAE Journal, Vol40, 1998.
5. Secop Capillary Tube Selector Capsel Version 1.0 Database 1.0



BYOD (BRING YOUR OWN DEVICE): SECURITY ISSUES

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ABSTRACT

More you open the gates for people to come in, more you have to worry to keep the evil ones out. Same is the case with today's IT Organizations following the current trend of inviting employees to bring their own device like smart phones, tablets and laptops to access the resources of the organization. The key concern is the security risk's because of BYOD. Preventive measures can be adopted by selecting suited MDM tools.

Keywords- BYOD, Information Security, Attacks, MDM, UWYT, IT Consumerization, Next-generation Firewall

I. INTRODUCTION

BYOD implies Bring Your Own Device that means allowing employees to work from their own devices like smart phones, tablets and laptops to improve the flexibility, productivity and mobility. It comes with some major challenges to companies such as connecting myriad devices to corporate cloud. The rise of BYOD has radically changed the workplace. It also helps in overcoming high cost to employ the resources. When the organization employs its own policy for BYOD devices it is termed as BYOD policy. BYOD security is nothing but to applying certain strategies by making policies on the BYOD devices so that they can mitigate the risks of security attacks. Ownership of the IT resources is being shifted towards the employees and the contractors. It is not limited to the ownership only; management of the devices is also being shifted towards the users. The trend being used by employees as consumers in order to get the work done of an organization is known as IT Consumerization. They purchase and use their devices for the work of the organization.

The current trend of working employees is to work in their own environment at their own time. Also they do not want to switch rapidly from one device to another. Working hours are going flexible. They want to



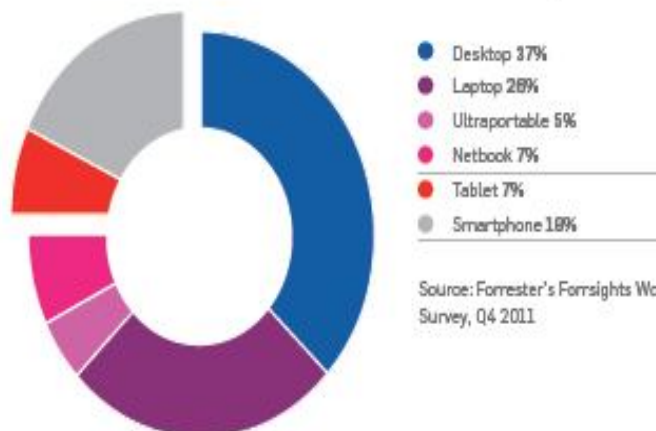
work from their home instead of sitting late in the offices. Another advantage is cost reduction of IT resources. People are coming with their own devices, sometimes they are working from their home.

Challenges that are attached with the flexibility of the use of mobile devices:

1. Connection given to myriad devices to the cloud of an organization: - Mobile devices as well as corporate owned devices are large in number and are increasing day by day. All the devices demand the privileges to access the corporate cloud.
2. The user working on smart devices may be smart enough to break the security policy on the device and may get the administrator privilege with the help of a few tools.
3. Sometimes there are possibilities of Man-in-the-middle attack or other attacks while accessing networking services provided through a wireless access point.
4. If the device goes into some wrong hands and is unlocked then various types of secured information cannot be prevented.
5. In case of lost or stolen device, one can wash out the corporate data.
6. Data Leakage may happen accidentally or by avoiding security experts guidelines.

Today mobile equipments and tablets are powerful enough to process any kind of operation. Operating System compatibility is different issue. The operating systems that are being frequently used in mobile devices are iOS, Windows, Android, Blackberry and so on. In this way the lifestyle of people are also changing. The challenges focus more on the security aspects of the mobile devices. IT managers are playing crucial role of designing better and tighter gateway to access the cloud.

One in four devices used for work are either smartphones or tablets.



Source: Forrester's Foresights Workforce Employee Survey, Q4 2011



This paper is divided in following sections; section II introduces the related work. Section III elaborates the issues associated with BYOD. Section IV discusses preventive measures. Section V lists the MDM tools and their comparative analysis. The final section VI concludes the paper and also introduces the possible future work.

II. RELATED WORK

Vaishali Singh & S. K. Pandey [10] focused on various proposed research areas particularly in terms of cloud. Their study aims to point out the challenges and prospects under cloud security. The center of attention of their study is the future directions of the studies of all the aspects of a cloud. They made a gist out of various research papers and drew the research areas.

T. Andrew Yang and Alan T. Yang [14] discussed the risks associated with BYOD. Their study proposed the risk management quartet. The quartet includes four functions connected with the help of arrows:

1. Technology
2. Controls
3. Liabilities
4. User Perception

Suarez-Tangil et al [6] have introduced a security model for current smart devices. Along with that they proposed a comparative analysis of different OS used in smart devices. Their study aims to explain especially the malware presented in the smart devices and security aspect of the mobile devices.

Niharika Singh [12] presented both merits and challenges of BYOD. Her study first checked the Use what you are told (UWYT) model then it switched to BYOD. She summarized the pros and cons of BYOD also. Main risks are the malware, wi-fi connection, stolen device etc. whereas benefits include more hours given by an employee, competitive advantage, flexible timing etc. They have also cited percentage of threats and important of BYOD.

Leo de souse [13] proposed an approach to introduce BYOD for employee i.e. it start from UYWT then there is policy development. Next step is technological research which is followed by implementation



based on policy and research. Finally it comes to BYOD.

Vijay Saradhi [11] discusses pros and cons of BYOD. Their study also aims to give a brief on mobile device management tools.

Scott Emery [4] focuses on institution-wide BYOD strategy. His study aims to introduce various research strategies for faculty and staff. The researcher elaborates the possibilities of BYOD with academicians.

Martijn Hensema [8] answers three major questions on BYOD through research i.e. 1. What is BYOD?
2. How do the organizations compare to this definition?
3. How is the acceptance of BYOD in these organizations?

Ahmed Dedeche et al. [1] made a research on emergent BYOD strategies and challenges. The center of attention was the risks and challenges later they answered a major question that what organization can do to manage risks. While answering they explained BYOD policy and MDM.

Hanlin Chen et al. [7] have elaborated risks and challenges associated with BYOD. They focused on training and motivation for using BYOD.

This paper explains a different out comings as it focuses on future dimensions. Along with pros and cons of BYOD the paper also gives a comparative chart of MDM tools. Also it explains something on open source, free MDM tools (i.e. packet fence). The paper also introduces possible future work and the proposed approach to BYOD.

III. ISSUES ASSOCIATED WITH BYOD

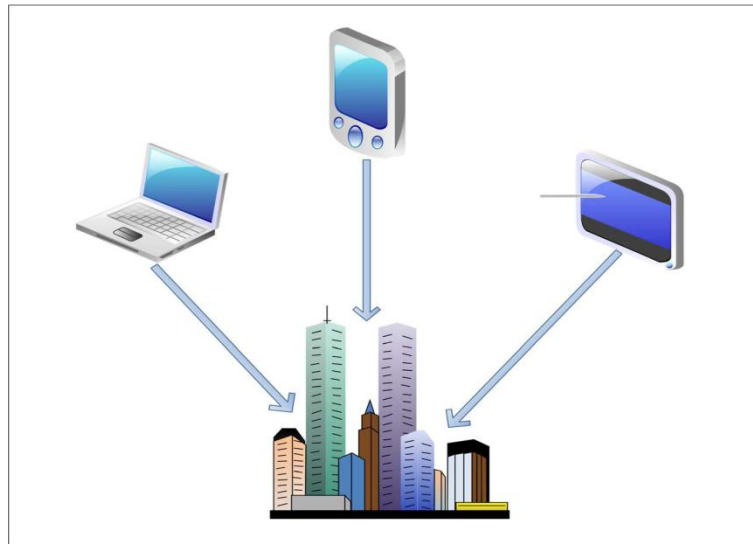
BYOD brings many issues concerning to the security as well as Organizational Policies.

- Are these devices optimized enough to be used at work, whether they fulfill BYOD security policies or not.



- Giving network access to non-corporate devices, policy should be there to define who and what is to be given access on the network.
- What if a non-corporate device with some corporate data is lost?
- There will be a possibility that the non-corporate device is affected with some malware.
- What if a non-corporate device goes in wrong hands?
- Wi-Fi is mostly used as a connection medium for giving access to BYOD devices. Is these wireless access points secured enough to restrict unwanted users.
- Bandwidth will also become a major issue if wireless access points are not available. 3G/4G network coverage is very much questionable.
- User authentication will be a major security concern for these mobile devices.
- What if some malicious Apps get network access, App filtering is also a security concern so as to allow only trusted apps like mail client, browser etc on BYOD devices.
- Data Storage is a major issue with BYOD devices, whether to use a local storage or some Network Storage Solution.
- If using Network Storage Solution then what about traffic encryption to prevent data leakage.
- If using a local storage for storing corporate data, then what backup strategies are followed is also a major point of concern.
- As the number of BYOD devices is increasing at a very rapid rate, giving access to every device is also a point of concern for network administrator.
- QOS also comes in this frame when talking about BYOD Devices.

BYOD is definitely beneficial for the organization in terms of employed resources and getting extra work from employees, but do come with a lot of issues as discussed above.



IV. PREVENTIVE MEASURES

To effectively employ BYOD devices there should be appropriate preventive measures to be taken.

Use of MDM (Mobile Device Management) tools is one of the ways of ensuring security for BYOD devices.

Mobile Device Management is used to manage and secure the mobile devices such as laptops, smart phones and tablets. MDM tools are used to focus on application management, file sharing, security tools and support to BYOD. It ensures who is authorized to access the cloud services from a particular mobile device.

Mobile market has enforced security features like UTM, remote device management, deep packet inspection, Virtual private network etc. Open Mobile Alliance Device management (OMA DM) are also being used for secure communication and managing the devices.

V. MOBILE DEVICE MANAGEMENT

A number of MDM tools are available in the market depending on the features they provide.

Selection of a particular MDM tool depends upon the variety of support for BYOD devices offered by the organization.

Figure below shows a comparison chart:-



	MobileIron	AirWatch	Fiberlink	Zenprise	Good	BoxTone	IBM	SAP	Semantic	Notify	McAfee	Sophos	SOTI	Tangoe	LANDesk
MGMT Supported	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Packaging															
SaaS	Yes	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	No	-	Yes	Yes	-
Appliances	Yes	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No
Windows Software	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mac Software	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No
Unix Software	No	No	No	Yes	No	No	-	No	No	No	No	No	No	No	No
Virtual Machine	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Reseller Theming	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	-
Licensing															
Perpetual License	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recurring License	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Maintenance															
Purchase	Mandatory	Mandatory	Optional	Mandatory	Optional	Optional	Optional	Optional	Mandatory		Mandatory	Mandatory	Mandatory	Optional	Optional
Includes dot releases	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Includes major releases	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Includes Support	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Support															
12x5	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12x7	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
24x7	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Scalability															
Locations	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Location-Specific Admin	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Role-based Admin	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mobile Configuration Features															
Require Passcode	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Device Restrictions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exchange Account Seeding	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes



Wi-Fi Configuration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VPN-L2TP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VPN-CISCO Anyconnect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VPN-Juniper	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
VPN-F5	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
APP Management															
Push Web Apps	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Catalog of in-house app	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recommended retail apps	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VPN Integration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	-	Yes	Yes	Yes
Administration Console															
Web	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
API or SDK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes
Desktop App	No	No	No	Yes	No	Yes	No	Yes	Yes	No	No	No	Yes	No	Yes
Alert when no response	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	Yes
Alert when roaming	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Alert on forbidden app	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	No	Yes	Yes	-	Yes
Supported Devices															
Android	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Blackberry	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Symbian	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	
Windows Mobile	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Windows Phone 7		Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes	No	-	Yes		
Windows Desktop	No	No	Yes	No	Yes	No	Yes	Yes	Yes	No	No	Yes	No	Yes	
Mac Desktop	No	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	No	Yes	
Linux Desktop	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	Yes	

MDM Comparison Chart, bluefish management

Above discussed MDM tools do come with a license, means one has to pay licensing cost for using them. On the other hand if one wants to use free of cost, open source tool then also he or she may has the flexibility. One can customize that tool also. One of such tools is PacketFence, it is used to provide solutions (especially security solution) to mobile device user.

Based on Gartner (May 2013) MDM tools are being compared and put in a quadrant having axes ability to execute and completeness of vision. Based on the quadrant MDM tools has been categorized in four categories; Leader, Visionaries, Challenger and Niche players.



Among all AirWatch, MobileIron and Citrix are at leading positions while Tanguo, LanDesk and Kaspersky Lab at downside and in challengers quadrant.

VI. CONCLUSION AND POSSIBLE FUTURE WORK

BYOD is an important step forward by IT Organization but need efficient security mechanisms for effective deployment. BYOD comes with several issues and Organization has to consider them seriously. Although introduction of MDM tools ensure security for BYOD devices but security needs to be multilayered. It depends upon the Organization exactly what kind of service they are offering and what type of MDM tools they use.

The compartments made in security system i.e. multilayered security architecture should be the new trend to BYOD security. The evolution of BYOD starts from UWYT devices then there comes policy formation which is followed by technological research then implementation then BYOD appears. BYOD is known as future trend as it requires policy implementation and technological research.

Possible future works are multilayered security implementation in every organization so that if an intruder breaks one compartment then he or she will face hurdles while breaking other compartments.

In case of stolen device there should be some security mechanism that is able to identify the user based on biometric data.

Use of next-generation firewall will be suitable for such devices because next-generation firewall identify content not packet, users not IP addresses and applications not ports.

REFERENCES

- [1] Ahmed Dedeche, F. L. (n.d.). Emergent BYOD Security Challenges and Mitigation Strategy. Retrieved from http://dtl.unimelb.edu.au/exlibris/dtl/d3_1/apache_media/L2V4bGlicmlzL2R0bC9kM18xL2FwYWNoZV9tZWVpYS8zMDAyOTc=.pdf
- [2] Carolyn Fitton, T. B. (n.d.). Enterprise Mobility for Dummies (2nd ed.). Mississauga: John Wiley & Sons Canada, Ltd. . Retrieved from http://high-impact-prospecting.com/staging/work/wp-content/uploads/2014/01/w_sapx293.pdf
- [3] Chart, M. C. (n.d.). mdm-comparison-chart. Retrieved from <http://www.bluefishwireless.net/http://www.bluefishwireless.net/2012/06/mdm-comparison-chart/>
- [4] Emery, S. (2012). Factors for Consideration when Developing a Bring Your Own Device (BYOD) Strategy in Higher Education. University of Oregon, Applied Information Management. Retrieved from <https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/12254/Emery2012.pdf>
- [5] Eschelbeck, G. (2013, July). BYOD Risks and Rewards.



- [6] Guillermo Suarez-Tangil, J. E.-L. (2013, November 7). Evolution, Detection and Analysis of Malware for Smart Devices. *Communications Surveys & Tutorials*, IEEE , PP(99), 1-27.
- [7] Hanlin Chen, J. L. (n.d.). Security Challenges of BYOD: a Security Education, Training and Awareness perspective. Retrieved from http://dtl.unimelb.edu.au/exlibris/dtl/d3_1/apache_media/L2V4bGlicmlzL2R0bC9kM18xL2FwYWNoZV9tZWVpYS8zMDAzMTY=.pdf
- [8] Hensema, M. (n.d.). Acceptance of BYOD among Employees at Small to Medium-sized Organizations. Retrieved from <http://referaat.cs.utwente.nl/conference/19/paper/7397/acceptance-of-byod-among-employees-at-small-to-medium-sized-organizations.pdf>
- [9] Navetta, D. (2012, March 28). the-security-privacy-and-legal-implications-of-byod-bring-your-own-device. Retrieved from <http://www.infolawgroup.com/http://www.infolawgroup.com/2012/03/articles/byod/the-security-privacy-and-legal-implications-of-byod-bring-your-own-device/>
- [10] Pandey, V. S. (2013, Aug). Research in cloud security: Problems and Prospects. *International Journal of Computer Science Engineering and Information Technology Research (IJCSEITR)*, 3(3), 305-314.
- [11] Saradhi, V. (2013, October 25). Leveraging-BYOD. Retrieved from <http://www.scribd.com/http://www.scribd.com/doc/178899863/Leveraging-BYOD>
- [12] Singh, M. N. (2012, December). B.Y.O.D. Genie Is Out Of the Bottle – “Devil Or Angel”. *Journal of Business Management & Social Sciences Research (JBM&SSR)*, 1(3), 1-12.
- [13] Sousa, L. d. (2012, May 1). Bring Your Own Device for Employees Understanding the IT Security Architecture Impacts. Retrieved from <http://www.slideshare.net/http://www.slideshare.net/leodesousa/byod-for-employees-leo-de-sousa>
- [14] T. Andrew Yang, R. V. (2013). Risk Management in the Era of BYOD: The Quintet of Technology Adoption, Controls, Liabilities, User Perception, and User Behavior. *International Conference on Social Computing* (pp. 411-416). International Conference on Social Computing.
- [15] Technology, M. (n.d.). BRING YOUR OWN DEVICE The future of corporate computing? Retrieved from http://mti.com/http://mti.com/Portals/0/Documents/White%20Paper/MTI_BYOD_WP_UK.pdf



WEAR ANALYSIS OF COMPRESSION MOLDED ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE COMPOSITE REINFORCED WITH TALC

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ABSTRACT

Ultrahigh-molecular-weight polyethylene (UHMWPE) is in clinical use over 40 years as a liner in the acetabular cups for total hip replacement and knee replacement. Despite its superior mechanical properties, generation of wear debris leads to the aseptic loosening and revision surgery. In the present work, UHMWPE based bio-composites with varying content of Hydroxyapatite (HA) (10wt %), Talc (10-20 wt %) and has been fabricated using compression moulding. HA addition is expected to impart biocompatibility, talc to improve strength and stiffness and wear resistance. It is observed that UHMWPE with 10% HA has the maximum hardness of ~71 MPa and minimum wear rate of 0.95×10^{-4} mm³/Nm than other filler reinforced composites. The study of tribological properties have shown that compositions have lower wear rate than UHMWPE, SEM images and study of fretting scar in optical profilometer has been done to explain the wear mechanisms involved. In vitro test for biocompatibility of compositions are done in SBF for a period of 72 h, compositions having HA as a constituent have shown presence of both calcium and phosphorus, thus indicating apatite formation.

Keywords: Fretting wear, UHMWPE, Mechanical properties.

1. Introduction

The concept of producing bone replacement by reinforcing a bio inert high density polyethylene (HDPE) matrix with a bioactive HA was introduced by Bonefield [1-3]. The use of ultra high molecular weight polyethylene (UHMWPE) over conventionally used HDPE as an implant has considerable advantageous due to its superior mechanical toughness, wear resistance and bio compatibility, however it does not achieve much success due to difficulties in processing[4-5]. In light of the above, novel composites were prepared by using compression molding process and their fretting wear study has been done against steel ball. Fretting is surface damage observed between two contacting surfaces experiencing oscillatory /cyclic motion, normally tangential of small amplitude, ~100µm as observed in ball and socket(cup) bone joints. This wear causes the release of smaller particles as wear debris from the mating surface, this debris remain in contact with the cup liner and head due to constricted motion which results in loss of clearance of total joints and causes implant loosening. Fretting wear is one of the most important factors for failure of bone joints [6-7]. Various metallic and ceramic materials (such as Ti, Al₂O₃, hydroxyapatite, Ag, zinc oxide, CNTs) have been used to improve the



wear resistance, toughness of the implant materials [8-10]. In this study particulate reinforcements of HA and talc are used to improve wear behavior and improvement in mechanical properties.

Nomenclature

UHMWPE	Ultra High Molecular Weight Polyethylene
HA	Hydroxyapatite
WR	Wear Rate
WV	Wear Volume
SBF	Simulated Body Fluid

2. Materials and Methods

UHMWPE powder having a molecular weight of 5×10^6 g.mol⁻¹ and density of 0.93 g/cm³ was supplied by M/S Polyrib, Kanpur, India. HA was synthesized using solution precipitation method, the as synthesized powder was further ball milled for 16 hours using agate jar and ball with a ball powder ratio of 4:1 at a speed of 250 rpm in acetone medium which was further dried in the oven at 100°C and crushed. The talc as white powder (3MgO.4SiO₂O) was obtained from M/s Loba Chemie Pvt. Ltd, Mumbai, India. The powder has a specific density of 0.3 g/cm³ and average particle size is ~10µm

2.1 Blend Preparation and Compression Molded sample preparation

The polymer UHMWPE powder particles and reinforcement powder particles of HA and talc were blended by ball milling (Fritsch Ball Mill P-7, Germany) without balls for 4 h at 300 rpm (pause of 10 min after every 30 min of blended in the presence of ethanol as a solvent This ball-milled powder was dried for ~12 h in an oven at 50°C. UHMWPE composite sheets of dimension 8.7 cm × 8.7 cm were processed by compression molding (SCM-30, M/s Santec Automation Pvt. Ltd., Delhi) at processing temperature of 200 °C, pressure of 7.5 MPa and holding time of 60 min. A rectangular die is used for the sample preparation (Figure 1).



Fig 1 Rectangular mould die



2.2 Fretting wear and microhardness testing

Fretting was done using a fretting wear tester (DUCOM TR281 M; Reciprocating Wear and Friction Tester; Bangalore, India) by employing a ball on- flat-type configuration with the variation of load of 5 N and 10 N against steel ball. Friction experiments were conducted with no lubrication at room temperature to analyse the wear mechanism, surfaces were examined by optical profilometer and scanning electron microscope.

3. Results and Discussion

The fretting wear scars have been studied under optical surface profilometer. The calculation of the wear volume has been done by taking the average of three x-profile depths measured by optical profilometer and multiplying by the length of scar as obtained in the images, values obtained for load 10N and stroke length 100 μ m and 10000 cycles are presented in Table 2. The multiple x- profile curves show variation of depth with length. The length of scar is measured in mm and depth in μ m. The scar images as obtained for different sample compositions has been shown in figure 2 and SEM images in figure 3.

Table 1 – Hardness (MPa) values of test samples

Composition of test samples	Hardness(MPa)
UHMWPE +10% Talc+ 10% HA	47.08
UHMWPE +10% Tal	49.01
UHMWPE	58.26
UHMWPE +10% HA	71.36

Table 2- Fretting Wear Rate and Wear Volume of samples

Composition of test samples units	Wear Volume mm ³	Wear Rate mm ³ /Nm
UHMWPE+10%HA+10%Talc	3.98×10^{-3}	3.98×10^{-4}
UHMWPE +10% Tal	1.21×10^{-3}	1.21×10^{-4}
UHMWPE	1.91×10^{-3}	1.91×10^{-4}
UHMWPE +10%HA	0.95×10^{-3}	0.95×10^{-4}

The maximum wear rate was found to be of composition having 10%Talc and 10%HA, which is in correspondence to minimum hardness of 47.08 MPa as represented in Table 1 and minimum for composition having 10% HA which is due to hardness imparted by addition of ceramic HA as represented in Table 1, the composition with 10% HA shows maximum hardness of 71.36 MPa.

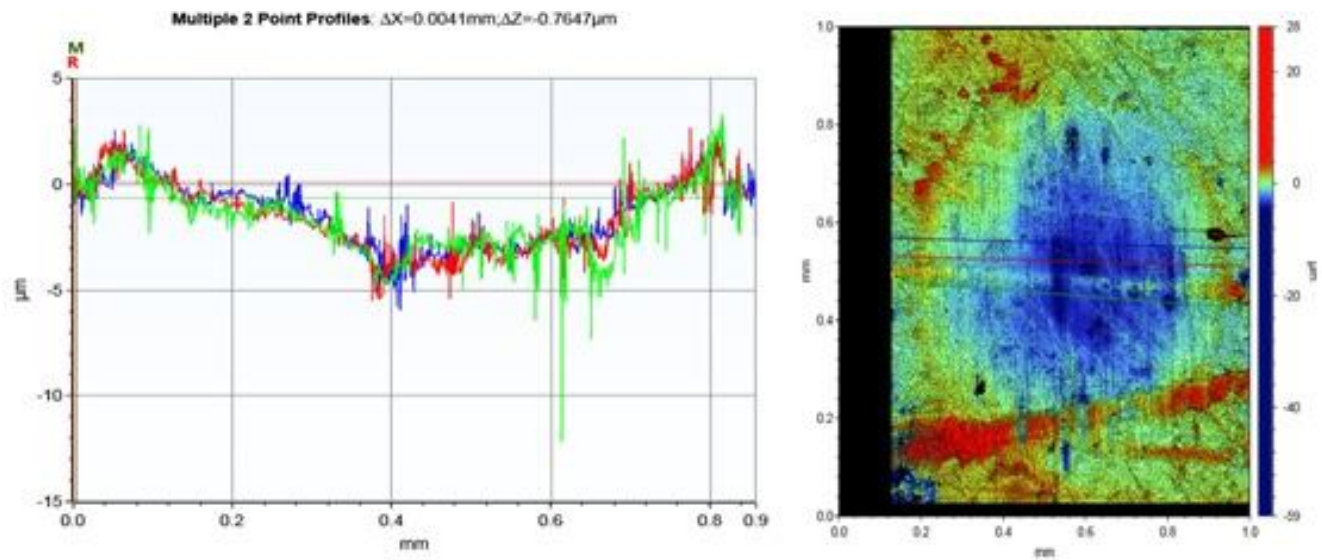


Figure 2 shows scar and multiple 2 point x-profile generated by optical profilometer, figure 3 shows the SEM image with clearly visible fretting wear direction.

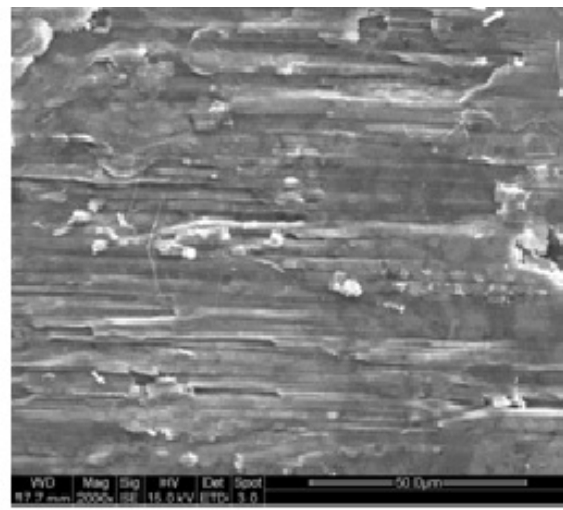


Fig 3 SEM image of fretting scar

In vitro Biocompatibility was performed in SBF, the prepared samples were cut into 10 mm × 10 mm tests before being soaked into the SBF, the samples were washed ultrasonically in acetone, absolute alcohol and deionized water for 10 min, in turn. After being dried in air, they were subsequently immersed into the SBF for 72 h. Simulated body fluid test is a method that is well recognized to characterize the in vitro bioactivity of ceramic materials. The SBF was prepared by dissolving reagent chemicals of NaCl, NaHCO₃, KCL, K₂HPO₄.3H₂O, MgCl₂.6H₂O, CaCl₂ and Na₂SO₄ in deionized water. The fluid was



then buffered at PH 7.4 and at 37°C with tris (hydroxyl methyl) amino methane [NH₂C(CH₂OH)₃] and hydrochloric acid.

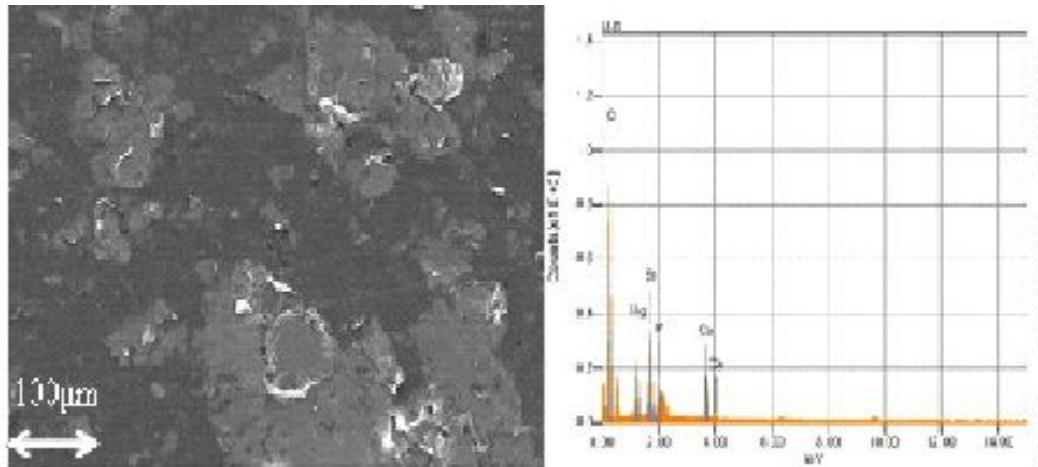


Fig. 4 SEM and EDS after immersion in SBF for 72 h.

It is observed that no phosphorus has been detected hence no apatite formation this can be attributed to inert nature of both UHMWPE and Talc. In composition having UHMWPE, 10% talc and 10% HA, phosphorus and calcium has been detected. Hence, apatite formation has taken place.

4. Conclusions and future scope of work

Incorporation of HA 10% in the UHMWPE polymer shows improvement in hardness, addition of Talc has shown a decrease in hardness of composite which may be attributed to its soft and porous nature. HA has also enhanced the wear resistance as composition having HA have been observed with lower wear rates. The composition having both Talc with HA was observed to be having lower hardness and higher wear rates. Addition of HA in inert UHMWPE and Talc has promoted bio compatibility.

Optimization of Talc and HA content between 5-15 wt % in UHMWPE to achieve synergy and better mechanical properties. Addition of coupling agent like EPDM into filler and UHMWPE to achieve the stronger interface between the reinforcements and UHMWPE matrix. In-vitro cytotoxicity study on UHMWPE-HA-Talc composite is required to be done to understand the effect of wear debris.

References



1. Wang M, Chandrasekaran M , and Bonfield W , Friction and wear of hydroxyapatite reinforced high density polyethylene against the stainless steel counterface. *J Mater Sci: Mater Med* 13(2002), p 607–611.
2. Wang W, Hench L L, and Bonfield W, Bioglass (R) high density polyethylene composite for soft tissue applications: preparation and evaluation, *Biomed Mater Res* 42(4) (1998), p 577–86.
3. Wang M, Joseph R, and Bonfield W , Hydroxyapatite-polyethylene composites for bone substitution: effects of ceramic particle size and morphology, *Biomaterials* 19 (1998), p 2357–66.
4. Pratik R, and Sailajan R N, Mechanical, thermal and bio-compatibility studies of PAEK-hydroxyapatite nanocomposites. *Journal of the mechanical behaviour biomedical materials* 49 (2015), p1-11.
5. Nielsen L E, and Landel R F, In *Mechanical properties of polymers and composites: Mechanical properties of polymers and composites*. 2nd ed. New York, Marcel Dekker, Inc. (1994).
6. Fahad F, Patel A K , Sharma R, and Balani, Processing, Characterization and Fretting Wear of Zinc Oxide and Silver Nanoparticles Reinforced Ultra High Molecular Weight Polyethylene Biopolymer Nanocomposite, *The Minerals, Metals & Materials Society* (2015), *JOM*, Vol. 67.
7. Fang L M, Leng Y, and Gao P, Processing of hydroxyapatite reinforced ultrahigh molecular weight polyethylene for biomedical applications, *Biomaterials* (2005), p 3471–8.
8. Yuanxin Z, Rangari V ,Hassan M, Shaik, and Mallick P K, Experimental study on thermal and mechanical behavior of talc/polypropylene and polypropylene/clay nano composites. *Materials Science and Engineering A* 402 (2005), p 109–117.
9. Qiufeng W, Yunxia W, Hongling W, and Fengyuan Y, Fretting wear behavior of UHMWPE - Influence of load and stroke, *Tribology Transactions* (2016).
10. Ruan S L, Gao P , Yang X G, and Yu T X, Toughening high performance ultrahigh molecular weight polyethylene using multiwalled carbon nanotubes. *Polymer* (2003), p 5643–54



THE LATEST SUPPLY CHAIN STRATEGIES DELIVERS LOW-CARBON GROWTH

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ABSTRACT

Supply chains must be shifted from a traditional focus on making and delivering, to various models which resolve customer needs and considers all challenges we are facing. The end perspective (responsible sourcing, design, logistics, recycle management, waste less manufacturing), along with integration and collaboration between partners that share information and knowledge, is key. This will create a stable supply chain that gives the accurate information and enables the good decisions in a faster way with visibility, transparency and connectivity. Large number of companies would show and offer leadership when it comes to operational and business excellence and show the way for smaller suppliers.

Since "low carbon" was deeply involved into people's minds in the global Climate Change Conference which was held in Copenhagen, the green wave in which the topic were new energy revolution and low carbon economy has been sweeping the world. The concept of low carbon supply chain was born and it has received wide attention. It has been the key point for the enterprises that want to become outstanding to adopt low carbon management in which the cooperation of the member enterprises play a very important role in the process of the low carbon management. Therefore, it is necessary for the whole supply chain member enterprises to find the strategies of advancing the cooperation satisfaction among enterprises based on low carbon supply chain management.

Literature review

The changing supply chain context

Today's competitive business model is driven by cost-efficiency, growth, economies of scale and the disaggregation of consumption and production. The corresponding supply chain model optimizes costs against service-levels. It features little emphasis on total sustainability, and is therefore carbon-inefficient and resource-intensive.

This model has delivered high growth to be sure. But, now, a new business paradigm is changing the landscape, creating new sources of pressure and opening up fresh opportunities. Resource constraints are tightening, and regulation is increasingly favoring carbon-efficient businesses. Consumption and production points are moving closer together.

Customer preferences are shifting towards lower-carbon goods and services; many are becoming less interested in owning products and more interested in the value of the service that the product ultimately offers.



These paradigm shifts suggest that we are facing an unprecedented opportunity to align business, society and the environment around sustainability. To meet these 21st century requirements, the supply chain needs to adapt to deliver on total sustainability (financial, social and ecological). Rising to this challenge will mean moving away from the linear approach to supply chain management and building closed-loop systems. This will position businesses to make progress in four key opportunity areas: product sustainability, product waste, low-carbon logistics and reverse chain maximization.

Four key opportunity areas

- **Enabling product sustainability**

Recalibrate design, engineering, manufacture, supply, use and recycling to improve product sustainability. Key enablers include collaboration to share life-cycle information among various actors in the supply chain.

- **Eliminating product waste**

Remove product waste from along the supply chain by ensuring products fulfill their intended use. Key enablers include direct communication, real-time monitoring and information exchange along the supply chain. These enablers help improve demand forecasting as well as inventory and asset management for product waste reduction, which could in turn improve customer service levels.

- **Driving low-carbon logistics**

Use transportation and warehousing capacity to move goods with maximum efficiency.

Improved information exchange among actors in the supply chain can enhance capacity utilization, inter-modality, route planning and transportation asset efficiency. Moreover, integration of carbon information at a strategic level can optimize network efficiency while reducing carbon emissions, both during initial design and network re-design.

- **Maximizing reverse supply chain**

Re-capture materials in used products or extend product lifespan. This requires extending the forward supply chain with a reverse chain, in turn lengthening product lifespan and securing the resource base. This strategy is proving an effective means to create business value while reducing carbon. Enacting it requires high levels of collaboration and integration as well as transparent information exchange between the manufacturers and the actors in both the forward and the reverse chains.

For some product categories, the largest sustainability gain will come through the adoption of a service-based business model. Several companies are already improving profitability by pursuing this route. To be successful the model needs to be rooted in a deep understanding of the value proposition for the customer and the precise nature of the sale – that is, a service from a product, rather than ownership of the product itself.

The study on low carbon supply chain management satisfaction with cooperation in enterprises

In 1970s, people began to think of the influence of the environmental factors and Webber proposed the concept of green procurement. Then Michigan State University Manufacturing Research Institute (MRC) first proposed the concept of green supply chain. By green designing, green material selection, green manufacturing, green manufacturing processes, green recycling, green packaging and green consumption and other ways, it was possible to achieve the aim in which there would be non-waste production and zero emissions in the whole process and maximized the elimination of the impact on the environment. Generally speaking, low carbon supply chain management is the specific performance of the green supply chain management in the trend of low carbon economy environment nowadays. According to the related information, the main study on low carbon supply chain management satisfaction with cooperation in enterprises is the following:



i) The higher the degree of the consultation in the supply chain, the higher the degree of the cooperation satisfaction. Close cooperation in the supply chain member enterprise is needed to reach the running goal of the low carbon supply chain. However, in the whole supply chain, each enterprise owns the independence and different interest demands, so a certain degree of controversy and conflict is existing. The controversy and conflict would seriously affect the cooperation of the member enterprises and the whole supply chain. It is the negotiation that is the most effective way to solve the non –adversarial dispute and conflict. Fully negotiation and high degree of consultation would help the enterprise reach the clear consensus and reasonable expectation, and then high degree of the cooperation satisfaction among low carbon supply chain member enterprises will be reached.

ii) The higher amount of the information sharing among the enterprises in industry, the higher the satisfaction of cooperative in enterprises. As we know, the existence of effect makes that upper manufactures can not accurately grasp the needs of the market information. The effective method for member enterprises to Reduce the "bullwhip effect" is get information shared among companies. The higher the degree of information sharing will allow members of low carbon supply chain enterprises to better organize production operations and inventory and distribution planning and make rational use of resources, to reduce operating costs and increase end user satisfaction, to access to the best interests of the supply chain, so that the satisfaction of all parties would have been increasing.

iii)The more mutual trust in all low carbon member enterprises , the higher the satisfaction of business cooperation in the low carbon supply chain. Construction of confidence is a prerequisite for effective cooperation. Effective low carbon supply chain must make sure that the chain members have established full trust with each other. Supply chain management is intended to strengthen the junction enterprises' core competitiveness that would help response rapidly to the market demands and ultimately improve the entire supply chain competitiveness in the market. Therefore, in order to achieve the aim, it is the core of supply chain management to strengthen the cooperation and develop the trust among enterprises. What trusting contributes to low carbon supply chain is: First, trust helps to reduce the transaction costs in the low carbon supply chain; Second, trusting promotes and deepens the cooperation in low carbon supply chain enterprises; Third, trusting throughout the supply chain can improve the rapid reaction capability; Last, it is the trusting that makes the enterprises insist on cooperating with each other and avoid the risk of choosing other ones. In summary, the trusting plays a key role of cooperation in the low carbon supply chain member enterprises.

iv)The business cooperation strategies of the members to increase profits help to improve cooperation satisfaction. Supply chain member enterprise will seek to maximize their profits as independent economic entities. The operational approaches try to improve the competence of the whole supply chain by the good cooperation of the member enterprises in low carbon supply chain management, and this would be carried out only with the situation that each enterprise would get profit from it. Therefore, in the process of the cooperation the influence which profit distribution mechanism gives on the follow actions of each enterprise must be considered to ensure the members in the low carbon supply chain get reasonable incentive of profit. In summary, the cooperation which can help improving the profit is conducive to enhance the depth and breadth of cooperative behavior in the whole low carbon supply chain while increasing the satisfaction of all member enterprises.



The low carbon management in supply chain is the specific implementation on low carbon strategy and the basis of establishing low carbon competitive advantage. This has been proved by a great amount of enterprises that are the leaders in the practice of low carbon supply chain management and that the low carbon performance and economic performance can complement each other and achieve win-win situation. Based on the above point of view, there are five dimensions variable that would influence the cooperation satisfaction among the low carbon supply chain member enterprises and they are: Degree of consultation, information sharing trust, profit improvement and low carbon management.

The key factors in the collaborative 21st century supply chain model are:

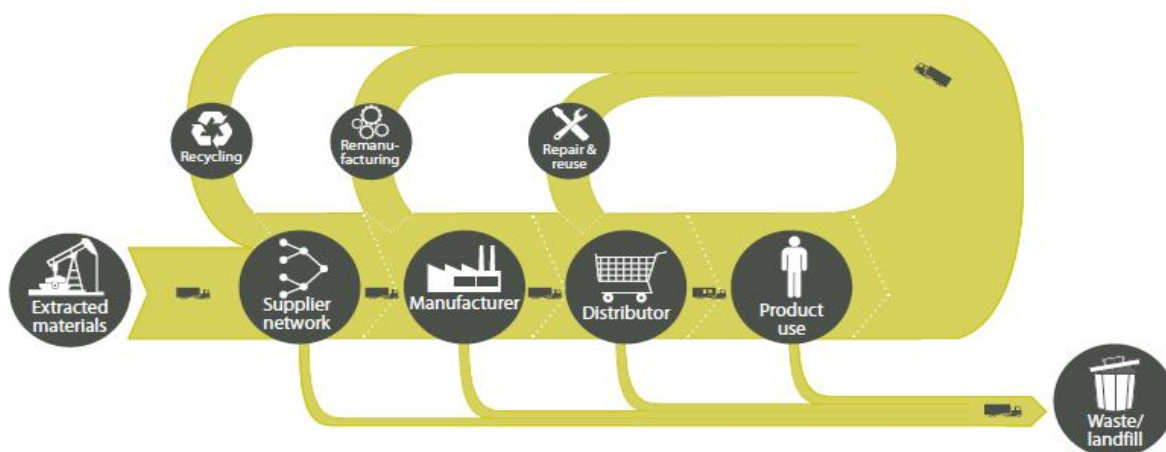
The changing expectations, pressures and realities of the business environment requires a new supply chain, capable of delivering growth while minimizing carbon emissions. While building on the strengths of the existing model in terms of its capability to handle high volumes with low inventory transaction costs, the distinguishing feature of the 21st century supply chain is its shape – a “closed loop” rather than a straight line.

Envisioning all actors as part of a cycle will overcome some of the current model’s limitations and enable the systematic pursuit of cost and environmental efficiencies throughout the product cycle; more collaborative and flexible information exchange among partners; and quicker response times to changing market dynamics.

Developing closed-loop supply chains will demand innovative collaboration among supply chain constituents, taking into account the forward product and reverse resource flows suppliers:

- manufacturers
- logistics service providers
- distribution partners
- consumers
- repair, remanufacturing and recycling partners

Dealing with 21st century business realities means that these actors need to start working with a closed loop model (see material flows in figure 3). Diverting the physical flow from the landfill back into the product chain requires collaboration from all supply chain partners, drawing on smart and integrated information exchange between direct and indirect partners across the supply chain.

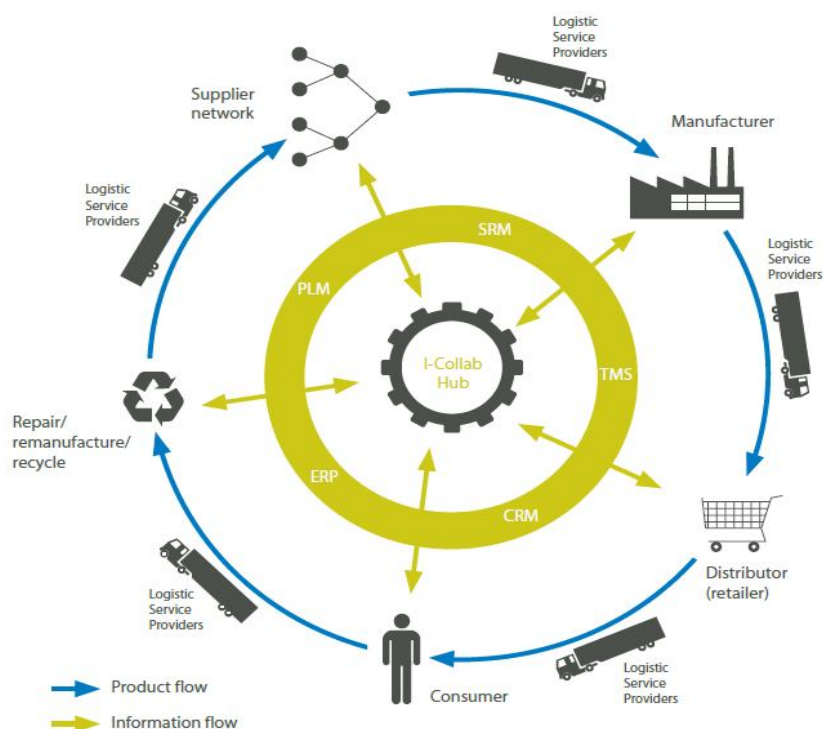


The closed loop system will be supported by changing the way information is collected, handled, processed and shared. Most importantly the new supply chain model will enable:

- *Going from bilateral to multilateral connectivity.* Currently, connectivity is mostly bilateral, restricted between a company and its direct suppliers and customers. To improve efficiencies and respond to simultaneous changes in many areas of the supply chain, communication needs to become two-way and connectivity to become multilateral, encompassing all the key players in the supply chain (both direct and non-direct actors).
- *Integrating new types of information on, for example, sustainability performance or real-time indicators (eg, logistic fill rate).* This will optimize the entire supply chain by generating intelligence about, for example, total supply chain cost, low-carbon logistics performance and product waste reductions.
- *New capabilities to arise as a result of enhanced connectivity and integration of sustainability and actor information.* As this information can be made accessible to a larger set of stakeholders, real-time decision making, reverse chain integration and design for product sustainability can become reality. One such capability could be migrating from a product- to service-based model. Enabling a service-based business model would require significant restructuring in the supply chain.

Driving Supply Chain Transparency and Collaboration

The 21st century supply chain model needs to be supported by an “information and collaboration hub” – a smart, integrated information exchange to deliver transparency and visibility across the supply chain. All supply chain actors would be able to access the hub in this new supply chain model as illustrated in figure 4.



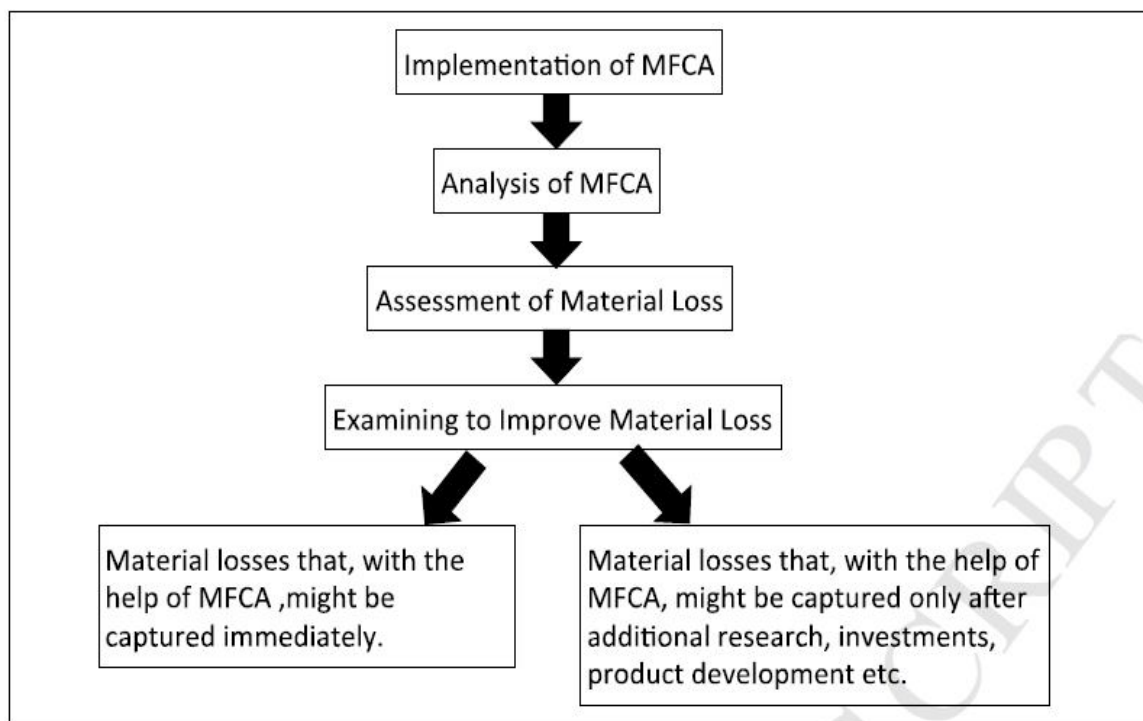
The information and collaboration hub enables connectivity among the various actors in the supply chain. The principal company or an external third party could serve as the natural focal point or ‘hub’, ensuring all supply chain actors are able to provide and extract relevant information. Multilateral connectivity will enable visibility and access to data across all the players in the supply chain, underpinning new collaborations.



Information systems, such as the ones shown in the middle cycle of figure 4 – Enterprise Resource Planning (ERP), Transport Management System (TMS), Product Life-Cycle Management (PLM), Customer Relationship Management (CRM), Supplier Relationship Management (SRM) and others – could process information captured in the supply chain.

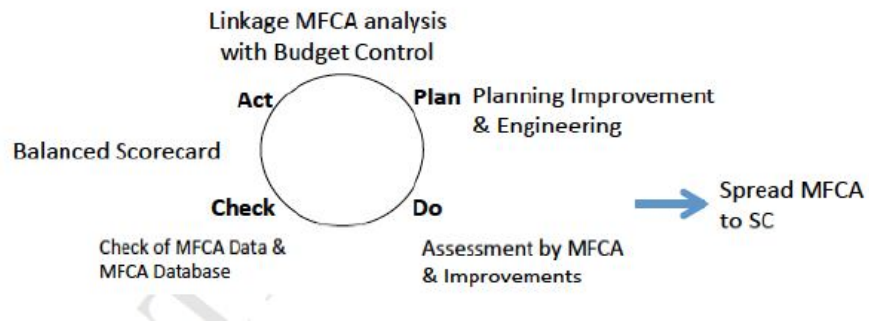
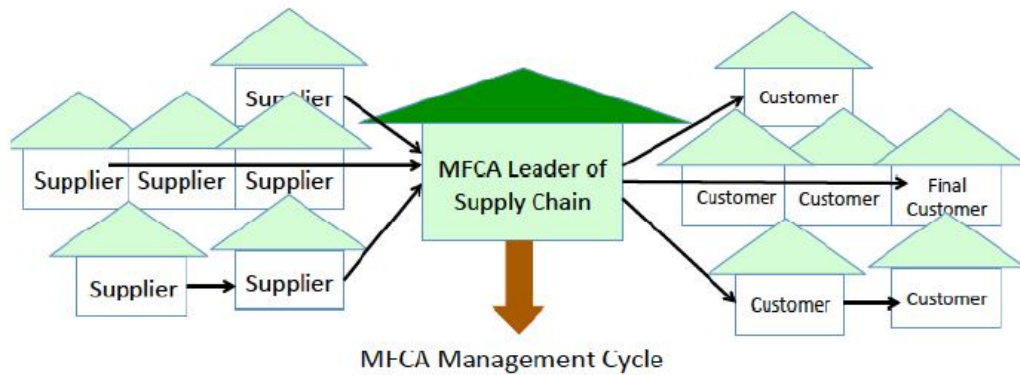
The inner circle of figure 4 illustrates a smarter hub that could enable new capabilities through tools such as real-time monitoring and decision making, capability-to-promise, collaborative designs and development, reverse chain planning and online exchanges (logistics, energy, materials, waste management, etc).

MFCA can be classified into the two types shown in Figure 1.



Relationship between a buyer and supplier introducing material flow cost accounting (MFCA)

The concept of SC has been discussed from different angles looking at the transportation and distribution of goods, value chains, etc. However, it is often treated in a narrow sense as the singular responsibility of a procurement department. If, on the other hand, the material flow along the entire SC is followed, and the construction of an optimum low-carbon SC is considered, the other departments, such as product development, production, sales, and logistics, must be involved, too.



CONCLUSION

This paper search out the manufacturing, pricing, carbon footprints, and green technology investigation strategies and the mutual coordination of low carbon supply chain made up of a low carbon production and a retailer. The low carbon manufacturer produces products under cap and trade policy and applies green technology investment to reduce carbon emissions in the whole production process. The retailer orders from the manufacturer and distributes the product to homogenous customers. With our best knowledge, we try to apply management of low carbon supply chains with strategic customer behavior. This paper provides several interesting observation techniques.

Analysis 1: There should be unique optimal production, pricing, carbon footprint and trading, and green technology investment strategies in centralized and decentralized supply chain. So, by deriving the optimal production, pricing, carbon trading, and green technology investment strategies in different situations, the low carbon manufacturer and the retailer can behave appropriately based on our findings to maximize their profit.

Analysis 2: Our findings also show that the centralized supply chain can improve its performance by quantity commitment. However, the manufacturer’s production and green technology investment are reduced while the optimal price is increased at this time. Therefore, quantity commitment is beneficial for the supply chain but is harmful to customers.

Analysis 3: We also show that the performance of decentralized supply chain is lower than that in QC scenario. We find that the decentralization reduces the manufacture’s optimal production quantity and green technology investment and increases the retailer’s optimal price. Besides, we find that the optimal



production quantity is increasing, the optimal price is decreasing, and the green technology investment is increasing, respectively, in the three situations of decentralized supply chain, QC scenario, and RE Equilibrium scenario.

REFERENCES

1. Zhu, Q.H: Green Supply Chain Management, Beijing: Chemical Industry Publisher;2004
2. Wu Yi-Ming. Circular Economy and the Sustainable Development. China Economist; 2005, p.84-85
3. Qian Yu .Green Supply Chain Management in Low Carbon Economy.Journal of China Water Transport;2010,p.15-19
4. Chen, Liu-qin. In Modern Organization How to Implementing Green Management.Tianjian Science&Technology; 2003
5. X. Chen, S. Benjaafar, and A. Elomri, "The carbon-constrained EOQ," Operations Research Letters, vol. 41, no. 2, pp. 172–179, 2013.
6. B. Liu, M. Holmbom, A. Segerstedt, and W. Chen, "Effects of carbon emission regulations on remanufacturing decisions with limited information of demand distribution," International Journal of Production Research, vol. 53, no. 2, pp. 532–548, 2015.
7. W. Jiang and X. Chen, "Optimal strategies for manufacturer with strategic customer behavior under carbon emissions-sensitive random demand," Industrial Management & Data Systems, 2015.
8. I. Dobos, "The effects of emission trading on production and inventories in the Arrow-Karlin model," International Journal of Production Economics, vol. 93-94, pp. 301–308, 2005.
9. A. S. Manikas and J. R. Kroes, "A newsvendor approach to compliance and production under cap and trade emissions regulation," International Journal of Production Economics, vol. 159, pp. 274–284, 2015.
10. D. Zhang and W. L. Cooper, "Managing clearance sales in the presence of strategic customers," Production and Operations Management, vol. 17, no. 4, pp. 416–431, 2008.



3-D PRINTING AS EMERGING TECHNOLOGY – A REVIEW

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ABSTRACT:

3D printing is an emerging technology all over the world. It booms the industrial growth in many sectors like biomedical, Automation and Aeronautics, Construction, Food Processing and in Defence. Additive manufacturing is the “process of joining materials to make objects from 3D model data, usually layer by layer, as opposed to subtractive manufacturing methods. Synonyms include additive fabrication, additive processes, additive techniques, additive layer manufacturing, and additive fabrication.” 3D printing, according to Wohler Report 2014:13, is the “fabrication of objects through the deposition of a material using a print head, nozzle, or other printer technology. However, the term is often used synonymously with additive manufacturing. In particular it is associated with machines that are lower in price and overall functional capability.”

The models are created with Computer aided design software, which make objects layer by layer of material under control. It's easy to operate and cover less space, all these properties make 3D Printing best for all. It changes the definition of Manufacturing and is easily accepted from child to adult to make their own dream product. Many free software are available in the Internet like FreeCAD, Cura, Blender etc from beginner to professional level which gives guidance of designing. This paper reviews about 3D printing as an emerging technology. This paper shows about the trigger of Next Industrial Revolution which is set to have a transformational impact on the direct or indirect production of a reasonable proportion of products. This paper reviews 3-d printing as an operation and throws some insight on the various possible applications of it.

Keywords: 3D Printing, Additive Manufacturing, Stereolithography, Rapid Prototyping, Nano-biomaterials, Sintering



INTRODUCTION:

3-D Printing also known as additive manufacturing (AM), refers to various processes used to synthesize a three dimensional object through joining one by one material. Successive layers of material are formed under computer control to create an object of almost any shape or geometry. In original sense it refers to processes that sequentially deposit material onto a powder bed with inkjet printer heads. As the various additive process matured, it became clear that soon metal remover would no longer be the only metal working process done under that type of control. 3D Printable models may be created with the computer aided design(CAD) package, via a 3D scanner or by a plain digital camera and photogrammetry software. The manual modelling process of preparing geometric data for 3D computer graphics is similar to plastic arts such as Sculpting. 3D scanning is a process of collecting digital data on the shape and appearance of a real object, creating a digital model based on it. It all starts with making a virtual design of the object you want to create. This virtual design is made in CAD file using a 3D modelling program or with the use of a 3D scanner (to copy an existing object). In recent years 3D printing technology continued developing, especially the breakthroughs in the material application. More than one hundred of raw materials can be used for 3D printing. They include thermoplastic plastics, metal, nylon, acrylic, plaster, ceramic, and edible material. The expansion of the material type will promote the application of this technology in more productive areas. Nowadays this technology could be used to produce spare parts, singular parts, bio constructs, micro machines, electronics, and even jewellery. [1]

HISTORY:

Early Additive Manufacturing equipment and materials were developed in the 1980's. Dr. Hideo Kodama first invented the modern layered approach to stereolithography by using ultraviolet light to cure photosensitive polymers. Where stereolithography is an early & widely used 3D printing technology. Also known as Rapid prototyping, Optical fabrication, Photo-Solidification, Solid free form fabrication and Solid imaging. 3-D Printing was invented with the intent of allowing engineers to create prototypes of their design in more time effective manner. In 1980's and 1990's, nearly all metal working was produced by casting fabrication, stamping & machining. Although plenty of automation was applied to those technologies, the idea of a tool or head moving through a 3-D work envelope transforming a mass of raw material into a desired shape layer by layer was linked with material removing processes. The term additive manufacturing gained wider currency in the decade of the 2000s. By the early 2010s, the terms 3D Printing



& additive manufacturing developed senses in which they were synonymous umbrella term for all Additive technologies, it reflects the simple fact that the technologies all share the common theme of sequential-layer material addition / joining throughout a 3D work envelope under automated control. In 2010s were the first decade in which metal parts such as engine brackets and large nuts would be grown in job production rather than obligately being machined from bar stock plate. As technology matured, several authors had begun to speculate the 3D printing could aid in sustainable development in the developing world.[2]

The origin of this technology is still debatable in definition. However, it is unanimous that a lot of activity in the 1950s and 1960s took place in development of this technology; but development of the associated technology (computers, lasers, controllers, etc.) caught up with the concept in the early 1980s. Interestingly, parallel patents were filed in 1984 in Japan (Murutani), France (Andre et al.) and in the USA (Masters in July and Hull in August)[11]. All of these patents described a similar concept of fabricating a 3D object by selectively adding material layer by layer. While earlier work in Japan is quite well-documented, proving that this concept could be realized, it was the patent by Charles Hull that is generally recognized as the most influential since it gave rise to 3D Systems. This was the first company to commercialize AM technology with the Stereolithography apparatus. Further patents came along in 1986, resulting in three more companies, Helisys (Laminated Object Manufacture or LOM), Cubital (with Solid Ground Curing, SGC), and DTM with their SLS process. Among these, only SLS remained as a commercial process with DTM merging with 3D Systems in 2001. In 1989, Scott Crump patented the FDM process, forming the Stratasys Company [11]. Also in 1989, a group from MIT patented the 3D Printing (3DP) process. These processes from 1989 are heavily used today, with FDM variants currently being the most successful. Rather than forming a company, the MIT group licensed the 3DP technology to a number of different companies, who applied it in different ways to form the basis for different applications of their AM technology [11]. The most successful of these was ZCorp, which focused mainly on low-cost technology.

TECHNOLOGY:

Additive Manufacturing (AM) technology came about as a result of developments in a variety of different technology sectors. Like with many manufacturing technologies, improvements in computing power and reduction in mass storage costs paved the way for processing the large amounts of data typical of modern



3D Computer-Aided Design (CAD) models within reasonable time frames. Nowadays, we have become quite accustomed to having powerful computers and other complex automated machines around us and sometimes it may be difficult for us to imagine how the pioneers struggled to develop the first AM machines.[11]

The most common technology used in 3D Printing is Stereolithography; In Stereolithography technology employs a vat of liquid ultraviolet curable photopolymer resin and an ultraviolet laser to build the objects layer one at a time. For each layer, the laser beam traces a cross-section of the part pattern on the surface of the liquid resin. Exposure to the ultraviolet laser light cures and solidifies the pattern traced on the resin and joins it to the layer below. This technology was invented in 1986 by Charles Hull, who also at the time founded the company, 3D System. [3] Not all the 3D Printers use the same technology; there are several ways to print all those available additives. It is also called as Rapid Prototyping, Kruth(1991) classified the Rapid Prototyping techniques according to the raw materials used into

- Liquid- based Techniques
- Powder-based Techniques
- Solid-based techniques

Some Technologies are:

1. **Digital Light Processing (DLP):** DLP uses a digital projector screen to flash a single image of each layer across the entire platform at once. Because the projector is a digital screen, the image of each layer is composed of square pixels, resulting in a layer formed from small rectangular bricks called voxels. DLP can achieve faster print times for some parts, as each entire layer is exposed all at once, rather than drawn out with a laser.[4]
2. **Fused Deposition Modeling (FDM):** 3D printers that run on FDM Technology build parts layer-by-layer from the bottom up by heating and extruding thermoplastic filament. The process is simple:
 - **Pre-processing:** Build-preparation software slices and positions a 3D CAD file and calculates a path to extrude thermoplastic and any necessary support material.
 - **Production:** The 3D printer heats the thermoplastic to a semi-liquid state and deposits it in ultra-fine beads along the extrusion path. Where support or buffering is needed, the 3D printer deposits a removable material that acts as scaffolding.
 - **Post-processing:** The user breaks away support material or dissolves it in detergent and water, and the part is ready to use.[5]



3. **Selective Laser Melting (SLM):** In this high power laserbeam is used to create a 3D metal parts by fusing fine metal powders together. Developed for 3D printing metal alloys.
4. **Selective Laser Sintering (SLS):**An SLS printer uses powdered material as the substrate for printing new objects. A laser draws the shape of the object in the powder, fusing it together. Then a new layer of powder is laid down and the process repeats, building each layer, one by one, to form the object. Laser sintering can be used to create metal, plastic, and ceramic objects. The degree of detail is limited only by the precision of the laser and the fineness of the powder, so it is possible to create especially detailed and delicate structures with this type of printer.[6]
5. **Electronic Beam Melting (EBM):** Instead of laser, Electron beam is used to melt a metal powder onto a build platform. The build platform is then lowered and the next layer of metal powder will be coated on top. The process of coating powder and melting where needed is repeated and the parts are built up layer by layer in the powder bed. Electron beam melting requires support structures, which anchor parts and overhanging structures to the build platform. This enables the heat transfer away from where the powder is melted. Therefore, it reduces thermal stresses and prevents warping. The build envelope can be filled by several parts which are built in parallel as long as they are all attached to the build platform. Parts are built under vacuum.[7]
6. **Laminated Object Manufacturing (LOM):**Laminated Object Manufacturing (LOM) is a process that combines additive and subtractive techniques to build a part layer by layer. In this process the materials come in sheet form. The layers are bonded together by pressure and heat application and using a thermal adhesive coating.
7. **Thermal Inkjet Printing (TIJ):** Inkjet printing is a “noncontact” technique that uses thermal, electromagnetic, or piezoelectric technology to deposit tiny droplets of “ink” (actual ink or other materials) onto a substrate according to digital instructions. In inkjet printing, droplet deposition is usually done by using heat or mechanical compression to eject the ink drops. In TIJ printers, heating the printhead creates small air bubbles that collapse, creating pressure pulses that eject ink drops



from nozzles in volumes as small as 10 to 150-picoliters. Droplet size can be varied by adjusting the applied temperature gradient, pulse frequency, and ink viscosity.[8]

8. **PolyJet:** PolyJet works by jetting photopolymer materials in ultra-thin layers onto a build platform. Each photopolymer layer is cured by UV light immediately after it is jetted, producing fully cured models that can be handled and used immediately, without post-curing. The gel-like support material, designed to support complicated geometries, is subsequently removed by water jetting. PolyJet technology enables horizontal layers of just 16 μm (0.0006"), fine details, and ultra-thin walls down to 0.6 mm (0.024") depending on the geometry of the part. That means PolyJet is capable of building very precise mechanical components, offering you high-quality prototypes for a shorter time to market.[9]

3-D PRINTING IN INDIA:

There has been slowly growing 3D Printing Industry that has been developing relatively organically. This industry is comparatively young; it seems solidly focused on developing 3D Printing technology first, while new start-ups and younger companies make up a significant portion of the industry. India's established technology companies have been moving quickly to position themselves against global companies who have also moved into India. Some of the larger businesses who are bringing 3D Printing technology to India's manufacturing industry include 3D Systems, Stratasys, Ricoh India, Voxeljet AG, Renishaw, EOS e-manufacturing solutions & Schneider prototyping GmbH. Notable Start-ups include J Group Robotics, global 3D Labs, Fracktal Works, Sahassoftech LLP, Imaginarium, 3 Ding, KC Bolts, Marco Polo Products and Shaper Jets. The market in India is growing at a rapid pace. Automotive and electronics hold the highest share in India 3D Printing market, while healthcare, aerospace and defence sectors are witnessing higher growth too. This technology allows designing without constraints, thus, enabling further creativity and innovation. Compared to the global 3D printing market, Indian market is relatively young; however, the growth has been quite encouraging especially due to rise of new start-ups and global company operations in India.



Industrial Perspective at Manufacturing of 3D Printing:

3D Printing in Industrial level is on the way to change production lines & value chains. Welding and tooling now become obsolete and first small production lines have been replaced. In the long run Additive manufacturing enables a shift from mass production to mass customization. The largest users are companies from aerospace, automotive, mechanical engineering, and electronics. In electronics the take-off in large scale manufacturing lines (chip production) is ahead. Architecture, jewellery, design have adapted additive manufacturing for models and prototypes. Medical and dental is the sector with the fastest replacement of given production technologies by additive manufacturing and in health biomaterial based technologies are expected to speed up. Industries adapting additive manufacturing in the production line. 3D printing (3DP) is also becoming a research and development focus in nanobiomaterials. 3-d printing can fabricate any desired 3D tissue model, accurately, if it's size is appropriate. The different material powders, with different dimensional scales and the printing strategies are the most direct factors influencing its quality. 3DP is adopted more frequently used for its rapidness in fabrication and precision in geometry. The fabrication in micro/nanoscale may change the performance of biomaterials and devices because it can retain more anisotropy of biomaterials compared with the traditionally rapid prototyping techniques. The only concern lies in biosafety and is investigated in performance and safety of biomaterials and devices [10]. Two kinds of 3DP techniques are mostly adopted for nanobiomaterials fabrication for this purpose. One is the inkjet printing with the typical printers such as the NP 2.1 (GeSim, Germany) and the Z402 (ZCorp, USA). The other is the nanoimprint lithography with the typical printers such as the EVG620 nanoimprinter and the 520 hot embosser (EV Group, Austria) [10].

THE RANGE OF APPLICATIONS:

- **3D printing rapid prototypes:**

3D printing has been used to create prototypes and concept models.

- **3D printing molds and other tooling:**

The fastest growing area of this application is the additive manufacture of production tools.

- **Direct Digital Manufacturing (DDM):**

It refers to the process of going directly from electronic digital representation of a part to the final product via additive manufacturing.



- **Personal Fabrication:**

Fabrication of wide range of products by own can be done through personal domestic 3D printer by their digital designs

- 3D printers may also be used to make future buildings, to create replacement organs and food industries.
- **Nanobiomaterials**

Conclusion:

3D printing would trigger the Next Industrial Revolution, within twenty years and possibly within less than ten – the digital manufacturing capabilities of 3D printing and related technologies are set to have a transformational impact on the direct or indirect production in reasonable proportion, and hence on a great many individuals and organizations.

3D Printing is the future; the medical professionals with help of this revolutionary engineering technology have successfully performed a full-face transplant. The operation was a major step forward as it involved not only skin & muscle but also the major portion of the facial mid face skeleton bone.[12]

It has already revolutionized prototyping, and we are now getting a glimpse of the technology's potential in mass customization, medicine & home use products. The technology possesses an immense potential of enhancing a wider array of life concerns. This technology also use in Defence. Nonetheless, there is a need to comprehend with the ethical consequences resulting from intense use of 3D printing technology. As example, 3D printed Guns and Grenade are not something desirable in that it may promote crime. Despite this, enacting laws governing the use of 3D Printing would limit its misuse, hence, enhancing its benefits.

Bibliography:

1. Zhen Chen 'Research on the Impact of 3D Printing on the International Supply Chain' , Advances in Materials Science & Engineering Volume 2016 (2016), Article ID 4173873
2. 3D Printing Wikipedia, Terminology and methods.
3. "3D Printing: What You Need to Know". PCMag.com. Retrieved 2013-10-30.
4. 3D Printing Technology Comparison: SLA Vs. DLP , Nov16,2016 in News, Formlabs.com



5. The Invention of FDM Technology, Stratasys.com
6. Hoy MB. 3D printing: making things at the library. *Med Ref Serv Q.* 2013;32(1):94–99. [PubMed]
7. Electron Beam Melting, www.additively.com
8. Cui X, Boland T, D’Lima DD, Lotz MK. Thermal inkjet printing in tissue engineering and regenerative medicine. *Recent Pat Drug Deliv Formul.* 2012;6(2):149–155. [PMC free article] [PubMed]
9. Polyjet, www.materialise.com
10. Application and Performance of 3D Printing in Nanobiomaterial, Wenyong Liu, Ying Li, Jinyu Liu, XufengNiu, Yu Wang, and Deyu Li, *Journal of Nanomaterials* Volume 2013 (2013), Article ID 681050
11. Additive Manufacturing Technologies, 3d printing, rapid Prototyping and Digital Manufacturing, Gibson, I.; Rosen, D.; Stucker, B., ISBN 978-1-4939-2112-6
12. ‘3D Printing Belgium’s First face Transplant’, www.materialise.com



DESIGN OF INSET FED RECTANGULAR PATCH ANTENNA USING ISM BANDSET FED RECTANGULAR

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ABSTRACT

In this paper an inset fed rectangular shaped microstrip patch antenna is designed. The designed antenna structure is further simulated using Agilent ADS(Advance Design System) simulation software. The patch is designed with RT Duroid 5880 substrate of having dielectric constant of 2.2 and thickness of 1.6 mm. The simulation result proves the theoretical aspects for ISM Band.

Keywords— RT Duroid 5880 ;inset fed; microstrip patch.

I. INTRODUCTION

Antenna is a device designed for radiating or receiving radio waves. The microstrip antennas also referred to as microstrip patch antennas (MSA) have several advantages like small size, light weight, low cost, low volume and easy to fabricate using printed circuit technology over conventional microwave antennas and therefore are widely used in many practical applications like aircraft, spacecraft, satellite, missile, mobile, GPS, RFID, Wi-Max and Radar etc. The radiating elements and the feed lines are usually photo etched on the dielectric substrate. MSAs suffer from disadvantages like low radiation efficiency, low gain, high Q, narrow impedance bandwidth etc.



All of the parameters in a rectangular patch antenna design (L , W , h , permittivity) control the properties of the antenna. As such, this page gives a general idea of how the parameters affect performance, in order to understand the design process. First, the length of the patch L controls the resonant frequency as seen here. This is true in general, even for more complicated microstrip antennas that weave around - the length of the longest path on the microstrip controls the lowest frequency of operation. Equation (1) below gives the relationship between the resonant frequency and the patch length: (1)

Second, the width W controls the input impedance and the radiation pattern. The wider the patch becomes the lower the input impedance is. The permittivity of the substrate controls the fringing fields - lower permittivities have wider fringes and therefore better radiation. Decreasing the permittivity also increases the antenna's bandwidth. The efficiency is also increased with a lower value for the permittivity. The impedance of the antenna increases with higher permittivities. Higher values of permittivity allow a "shrinking" of the patch antenna. Particularly in cell phones, the designers are given very little space and want the antenna to be a half-wavelength long. One technique is to use a substrate with a very high permittivity. Equation (1) above can be solved for L to illustrate this: (2)

Hence, if the permittivity is increased by a factor of 4, the length required decreases by a factor of 2. Using higher values for permittivity is frequently exploited in antenna miniaturization. The height of the substrate h also controls the bandwidth - increasing the height increases the bandwidth.

II. ANTENNA DESIGN

The design of inset fed rectangular patch antenna with its dimensions is shown below:

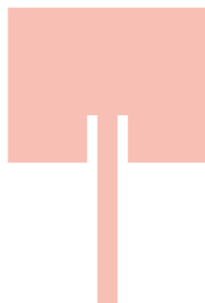


Fig 1: Design of rectangular patch antenna.

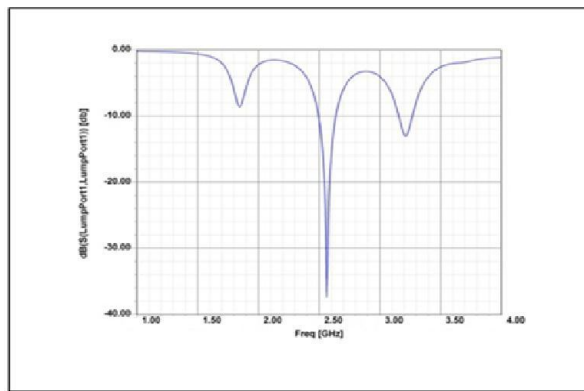


Table 1: Dimensions of Inset fed Rectangular patch antenna

Solution frequency	2.45 GHz
Patch dimension along x	48.4 mm
Patch dimension along y	40.49 mm
Substrate thickness	1.6 mm
Substrate dimension along x	82.2
Substrate dimension along y	120.83
Inset distance	12.215
Inset gap	2.465
Feed width	4.93
Feed length	37.298

III. RESULT

The return loss of inset fed rectangular patch antenna according to the base paper consulted is -38dB.



The return loss of inset fed rectangular patch antenna has been obtained -21.966 dB.

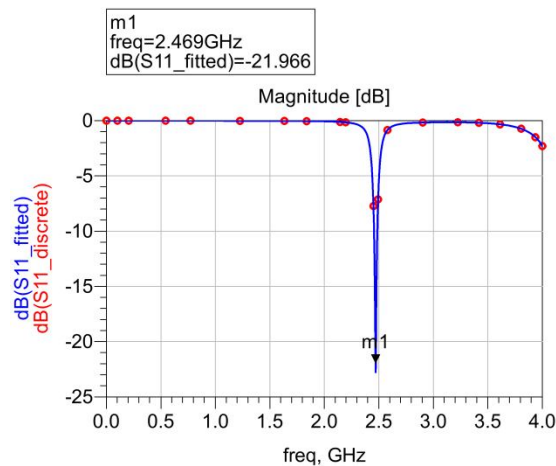


Fig 2: Figure shows the return loss of inset fed rectangular patch antenna.



Radiation pattern of inset fed rectangular patch antenna showing the polar plot of gain and radiated power is shown below. The gain obtained by the polar plot is 7.05257dB and the radiated power is 0.00193318W.

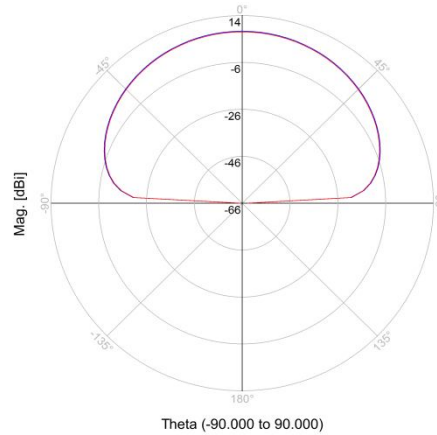


Fig 3: Polar plot of gain.

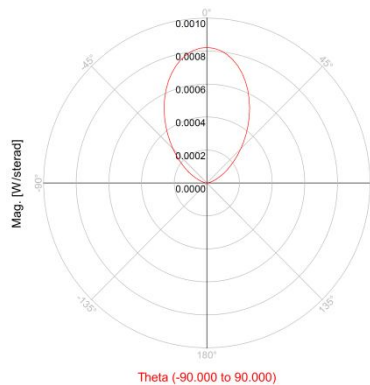


Fig 4: Polar plot of radiated power.

The radiation pattern of inset fed microstrip patch antenna as obtained in 3D structure can be shown as in fig.5. This structure is in the shape of an apple and the far field cut can be shown as:

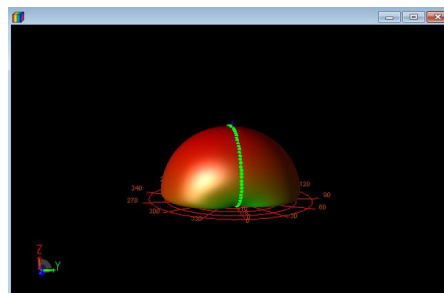


Fig 5: Far field cut shown in radiation pattern.



The antenna parameters thus obtained by the analysis of inset fed rectangular patch antenna is shown in table below. these parameters are obtained by analysing the antenna on Agilent ADS software.

Table 2: Antenna parameters

Power radiated (watts)	0.00192318
Effective angle (steradians)	2.31339
Directivity (dB)	7.378785
Gain (dB)	7.55257

IV. CONCLUSION

An inset fed rectangular patch antenna is designed and simulated over Agilent ADS simulation software. The simulated result shows that the designed antenna structure is suitable to operate in ISM frequency band. The return loss of designed antenna compared to the return loss of antenna designed in base paper, is slightly low. To improve the results further optimization has to be done.

V. ACKNOWLEDGEMENT

The authors would like to express their sincere thanks to Electronics and Communication Engineering Department of Shri Ram Murti Samrak College of Engineering and Technology, Bareilly for providing the help to carry out this study and work.

References

- [1] D. Orban and G.J.K. Moernaut, The Basics of Patch Antennas, Orban Microwave Products
- [2] David M. Pozar, "Microstrip Antennas", Proceedings of the IEEE, Vol. 80, No 1, p.p. 79- 91, January 1992.
- [3] Tauheed Qamar, Naseem Halder, Mohd. Gulman Siddiqui, Vishal Varshney, "SSimulation and analysis of slot-coupled patch antennaat different frequencies using HFSS" Amity School of Engineering And Technology, Amity University, Noida, U.p, India.
- [4] Fan Yang, Xue-Xia Zhang, Xiaoning Ye, and Yahya Rahmat-Samii, "Wide-Band E-Shaped Patch Antennas for Wireless Communications" IEEE Transactions on Antennas and Propagation, Vol. 49, no. 7, July 2001



- [5] Rajendra R. Patil, Vani R. M, P.V. Hunagund, “Antenna miniaturization techniques for wireless applications” Dept. of E&CE, Appa Institute of Engineering & Technology, Gulbarga-585103, Karnataka, India.,
- [6] Amit Kumar Gupta¹ , R.K. Prasad² , Dr. D.K. Srivastava³, “Design and development of dual e-shaped microstrip patch antenna for bandwidth and gain enhancement “ Department of Electronics and Communication Engineering 1, 2 Madan Mohan Malaviya Engineering College, Gorakhpur, INDIA 3 Bundelkhand Institute of Engineering & Technology, Jhansi, INDIA
- [7] Pradeep Kumar, Neha Thakur, Aman Sanghi, "Micro strip Patch Antenna for 2.4 GHZ Wireless Applications" International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 8- August 2013



EXPLOITATION OF BUCK - BOOST CONVERTERS FOR EXECUTING PERTURB AND OBSERVE MPPT IN THE PV SYSTEM

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ABSTRACT

Renewable energy is best option for fulfilling energy requirements in rural and needy areas. The main problem with its implementation is cost and efficiency. As far as cost is concerned it has been suppressed by advancement in Indigenous Technology and support from Govt. of India, whereas increment in efficiency is different matter. For increasing the efficiency of renewable sources like Solar PV Panels various methods have been adopted , one of which is Maximum power point tracing(MPPT). MPPT system is an electronic system that may be ready to compel the utmost power from a PV system. It doesn't involve any mechanical element that ends up in the movement of the module's dynamic, their direction and create them face straight towards the sun. MPPT system may be a fully electronic system which might deliver most allowable power by varying the operative purpose of the modules electrically. In this paper we present execution of Perturb and Observe MPPT exploiting buck-boost Converters. Results for each various combination have been recorded. The simulation has been done in software of MATLAB Math works.

Keyword

Maximum Power Point Tracking, Perturb and Observe, DC-DC Converters, Photovoltaic System .

1. INTRODUCTION

Expanding energy access to poor households in rural and remote areas could be a complicated development challenge. The task of increasing access to trendy energy, each for domestic and productive uses, poses a formidable challenge to planners and development practitioners. There are some limitations to the enlargement of the electricity grid similarly as transmission of electricity through the grid. There are constraints to providing acceptable and reasonable solutions to satisfy energy needs particularly within the rural and remote areas. A region of the gap is understood to be met by the utilization of diesel and kerosene that are exhaustible and extremely volatile in accessibility and prices. Use of inefficient energy conversion devices like conventional cook stoves not solely leads to indoor pollution however causes



stress on natural resources similarly. There's substantial scope for the employment of renewable in bridging this gap. But the main problem with renewable sources is their lower efficiency rates.

For increasing the efficiency of renewable sources like Solar PV Panels various methods have been adopted. One of which is used by Maximum Power Point Tracking (MPPT) using P&O algorithm. Many other MPPT are also suggested in the literature ; example are the Perturb and Observe (P&O) methods, Incremental Conductance (IC) methods and constant voltage methods.. etc. .In this paper the most popular of MPPT technique (Perturb and Observe (P&O) method, Buck and Buck- Boost DC-DC converters will involve in Implementation study. Some results such as current, voltage and output power for each various combination have been discussed. The MPPT technique will be implemented, by using MATLAB tool Simulink. This study is a novel work which could be a great help for future erection of these kind of projects.

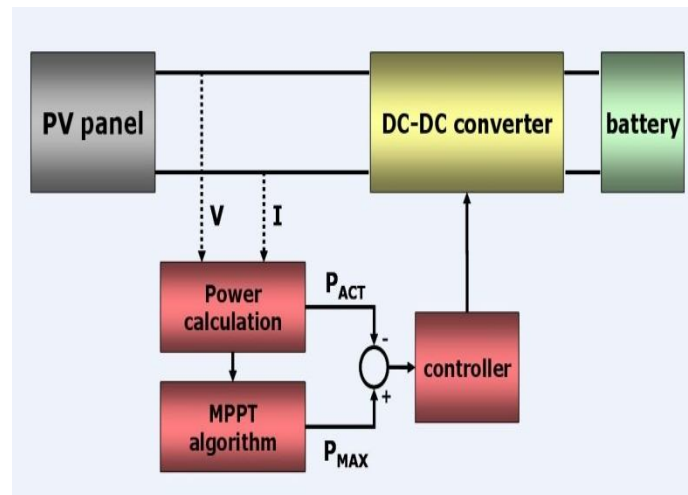
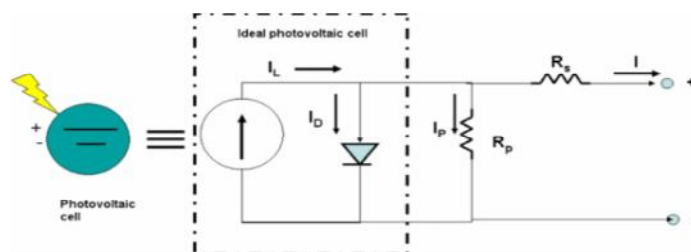


Figure 1. PV module and dc/ dc converter with MPPT

2. PV CELL

Photovoltaic generators are neither fixed current sources nor voltage sources but can be approximated as current generators with dependant voltage sources. During darkness, the solar cell is not an active device. It produces neither a current nor a voltage. A solar panel cell essential is a p-n semiconductor junction. When exposed to the light, a current is generated (DC current).The generated current change linearly with the solar irradiance. Figure 2 show the equivalent electrical circuit of an ideal solar cell.





The I-V characteristics of the solar cell circuit can be sets by the following equations [14]. The current through diode is given by:

$$I_D = I_0 [\exp (q (V + I R_S)/KT)) - 1] \quad (1)$$

While, the solar cell output current:

$$I = I_L - I_D - I_{sh} \quad (2)$$

$$I = I_L - I_0 [\exp (q(V + I R_S)/KT)) - 1] - (V + I R_S) / R_{sh} \quad (3)$$

Where,

I : Solar cell current (A)

I_L : Light generated current (A)

I_0 : Diode saturation current (A)

q : Electron charge (1.6×10^{-19} C)

K : Boltzman constant (1.38×10^{-23} J/K)

T : Cell temperature in Kelvin (K)

V : solar cell output voltage (V)

R_s : Solar cell series resistance (Ω)

R_{sh} : Solar cell shunt resistance (Ω)

3. DC-DC CONVERTER ANALYSIS

3.1 Buck Converter

A buck converter or voltage regulator is also called a step down regulator since the output voltage is lower than the input voltage. In a simple example of a buck converter, a diode is connected in parallel with the input voltage source, a capacitor, and the load, which represents output voltage. A switch is connected between the input voltage source and the diode and an inductor is connected between the diode and the capacitor, shown in Figure 3 [15].

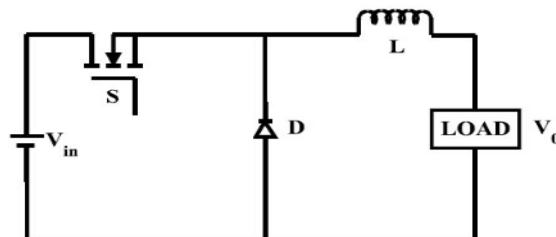


Figure 3(a). Basic buck converter

3.2 Buck-Boost Converter



The last and most important type of switching regulator is the buck-boost converter. In this converter, the buck and boost topologies covered earlier are combined into one. A buck-boost converter is also built using the same components used in the converters covered before. The inductor in this case is placed in parallel with the input voltage and the load capacitor. The switch or transistor is placed between the input and the inductor, while the diode is placed between the inductor and the load capacitor in a reverse direction, shown in Figure 4. The buck-Boost converter provides an output voltage that may be less than or greater than the input voltage [15].

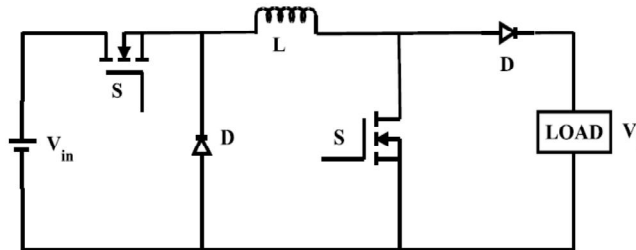


Figure 3(b). Basic buck-boost converter

4. PROBLEM OVERVIEW

The MPPT method consider is to automatically find the current I_{MPP} or voltage V_{MPP} at which a PV array should work to extract the maximum output power P_{MPP} under a given temperature and irradiance. Most of MPPT methods respond to variations in both irradiance and temperature, but some are precisely more useful if temperature is approximately constant. Most MPPT methods would automatically respond to various in the array due to aging, though some are open-loop and would require periodic fine tuning. In our context, module will typically be connected to a power converter that can vary the current coming from the PV array to the load.

5. MPPT CONTROL ALGORITHM

The weather and load changes cause the operation of a PV system to vary almost all the times. A dynamic tracking technique is important to ensure maximum power is obtained from the photovoltaic arrays. The following algorithms are the most fundamental MPPT algorithms, and they can be developed using micro controllers.

The MPPT algorithm operates based on the truth that the derivative of the output power (P) with respect to the panel voltage (V) is equal to zero at the maximum power point. In the literature, various MPP algorithms are available in order to improve the performance of photovoltaic system by effectively tracking the MPP. However, most widely used MPPT algorithms are considered here, they are:

1. Perturb and Observe (P&O)
2. Incremental Conductance (In Cond)
3. Constant Voltage Method



5.1 Perturb and Observe (P&O)

The most commonly used MPPT algorithm is P&O method. This algorithm uses simple feedback arrangement and little measured parameters. In this approach, the module voltage is periodically given a perturbation and the corresponding output power is compared with that at the previous perturbing cycle. In this algorithm a slight perturbation is introduced to the system. This perturbation causes the power of the solar module to vary. If the power increases due to the perturbation then the perturbation is continued in the same direction. After the peak power is reached the power at the MPP is zero and next instant decreases and hence after that the perturbation reverses as shown in Figures 5(a) and 5(b). When the stable condition is reached the algorithm oscillates around the peak power point. In order to maintain the power variation small the perturbation size is kept very small. The technique is advanced in such a style that it sets a reference voltage of the module corresponding to the peak voltage of the module. A PI controller then acts to transfer the operating point of the module to that particular voltage level. It is observed some power loss due to this perturbation also it fails to track the maximum power under fast changing atmospheric conditions. But this technique is very popular and simple.

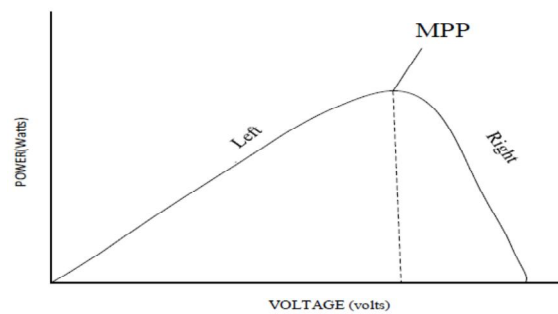


Figure 5(a). P-V characteristics of a solar module

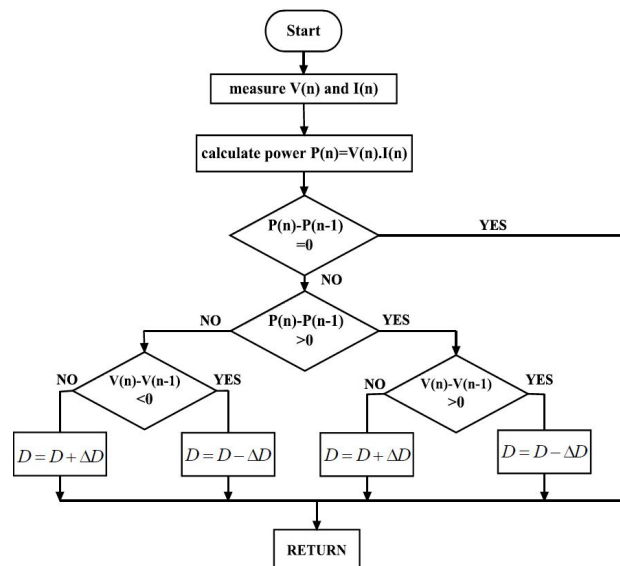


Figure 5(b). P&O Algorithm



5.2 Incremental Conductance (IC)

The perturb oscillation around peak power point of the perturb and observe method to track the peak power under fast varying atmospheric condition is overcome by IC method. The Incremental Conductance can determine that the MPPT has reached the MPP and stop perturbing the operating point. If this condition is not met, the direction in which the MPPT operating point must be perturbed can be calculated using the relationship between dI/dV and $-I/V$. This relationship is derived from the truth that dP/dV is negative when the MPPT is to the right side curve of the MPP and positive when it is to the left side curve of the MPP. This algorithm has advantages over P&O in that it can determine when the MPPT has reached the MPP, where P&O oscillates around the MPP. Also, incremental conductance can track rapidly increasing and decreasing irradiance conditions with higher precision than perturb and observe. The disadvantage of this algorithm is the increased complexity.

5.3 Constant Voltage Method

The Constant Voltage method (CV), also in some literature called Open voltage Ratio method, uses the fact that the MPP voltage at different irradiance is approximately equal, as shown in Figure 6.

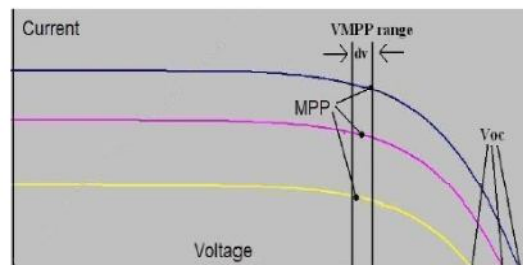


Figure 5(c). Constant Voltage Method in V-I curve

VOC represented the open circuit voltage of the PV panel. VOC depends on the property of the solar cells. A commonly used VOC/VMPP value is 76%. This relationship can be described by equation (4) below :

$$VMPP = k * VOC \quad (4)$$

where $k \approx 0.76$ in this case.

The solar panels are always disconnected from the converter circuit for a short duration of time for VOC measurement. The operating voltage of the MPP is then set to 76% of the measured VOC. The major advantage of this method is that the MPP may be located very quickly. However at the same time this method suffers from low accuracy, because the VOC is also affected by the temperature of the solar cells which may change the VOC/VMPP ratio significantly. Any small deviation of the VOC after the sampling can cause large difference in tracking the MPP during that sampling period. Moreover, power is lost during the short sampling time, further reducing the efficiency of constant voltage method.

6. RESULTS AND SIMULATION



The voltage, current and output power is the main points of comparison to take into account. The complexity and simplicity of the circuit have been set based on the literature. Hardware required, convergence speed and range of effectiveness are as in.

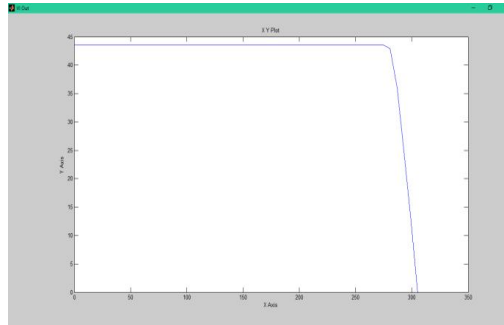


Figure 6(a). V-I curve of photovoltaic module

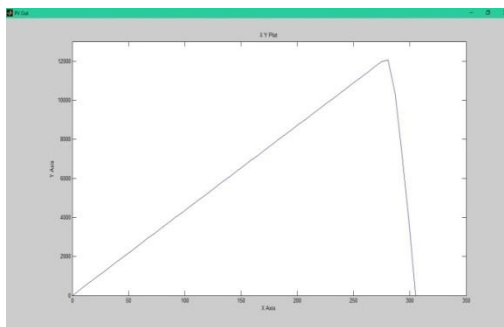


Figure 6(b). P-V curve of photovoltaic module

Fig 6(a) & 6(b) represent the I-V and P-V characteristics of a PV module. From fig 6(a) we can see that short circuit current (I_{sc}) of PV module is approximately 44 A and open circuit voltage (V_{oc}) is approximately 300 volts. From fig 6(b) we can observe that maximum power is approximately 12000W and it occurs at a voltage of 270 V approximately.

6.1 Effect Of Variation of Irradiation

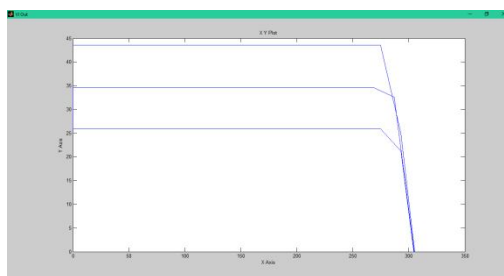


Figure 6(c). Effect of variation of irradiation on I-V characteristics

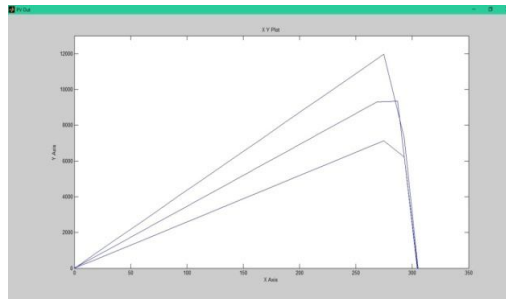


Figure 6(d).Effect of variation of irradiation on P-V characteristics

In fig 6(c),6(d) we can see the effect of change in solar irradiation on PV characteristics. From fig 6(c) we observe that as we increase the solar irradiation short circuit current increases. Variation in Solar irradiation effects mostly on current, as we can observe from fig 6(c) as we increase solar irradiation from 800 w/m² to 1000 w/m² current increases from 34 A to 44 A approximately but effect of variation of solar irradiation on voltage is very less. Fig 6(d) shows the effect of variation of solar irradiation on P-V characteristics. As solar irradiation increases, power generated also increases. Increase in power is mainly due to increment in current.

6.2 Outputs After MPPT

Output power , output current & output voltage are manifested in the Fig. 6(e), 6(f) & 6(g) respectively. As we observe from the fig 6(b), maximum power is achieved at voltage 270 volts; from Fig 6(f) we can see we are able to track the output voltage where we can get the maximum power which is approximately 240 volts. From Fig 6(e) we can see the maximum power which is approximately 12000 watts can be tracked.

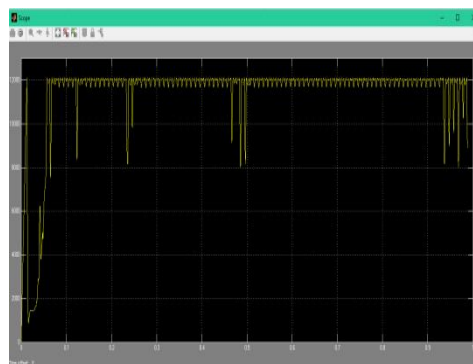


Figure 6(e).Output power of PV module after MPPT



Figure 6(f).Output voltage of PV module after MPPT



Figure 6(g).Output current of PV module after MPPT

7. CONCLUSION

P&O MPPT method is implemented with MATLAB-SIMULINK for simulation. The MPPT method simulated in this paper is able to improve the dynamic and steady state performance of the PV system simultaneously. Through simulation it is observed that the system completes the maximum power point tracking successfully despite of fluctuations. When the external environment changes suddenly the system can track the maximum power point quickly. Both buck and buck-boost converters have succeeded to track the MPP.

REFERENCES

- [1] A.P.Yadav, S. Thirumaliah and G. Harith. "Comparison of MPPT Algorithms for DC-DC Converters Based PV Systems" International Journal of Advanced Research in Electrical, Electronics and



- Instrumentation Engineering Vol. 1, Issue 1, July 2012.
- [2] Y.-H.Chang and C.-Y. Chang, "A Maximum Power Point Tracking of PV System by Scaling Fuzzy Control," presented at International Multi Conference of Engineers and Computer Scientists, Hong Kong, 2010.
 - [3] S.Mekhilef, "Performance of grid connected inverter with maximum power point tracker and power factor control," *International Journal of Power Electronics*, vol.1, pp. 49-62.
 - [4] M.E.Ahmad and S.Mekhilef, "Design and Implementation of a Multi Level Three-Phase Inverter with Less Switches and Low Output Voltage Distortion," *Journal of Power Electronics*, vol. 9, pp. 594- 604, 2009.
 - [5] H.N.Zainudin and S. Mekhilef, "Comparison Study of Maximum Power Point Tracker Techniques for PV Systems" *Proceedings of the 14th International Middle East Power Systems Conference (MEPCON'10)*, Cairo University, Egypt, December 19-21, 2010.
 - [6] R.Faranda and S. Leva, "Energy Comparison of MPPT techniques for PV Systems," *WSEAS Transaction on Power Systems*, vol. 3, pp. 446-455.
 - [7] Vikrant A. Chaudhari, "Automatic Peak Power Tracker for Solar PV Modules Using Dspace Software," in Maulana Azad National Institute of Technology. Master Thesis of Technology in Energy. Bhopal: Deemed University, 2005.
 - [8] T.P.Nguyen, "Solar Panel Maximum Power Point Tracker," Ph. D. Thesis in Department of Computer Science & Electrical Engineering: University of Queensland, 2001.
 - [9] S.Balakrishna, N. A. Thansoe, G. Rajamohan, A. S. Kenneth and C. J. Ling, "The Study and Evaluation of Maximum Power Point Tracking Systems," *International Conference on Energy and Environment 2006 (ICEE 2006)*, pp. 17-22, 2006.
 - [10] C.S.Lee, "A Residential DC Distribution System with Photovoltaic Array Integration," Degree of Honors Baccalaureate of Science in Electrical and Electronics Engineering, Oregon State University, University Honors College 2008.
 - [11] T.Esram and P. L.Chapman, "Comparison of Photovoltaic Array Maximum Power Point Tracking Techniques," *IEEE Transactions on Energy Conversion*, Vol. 22, No. 2, 2007.
 - [12] E.I.O. Rivera, "Maximum Power Point Tracking using the Optimal Duty Ratio for DC-DC Converters and Load Matching in Photovoltaic Applications," *Twenty Third Annual IEEE Applied Power Electronics Conference and Exposition, APEC 2008*, pp. 987-991, 2008.
 - [13] D.Peftsis, G. Adamidis, P. Bakas and A. Balouktsis, "Photovoltaic System MPPT Tracker Implementation using DSP engine and buck–boost DC-DC converter", *13th Power Electronics and Motion Control Conference*, 2008.
 - [14] M.Azab, "A New Maximum Power Point Tracking for Photovoltaic Systems," *WASET*, vol. 34, 2008, pp. 571- 574.
 - [15] A.Scheurer, E. Ago, J. S. Hidalgo and S. Kobosko, "Photovoltaic MPPT Charge Controller" Mentor Alan Shaffer Lakeland Electric, Sponsored by Workforce Central Florida, Spring 2012.
 - [16] H.Knopf, "Analysis, Simulation, and Evaluation of Maximum Power Point Tracking (MPPT) Methods for a Solar Power Vehicle," in *Electrical and Computer Engineering*, Master Thesis in Electrical and Computer Engineering: Portland State University 1999.



- [17] D.P.Hohm and M. E. Ropp, "Comparative Study of Maximum Power Point Tracking Algorithms Using an Experimental, Programmable, Maximum Power Point Tracking Test Bed", IEEE Proc. of photovoltaic specialists conference, pp. 1699-1702, 2000.
- [18] S.Mekhilef and M. N. A. Kadir, "Voltage Control of Three-Stage Hybrid Multilevel Inverter Using Vector Transformation," IEEE Transactions on Power Electronics, vol. 25, pp. 2599-2606, 2010.
- [19] S.Azadeh and S. Mekhilef, "Simulation and Hardware Implementation of Incremental Conductance MPPT with Direct Control Method Using Cuk Converter," IEEE Transaction on Industrial Electronics, vol. 58, No. 4, 2010, pp. 1154-1161.
- [20] Yen-Jung M. Tung, A.P. Hu and N.K. Nair "Evaluation of Micro Controller Based Maximum Power Point Tracking Methods Using Dspace Platform" Australian University Power Engineering Conference, 2006.
- [21] M.S.Sivagamasundari, P. Melba Mary and V.K. Velvizhi "Maximum Power Point Tracking For Photovoltaic System by Perturb and Observe Method Using Buck Boost Converter" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 2, Issue 6, June 2013.
- [22] Ch.Kalpana, Ch. S. Babu and J. S. Kumari "Design and Implementation of different MPPT Algorithms for PV System," International Journal of Science, Engineering and Technology Research (IJSETR) Volume 2, 2013.
- [23] R.Faranda and S. Leva, "Energy Comparison of MPPT techniques for PV Systems," WSEAS Transaction on Power Systems, vol. 3, pp. 446-455, 2008.



ECONOMIC ANALYSIS AND ENVIRONMENTAL ANALYSIS OF A PV WITH DIESEL-BATTERY SYSTEM FOR REMOTE VILLAGES

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ABSTRACT

Integration and combined utilization of renewable energy sources are becoming increasingly attractive. This paper is a review of hybrid renewable energy systems technologies for power generation, important issues and challenges in their design stage. Generation technology selection and unit sizing, System configurations and Energy management and control are discussed. Applications of hybrid energy systems, advantages of hybrid energy systems, issues and problems related to hybrid energy systems and an overview of energy storage technologies for renewable energy systems are presented. This paper also highlights the future trends of Hybrid energy systems, which represent a promising sustainable solution for power generation

HYBRID POWER SYSTEM MODEL

HE need for energy-efficient electric power sources in remote locations is a driving force for research in hybrid energy systems. Power utilities in many countries around the world are diverting their attention towards more energy efficient and renewable electric power sources. Reasons for this interest include the possibilities of “taxes” or other penalties for emissions of greenhouse gases as well as other pollutants plus the finite supply of fossil fuels. The use of renewable energy sources in remote locations could help reduce the operating cost through the reduction in fuel consumption, increased system efficiency and reduced noise and emissions. Hybrid power systems are often more cost effective than utility grid extensions mainly due to the high cost of transmission lines. In this model PV, wind and other renewable sources of energy are being integrated with DEGs to help reduce the fuel consumed by the DEGs. This paper presents a model based on an existing hybrid electric power system for a remote location. The remote terminal unit allows for remote data collection and system control while also providing information necessary for modeling the hybrid power system. The RTU and the model can be used to optimize the performance of the hybrid power system. MATLAB Simulink™ is used to model the system and apportion the electrical production between the PV and diesel electric generator. Simulations are performed for three cases: 1) diesel only, 2) diesel-battery, and 3) PV. The results of the simulations are used to perform an economic analysis and predict the environmental impacts of integrating a photovoltaic (PV) array into diesel-electric power systems for remote villages. The economics part of the model calculates the fuel consumed, the kilowatt-hours (kWhrs) obtained per gallon of fuel supplied, and the



total cost of fuel. The environmental part of the model calculates the CO₂, particulate matter (PM), and the NO_x emitted to the atmosphere. These results are then utilized to calculate the energy payback, the simple payback time for the PV module, and the avoided costs of CO₂, NO_x, and PM.

Background & Previous Work

In this section previous literature related to micro grids renewable scenario is described. The baseline of government report describe conditioned of isolated villages to understand socioeconomic conditions, recommended a proper drinking water supply system, irrigation facility, and electricity coverage either through the national grid or renewable energy for isolated villages. As per Rural Energy Policy :

- To reduce dependency on traditional energy and conserve the environment by increasing access to clean and cost effective energy in rural areas.
- To increase employment and productivity through the development of rural energy resources.
- To increase the living standards of the rural population by integrating rural energy with social and economic activities.

SIMULINK MODEL

A general model block diagram for the wind-PV-diesel-battery hybrid power system is shown in Fig. 2. The model is based on previous work with a PV-diesel-battery system (Wies, et al., 2005a) & (Wies, et al., 2005b), and a wind-diesel battery system (Wies, et al.2005c). The model consists of nine different subsystems contained in blocks. The electrical energy sources in the model include DEGs, subsystems are described. The model consists of nine different subsystems contained in blocks. The electrical energy sources in the model include DEGs, WTGs, a PV array, and a battery bank. Currently, the Simulink® model performs a long term performance analysis including the environmental impact calculations of the hybrid power system under consideration. The different inputs required include the annual load and power factor profile, the annual wind speed for the WTGs, the annual insolation profile for the PV array, the annual ambient air temperature in which the power system is operating, the kW ratings of the generators, and the kW rating of the battery bank.

A model of a hybrid power system of remote Village was designed using MATLAB Simulink. The Simulink model was developed so that it can be used to study the performance of any hybrid power system. Using the -function in Simulink, blocks representing other renewable energy sources can be easily incorporated into the existing hybrid power system model. Simulink also allows the dynamic operation and the control system strategy to be incorporated into the hybrid power system model to study the dynamic performance of the system. The overall block diagram of the current system. The model consists of nine different subsystems contained in blocks. The Input Parameters block includes data files obtained from the site. After the installation of the RTU, the model will acquire the data directly from the RTU. This data can be used by engineers and operators to evaluate and optimize the performance of the system. Sensors on the system are used to gather information, such as the amount of sunlight incident upon the PV arrays, charge level of the batteries, and important operating parameters of the diesel generator. The voltage or current signals from these sensors are transmitted to signal conditioning devices that convert the signals to an instrumentation level. These signals are then passed to analog input modules of the RTU and digitized for processing. The processing consists of scaling the inputs and converting them to a meaningful unit. The data is then saved within the memory of the RTU and unloaded to a database on a



central server at a location outside of the village at a user-specified time interval. The data are transferred through TCP/IP connections and are usually accomplished through dial-up/Ethernet connections with the RTU. At this point, the data are placed in a database and accessed via a web page or other methods and are available as input to the model. The input data files to the model are the system electrical load, solar insolation values, ambient temperature, and the kilowatt ratings of the different energy components. The Simulink model developed here uses data from the manufacturer to calculate the efficiency and the amount of fuel used for the DEG. Knowing the above parameters, the Simulink model can be used to study the performance of any hybrid power system. After being processed by the Input Parameters block of the model, this information is used by all of the other subsystems to calculate efficiency, fuel consumption, and total cost of fuel.

The PV Model block is the model of the 12-kW PV array installed at Lime Village. This block calculates the power available from the PV array, depending on the intensity of sunlight. The `-function` written in MATLAB performs the following tasks.

1) The total power available from the PV array (aligned due south and tilted at a 15 angle) is calculated using the solar insolation values, the total area of the collector, and the efficiency of the solar collector. The solar insolation values were obtained as the input of the PV Model from the output of the Input Parameters block. These input values were obtained using a solar map developed by the National Renewable Energy Laboratory (NREL). This map utilizes extrapolations of 30-yr data from measurements at other locations combined with satellite data on cloud cover. The total collector area for the PV array was obtained from the manufacturer data sheet. The efficiency of commercially available solar collector is about 15%. In this project, a collector efficiency of 12% is assumed. 2) The model compares the calculated PV power to the required load. If the PV power is more than the load on the system, the model checks the battery kilowatthours.

If the battery kilowatthours is less than 95% of its rated kilowatthours, the model will send the excess available power to charge the battery bank. On the other hand, if the kilowatthours rating of the battery is more than 95% of its rated kilowatthours, the model will send the excess power to the dump load. The dump load consists of resistive banks that can adsorb excess power available from the PV array, which can subsequently be used to provide space heating. Lime Village does not currently have dump load. If the PV power is less than the load on the system, all of the power available from the PV array will go to the load. The battery bank will supply the remaining load. If the battery bank is unable to supply the rest of the load, the load is passed to the diesel generator. The diesel generator then supplies the load and charges the battery bank simultaneously.

The hybrid power system is designed in such a way that the PV array has the highest priority to supply the load. If the load is not met by the PV power, the battery bank is used to supply the required load. If the battery bank is less than 20% charged, the controller sends the signal to start up the diesel generator. The diesel generator is then used to supply the desired load and charge the battery bank simultaneously. On the other hand, if there is excess power available from the PV array, the excess power is used to charge the battery bank. If the battery bank is 95% charged, the excess power is sent to a resistive dump load, which can be used for space-heating purposes. In the Simulink model, the roundtrip efficiency of the rectifier/inverter and the internal loss in the battery bank per cycle was considered as 90%.



The Battery Model block consists of the battery bank and controller. The Battery Model has the second highest priority to supply the load. Once the RTU is installed at Village, it will regulate the power output of the diesel generator, the PV array, and the battery bank through digital/analog output capabilities that enable equipment to be switched “on” and “off.” The control settings and set point configurations are programmed into the memory of the RTU. These set points of the RTU can be changed while the simulation is in progress in order to further optimize the system. The -function in the Battery Model block performs the following tasks.

1) The total battery voltage is calculated using the number of battery cells () and the voltage per cell 2) The model then compares the required load with the maximum capacity of the two generators. If the required load exceeds the capacity of the two generators, then the model displays the message that the load cannot be supplied with the available generators. If the load is less than the maximum capacity of the two generators, then the model checks for the available kilowatthours and the mode (charging or discharging) of the battery bank. If the available kilowatthours of the battery bank is greater than 20% and the battery is in the discharging state, then the battery energy will be used to supply the load. If the available kilowatthours of the battery bank is less than 20% of its rated kilowatthours or if the battery bank is in the charging stage, then the energy from the diesel generator will be used to supply the load and charge the battery bank simultaneously.

The Generator Model block contains the manufacturer’s specifications for the efficiency of the electric generator. Knowing the efficiency and the load on the generator, the power input to the generator can be calculated. The Generator Model block is designed in such a way that the diesel generators are always operating at 95% of their kilowatt rating while operating in conjunction with the battery bank and the PV array. This way, the generators operate at their maximum efficiencies and also give better displacement power factor. If one generator is insufficient to supply the load, the second generator is turned “on.” In Village, one generator is always sufficient to supply the load, while the other generator acts as a back-up generator. If the model is used for other villages where two generators are used to supply the load, the percentage load on both the generators is the same. Therefore, both generators operate at 95% of their kilowatt rating.

The Fuel Consumption Model block calculates the amount of fuel required by the diesel engine to supply the load. The fuel consumed by the engine depends on the load and the electrical efficiency of the generator. The electrical efficiency is dependent on the displacement power factor of the load. If there are two generators operating, the block will calculate the fuel required by each engine and also the total fuel required to supply the load. The plot for the fuel consumption obtained from the manufacturer’s data sheet can be mathematically interpreted.

SIMULATIONS AND RESULTS

Simulations were performed for three cases using the Lime Village model and a one-year time period. The three cases studied in this work include diesel-only system, diesel-battery system, and PV with diesel-battery system. Table I shows the costs of the different components installed at Village for the three cases. The costs of the different components were obtained from the various manufacturers. The engineering cost, commissioning, installation, freight, and other miscellaneous costs were obtained from a report prepared. Due to the remoteness of the site, the cost for transporting the various components is relatively high. Table II shows the results for the three cases. In this model, the roundtrip efficiency of the



rectifier/inverter and the internal loss in the battery bank per cycle was considered as 90%. The collector efficiency for the PV array is assumed as 12%. As mentioned in HOMER, the heating value of fuel is assumed to be 48.5 MJ/kg, and the density of fuel is assumed to be 840. The post-simulation analysis includes an economic and environmental component illustrating the simple payback and avoided cost of emission reductions using the PV array.

A. Economic Analysis

The economic analysis part of the simulation model involves calculation of the simple payback time (SPBT) for the PV module and calculation of energy payback time (EPBT) for the PV array. In most of the remote villages, battery banks are used as back-up sources for power. Therefore, the PV with diesel-battery system is compared to the diesel-battery system in the analysis of SPBT. The SPBT is given as

$$\text{SPBT} = \frac{\text{Excess Cost of PV system}}{\text{Rate of Saving}}$$

Item	Cost per unit	No of units	Diesel-only system	Diesel-battery system	PV with diesel battery system
35 kW diesel generator	\$28,000	1	\$28,000	\$28,000	\$28,000
21 kW diesel generator	\$18,500	1	\$18,500	\$18,500	\$18,500
Switch gear to automate control of both diesels	\$16,000	1	\$16,000	\$16,000	\$16,000
Rectification/Inversion	\$18,000	1	\$0	\$18,000	\$18,000
New Absolyte IIP 6-90A13 battery bank	\$2,143	16	\$0	\$34,288	\$34,288
BP275 Solar	\$329	105	\$0	\$0	\$34,545
Siemens M55 Solar	\$262	75	\$0	\$0	\$19,650
Engineering		1	\$3,000	\$3,500	\$4,000
Commissioning, Installation, freight, travel, miscellaneous		1	\$13,000	\$14,000	\$16,000
		TOTAL	\$78,500	\$132,288	\$188,983

B. Environmental Analysis

The environmental analysis part of the model involves the calculation of the avoided costs for , PM, and . The figures for PM and obtained in Table II are based on the values obtained from the manufacturer. The emission of 3.1 kg /kg fuel is based on the mass balance for the combustion of the fuel. In [10], Narula et al. describe a way of calculating the avoided costs for . One way of reducing the greenhouse gas emissions from electric power plants is by removing the gases through the use of chemical or other processes. Some DEGs have pollution control equipment to reduce emissions. DEGs in most villages are not currently required to have emissions monitored. The cost associated with the removal processes is called removal



cost (RC) and is described. in the amount of emitted pollution is called the avoided cost. The avoided cost is calculated as

$$AC = \frac{COE_L - COE_H}{E_H - E_L}$$

where

- AC avoided cost (\$/ton);
- COE_L cost of electricity from low emission plant;
- COE_H cost of electricity from high emission plant;
- E_H emission from high emission plant (ton);
- E_L emission from low emission plant (ton).

OVERALL RESULT

Parameter	HOMER	Simulink Model
System cost (USD)	188,983	188,983
System efficiency (%)	29.9	29.96
kWhr per gallon	11.84	12.1
Fuel consumed (gallons)	6,817	6,583
Total cost of fuel (USD)	27,058	26,340
Energy generated		
(a) Diesel engine (kWhr)	87,064	82,497
(b) PV (kWhr)	9,444	9,445
Energy supplied to load (kWhr)	89,224	89,220
Operational life		
(a) Generator (years)	4.62	5.4
(b) Battery bank (years)	6.07	5.4
Net present value (NPV) (USD)	585,012	547,322
Emissions		
(a) CO ₂ (Tons)	*68.58	63.64
(b) NO _x (Pounds)	-	1425
(c) PM (Pounds)	-	59.92

*Based on 88% carbon content in the diesel fuel

CONCUSION

The preliminary results reported here demonstrate that the integration of a PV array into a diesel-battery stand-alone hybrid power system reduces the operating costs and the greenhouse gases and particulate matter emitted to the atmosphere. The Simulink model can be used to study the performance of any PV with diesel-battery hybrid power system if the operating characteristics of the power system are known. With few modifications, the model can be extended to incorporate other renewable energy sources. The incorporation of additional renewable sources of energy, such as wind turbines in this system, could further reduce fuel consumption. The dynamic performance and the control system strategy of the power system can also be incorporated into the model.



REFERENCES

- [1]. Ministry of Finance report 2015
- [2]. India Infrastructure report 2008
- [3]. Chedid R, El Khoury H. Design of a Hybrid Wind-PV-Fuel Cell System for Powering a Desalination Plant. 2007 IEEE Power Engineering Society General Meeting [Internet]. Institute of Electrical & Electronics Engineers (IEEE); 2007 Jun; Available from: <http://dx.doi.org/10.1109/pes.2007.385440>
- [4]. IEEE Power and Engineering Society-General Meeting Feb.9.2011,Arpa-E,Doe USA,MSE Italy, European Commission-Energy-Caffese plan and Consortium
- [5]. Elistratov V.V, Hybrid system of Renewable Energy Sources with Hydro Accumulation
- [6]. Sreeraj, E.S. et al., "Design of isolated renewable hybrid power systems". Sol. Energy (2010).
- [7]. Reliability Criteria in Optimal Sizing of Stand-alone Hybrid Wind-PV- Battery bank System.
- [8]. Rahman S, Kwa-sur T. A feasibility study of photovoltaic-fuel cell hybrid energy system. IEEE TransEnergy Convers 1988; 3(1):50-5
- [9]. Optimization methods applied to renewable and sustainable energy: A review.



COLONY BASED ROUTING CULTURE ALGORITHM FOR INTERNET TRAFFIC OPTIMIZATION

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ABSTRACT

The Internet has grown and changed ever since the first connections were made in 1969. The problem of routing assignments has been one of the most intensively studied areas in the fields of Data Communication Network. Network Routing essentially consists of two entities named Routing Protocol and Routing Algorithm. The Routing Protocol provides each node in a network, a consistent view of the topology and the Routing Algorithm provides the intelligence to compute paths between nodes. The basic routing algorithm used in data communication like link state routing which uses Dijkstra for minimum path calculation transfers all the received packets from the previous router to the next router of minimum cost function which makes the algorithm simpler but increases the overall response time from source to destination.

The present work proposes a civilized colony based culture of routing with objective to improve the response time from source to destination in many cases. The proposed scheme divides the whole network of routers into civilized colonies with a head each. All the members of a colony may communicate to each other directly and head of colony communicate with members of other colony. All the intermediate routers in the path of the packet are not decision place in case of civilized colony based routing culture algorithm, the decision takes place only at the source router or the intermediating colony head and in such a way the overall processing time is improved.

This new algorithm is implemented on various cases and compared with the link state Dijkstra algorithm for total processing time. It is observed that the percentage improvement in total processing time is 75% to 85% when the numbers of routers in a colony are 13 to 50.

Keywords— Routing, Routing algorithm, Communication cost, Dijkstra algorithm, Cost function

I. INTRODUCTION

In data communication network transmission of information takes place in the form of packets [1]. Packet is a bit stream containing more than one or a part of a message encapsulated with some protecting bits



depending upon the type of protocol used. The transmission of packets takes place via some intermediating switching devices [2]. The switching device must be intelligent enough to route the packet in a proper path with minimum cost function. Such an intelligent switching device is known as router and the intelligence inside them is known as routing algorithm.

The existing routing algorithms [3] [4] [5] used in data communication network for packet communication, working at each level of hierarchy are Distance vector routing algorithm and link state routing algorithm. These routing algorithms transfer all the received packets from the previous router to the next router of minimum cost function, determined by the shortest path algorithm [6] [7]. The next router again transfers the packet to the coming router and hence although the path is predetermined the decision of pathway is taken at each intermediating router which increases the overall response time from source to destination.

Any algorithm can be analyzed on the basis of the very important parameter, total processing time [3]. It is the time required to process the data packet from source to destination. It is a combination of record searching time and link movement time.

- Record searching time: It is the time required to search routing tables to compute the route from source to destination. It also represents the complexity or computational effort of the system. If the routing table contains more data the route computation time is more and the effort is more and hence the system is more complex.
- Link movement time: It is the time required to move the packet from source router the destination router.

II. PROPOSED ROUTING ALGORITHM

The proposed routing algorithm i.e. civilized colony based routing culture algorithm is modified link state Dijkstra algorithm. In the proposed scheme the link state database is considered as the base information. Here the word colony stands for a group of routers formed with shortest path connectivity and the word Civilized means all the routers in a colony could communicate directly and this group works under a leading router, which is known as head of that colony. This scheme is applicable at all levels in the hierarchy.

The civilized colony based culture of routing is a routing scheme in which the whole network of router is grouped in a specific manner and all these groups are civilized means they do know the pathway to reach at each other and works under the group leader.

A. Modes of operation of the proposed scheme of routing

The proposed routing scheme operates in the following modes

- Base information collection
- Colony formation and civilization
- Tabulation of available information
- Route selection
- Updating information

In Base information collection the basic requirement i.e. link state data base and routing tables for all the routers is collected at each router. Colony formation and civilization mode forms colony and by selecting



head make the colony civilized. Tabulation of available information creates the new civilized routing tables, colony routing table and colony table to collect the information in tabular form. Route selection mode selects the best possible route for packet transmission using the algorithm. The last mode Updating information updates the information for any change in the network condition.

B. Algorithm of the proposed colony based culture of routing

Define: CVRT-civilized colony table, CRT-colony routing table, CT-colony table, LSDB-link state data base

Variables: M[]= array for consisting no of routers in all colonies e.g. M[3] consist no of router in third colony; N= no of colonies; A[a][i]= array of routers of all colonies e.g. A[5][6]is sixth router of fifth colony; B[]=array of colonies consist record of all the colonies; H[]=head of all colonies e.g. H[8]gives head of eighth colony; R=Route of packet

Create Routing tables

Create table CVRT (S char(2),D char (2),C int(2),P char (30))

Create table CRT (SC char(2),DC char (2),CC int(2),PC char (30))

Create table CT (NC char(2),MC char (2),H char (2))

Where: S-Source, D-Destination, C-Cost of CVRT, P-Pathway for CVRT, SC-Source colony, DC-Destination colony, CC-colony cost for CRT, PC-pathway of colony for CRT , NC-Name of colony, MC-Member of colony, H-Head(for CT)

Algorithm 1: colony based culture of routing

S1: At all the members of all the colonies create CVRT

for (a=1,a<=N, a++)

{For(i=1,i<=M[],i++)

{For (j=1,j<=M[],j++)

{Insert into CVRT values (A[i],A[j],C,P);

--Value of C and P will be fetched from Dijkstra's algorithm

} } }

S2: At the colony head of all the colonies create CRT and CT

For (b=1,b<=N,b++)

{ Insert into CRT values (B[a],B[b],CC,PC);

-- Value of CC and PC will be fetched from Dijkstra's algorithm

For(c=1,c<=M[b],c++)

{Insert into CT values (B[b],A[b][c],H[b]);

} }

S3: Packet received_X

S4: Destination_packet_U

S5: select P into R from CVRT of X when D=U and go to step 14

S6: R=pathway from CVRT of head of colony X

S7:Search CT and find whether U is member of any colony if yes ,route the packet to the pathway given in the attribute PC of the CRT and go to step 4.

S8: consider the LSDB from Dijkstra algorithm & fetch the values from the table and put them into array

Dest [] –is network station

Source[]—is advertiser

Cost LSDB[] –cost corresponding to the source destination pair.

S9: Searching variable=U and call function neighbor search(searching variable)

--U is not member of any colony so search its neighbor with least cost



S10:search ad in colony table. If ad is not member of any colony execute the function neighbor search () with searching variable = ad

else put Y=colony of ad

update the tables of the colony of ad and make U part of that colony and also update all the tables accordingly.

S11: select PC into R from CRT when SC=X and DC=Y

S12:from the step 13 we are at the nearest member of U now put P into R from CVRT of Y when D=U.

S13: end

Algorithm 2: Neighbor search

S1: Neighbor search(searching variable)

{For (y=1,y<=size of Dest[],y++)

{Count=1

If Dest [y]= "searching variable"

{Temp=cost [y]

If (count==1)

{Ad=source[y]

Min=temp

Count++}

Else{

If (temp<min)

{Min=temp,

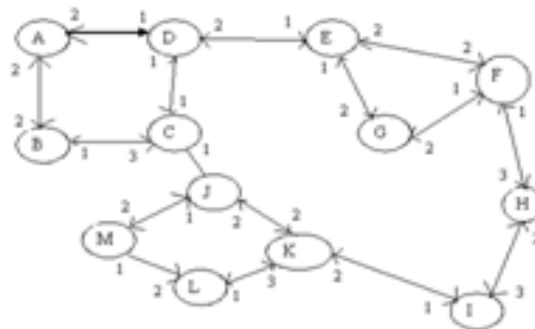
ad=ad[y] }}}

Return (ad)}

III. CASE STUDY

To analyze the performance of the proposed algorithm the network of figure1 is considered. In this case, the network analyzed has the following features:

- Network of router having 13 nodes.
- Connectivity of nodes as shown in figure
- Different link movement cost in forward and backward direction as shown in figure.
- Seven different source destination pair are taken randomly to compare both the algorithms



The proposed algorithm uses the link state data base and routing tables of all the routers as base information .The tables I shows the link state data base which is tabular representation of the network of



router and table II shows the routing table of router A which gives link movement cost and the next hop in the pathway for all the possible destination. Using link state Dijkstra shortest path algorithm, tables for all other router has been formed which look similar to that of router A.

TABLE I

Link state data base for the network

S No	Advertiser	Network Station	Cost
01	A	D	1
02	A	B	2
03	B	A	2
04	B	C	3
05	C	D	2
06	C	B	1
07	C	J	2
08	D	A	2
09	D	C	1
10	D	E	1
11	E	D	2
12	E	G	2
13	E	F	2
14	F	E	2
15	F	G	2
16	F	H	3
17	G	E	1
18	G	F	1
19	H	F	1
20	H	I	3
21	I	H	2
22	I	K	2
23	J	C	1
24	J	K	2
25	J	M	2
26	K	J	2
27	K	L	1
28	K	I	1
29	L	K	3
30	L	M	1
31	M	J	1
32	M	L	2



TABLE II
ROUTING TABLE FOR A

Destination	Cost	Next Hop
A	0	-
B	2	-
C	2	D
D	1	-
E	2	D
F	4	D
G	4	D
H	7	D
I	10	D
J	4	D
K	6	D
L	7	D
M	6	D

Using all the existing tables the new algorithm will form groups with both forward and backward move using the algorithm of proposed scheme. Figure 2 shows the first group i.e. colony X.

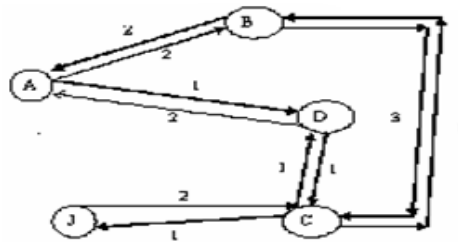


Fig. 2 Network for colony X

Routing table for all the members of colony X known as civilized routing table is shown in tables III to VII which gives routing table for all the members of a colony.

TABLE III
CIVILIZED ROUTING TABLE OF ROUTER A

Source	Destination	Cost	Pathway
A	B	2	AB
A	C	2	ADC
A	D	1	AD
A	J	4	ADCJ



TABLE II
CIVILIZED ROUTING TABLE OF ROUTER B

Source	Destination	Cost	Pathway
B	A	2	BA
B	C	3	BC
B	D	3	BAD
B	J	5	BCJ

TABLE V
CIVILIZED ROUTING TABLE OF ROUTER C

Source	Destination	Cost	Pathway
C	A	3	CD A
C	B	1	CB
C	D	1	CD
C	J	2	CJ

TABLE VI
CIVILIZED ROUTING TABLE OF ROUTER D

Source	Destination	Cost	Pathway
D	A	2	DA
D	B	2	DCB
D	C	1	DC
D	J	3	DCJ

TABLE VII
CIVILIZED ROUTING TABLE OF ROUTER E

Source	Destination	Cost	Pathway
J	A	4	JCDA
J	B	2	JCB
J	C	1	JC
J	D	2	JCD



Figure 3 shows the second group i.e. colony Y; in the same manner in which first group was formed.

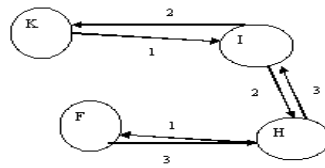


Fig. 3 Network for colony Y

Routing table for all the members of colony Y is shown in table VIII to XI

TABLE VIII
CIVILIZED ROUTING TABLE OF ROUTER K

Source	Destination	Cost	Pathway
K	I	1	KI
K	H	3	KIH
K	F	4	KIHF

TABLE IX
CIVILIZED ROUTING TABLE OF ROUTER I

Source	Destination	Cost	Pathway
I	K	2	IK
I	H	2	IH
I	F	3	IHF

TABLE X
CIVILIZED ROUTING TABLE OF ROUTER H

Source	Destination	Cost	Pathway
H	K	3	HIK
H	I	3	HI
H	F	1	HF



TABLE XI
CIVILIZED ROUTING TABLE OF ROUTER F

Source	Destination	Cost	Pathway
F	K	8	FHIK
F	I	6	FHI
F	H	3	FH

After such all process the routing table will be erased from all the routers except the colony head. Colony head will have two more table that is colony table and colony routing table shown in tables XII and XIII

TABLE XII
COLONY ROUTING TABLE

Source Colony	Destination Colony	Cost	Pathway
X	Y	2	-JK-
Y	X	2	-FKJ-

TABLE XIII
COLONY ROUTING TABLE

Colony id	Colony Member id	Colony Head
X	A,B,C,D,J	J
Y	F,H,K,I	F

After, formation of all the tables the scheme is ready to select the new route from source to destination following the steps shown in the algorithm.

I. RESULT

Total processing time and record searching time for seven random source destination pair for the case in both the routing algorithm is shown in the table XIV

TABLE XIV
RESULT

SN	Source	Destination	Djakstra Algorithm		Civilized Colony Based Culture of Routing	
			Processing Time	Record Searching Time	Processing Time	Record Searching Time
01	A	I	39t+10p	39t	11t+10p	11t
02	C	K	26t+4p	26t	9t+15p	9t
03	I	C	39t+5p	39t	9t+6p	9t
04	H	B	65t+7p	65t	9t+5p	9t
05	B	F	65t+6p	65t	6t+10p	6t
06	E	J	39t+5p	39t	39t+5p	39t
07	H	A	52t+7p	52t	5t+7p	5t

Where:



p = Time during the link movement per unit cost
t = Processing time in searching per unit record

Using MATLAB the results are graphically expressed for different values of p and t. Fig 4 shows the graph of total processing time for all the source destination pair for p=.001s. Blue lines showing total processing time for link state Dijkstra algorithm and green line showing that for proposed algorithm. Fig 5 shows the graph for record searching time for different source destination pair, where blue bars show computational effort for proposed algorithm and brown lines show that of link state Dijkstra algorithm.

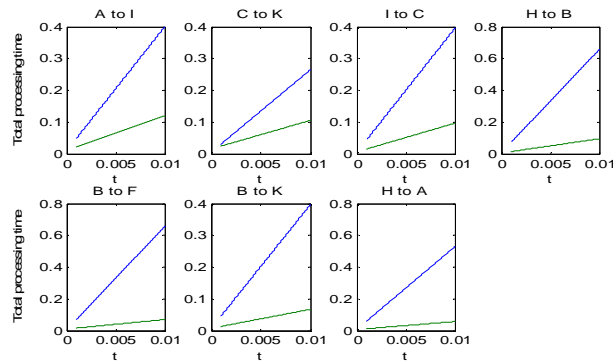
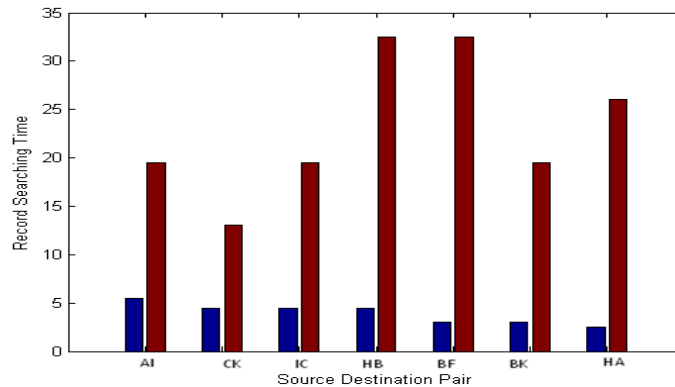


Fig 4. Unit processing time Vs Total processing time for different source destination pair with p=0.001S



A. Effect of Number of Routers in a Network on Proposed Algorithm

The graph showing the relation between the number of routers in a case and the total processing time is shown figure 6

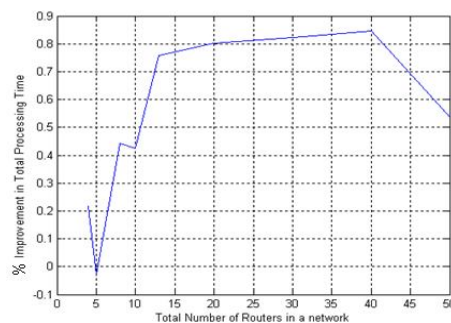


Fig. 6 Effect of number of routers in network



Figure 6 shows the effect of number of routers in a network on the performance of the total processing time. The percentage improvement in total processing time is defined as the ratio of change in total processing time from Dijkstra link state routing algorithm to civilized colony based routing culture algorithm with respect to total processing time of Dijkstra link state routing algorithm. From the graph it is found that increase in number of routers improve the total processing time but the improvement is very low for very small number of routers and very large number of routers in a colony. The optimum solution for the number of routers in a colony lies in 13 to 50, where the total processing time is 75% to 85%. The result have been obtained for the specific connectivity and cost function (already discussed in case study)

V. CONCLUSIONS

The analysis of the proposed routing algorithm and the existing link state Dijkstra algorithm concludes that the total processing time in civilized colony based routing culture algorithm for all the considered cases is better i.e. the maximum percentage improvement in total processing time of the proposed algorithm is about 85%. The analysis also reflects less record searching time than Dijkstra algorithm for all the considered cases in proposed algorithm. It can also conclude from the analysis that the number of routers in the colony affects the performance. The graph of figure 6 shows that, the total processing time is very low for the networks having very less number of routers and also for the networks having very high number of routers. The improvement in the total processing time is in the range of 75% to 85% when the number of routers in a network lies between 13 to 50 routers.

REFERENCES

- [1] William Stallings "Data and Computer Communication" PHI publication 6th edition.
- [2] Behrouz A Forouzan "Data Communication and Networking" Tata McGraw Hill Publication 3rd edition.
- [3] Andrew S Tanenbaum "Computer Networks" Pearson Publication 4th edition.
- [4] Behrouz A Forouzan "TCP/IP Protocol Suite" Tata McGraw Hill Publication 3rd edition.
- [5] Wayne Tomasi "Introduction to Data Communication and Networking" PHI publication 1st edition.
- [6] Chinoy, B. "Dynamics of Internet Routing Information" Proceedings of ACM SIGCOMM, pp. 4552, September 1993.
- [7] Kirill Levchenko Geoffrey M. Voelker "XL: An Efficient Network Routing Algorithm" SIGCOMM'08, August 17–22, 2008, Seattle, Washington, USA, page(s)15-26



A REVIEW ON VOLTAGE STABILITY ANALYSIS

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ABSTRACT

The present scenario of electrical power system worldwide shows that electrical load demand is increasing day by day and in order to meet the growing electrical load demand utility companies are operating their plants at their maximum capacity. As the operating points are close to their steady state stability limits the risk of voltage collapse events throughout the world were experienced. Preventing voltage collapse occurrences in power system is a challenging task. This paper provides a review on different techniques used for determining the voltage stability margin. This study aims at revealing the basic research methodology used area of problem and the requirement of new technique. The review study covers the articles coming from major journals related with the topic including a taxonomy study and detailed investigation as to the methodologies approaches and findings of these works. The methodology followed during the conduct of this research includes a broad base of articles lying at the voltage collapse phenomenon.

Keywords- Voltage collapse; Steady state stability limit; P-V; P-Q; CSNBP; Modal Analysis.

I. INTRODUCTION

As power system is operated under increasingly stressed conditions the ability to maintain the voltage stability becomes a growing concern. The heart of the voltage stability problem is the voltage drop that occurs when the power system experiences a heavy load, and one serious type of voltage instability is voltage collapse. Voltage instability or collapse generally arises from two types of system events: gradual deterioration in system operating conditions due to rapid load pickup or due to severe contingency. Present day power system operating environment substantially increases the difficulty of maintaining acceptable system voltage profiles. Low voltage can result in loss of stability and voltage collapse and ultimately to cascading power outages. Voltage collapse has become a serious problem, and is now an active research subject attracting investigators from the field of power engineering, as well as from circuits and systems [1] [2] [3] [4]. In last few years many researchers worked out for voltage stability and published number of papers related with the problem of voltage collapse and voltage security. Voltage collapse is the critical form of voltage instability and voltage security is the prevention from such voltage instability. In the last 50 years many voltage instability incidence have occurred around the world [5].



The subject of voltage collapse and voltage instability have created a renewed interest in load flow Jacobian singularities and their relationship to steady state stability while load flow has been the primary method used to compute steady state conditions, its role in evaluating stability has not been fully clarified. In research about the voltage collapse or voltage stability analysis researchers introduced different methods for determining the voltage collapse in different journals or publications. Some of them are P-V and Q-V analysis, Thevenin's parameter based, SNBP based, Modal analysis, Sensitivity analysis, Tangent vector, Line voltage stability indexes. These analysis are based on different techniques but with the aim to calculate the voltage collapse point or to find out the voltage stability limit.

II. REVIEW METHODOLOGY

The initial reading list for the review covered 40 articles from major science cited journals. Because of the different varieties of voltage stability analysis topic, the papers which are strongly related with voltage collapse, computable analysis method and stability limit were in the list to be able to provide a broad perspective covering technology, scenario and load aspects. Taxonomy of these papers has been made and 25 papers are found much more relevant for the intersection of voltage collapse and stability analysis topics. The list of papers included in the review and their classification with method used for analysis, brief description and no. of paper reviewed are summarized in table 1.

TABLE I.
REVIEW TABLE

SN	Method of voltage analysis	Brief description of method	No. of paper review-ed
1	PV,QV curve/ Sensitivity analysis	The curves give relation between variation of reactive and active power with voltage which can be used to determine the voltage stability margin and point of collapse. QV sensitivity can also be used for calculation.	04 [6][14] [21] [22]
2	Circuit Theory Based	Complex transmission system is modeled into simplified structure using circuit theory approach and then stability assessment is done.	03 [8][29] [30]
3	Bifurcation Based	Static bifurcation theory is appropriate for definition classification and analysis of voltage collapse. Saddle node or Hopf bifurcation are used for stability assessment along with various computational intelligence.	05 [3][10] [17][20] [24]
4	Modal Analysis	Large power system can be analyzed using this method, it computes specific no. of Eigen values and Jacobian parameters to determine voltage collapse point which make the method computationally fast and efficient.	03 [7][13] [18]
5	Stability Index Based	Some numerical value can be assigned to a mathematically defined function termed as index, its variation shows the relative stability of the system like Line stability index, Tangent vector etc. They provide relative stability as well.	10 [9][11] [12][15] [16][19] [23][25] [26][28]



The papers for review are categorized on the basis of various method used for analysis. These methods are than studied in depth and are reviewed on the basis of focus of the work, contribution to the existing technology and approach used, so that their characteristics can be obtained

III. BASIC CHARACTERISTICS AND CONTRIBUTION OF WORK REVIEWED

The papers included in the review can be categorized on the basis of methodology used to find the voltage collapse. In this section characteristics and contribution of the works reviewed are discussed in chronological order.

In 1986 Harry G.Kwatny [3] proposed online voltage control algorithm based on optimal power flow formulation which says static bifurcation theory is a suitable framework for the definition, classification and analysis of voltage collapse phenomenon. Flatabo, et al [6] used MVAR distance to voltage collapse as criterion for determining the voltage stability. For this sensitivity matrix was established and then calculation of resultant reactive power generation sensitivity have been done.

Method which provide an analytical tool capable to predicting voltage collapse and computes a specified no. of smallest Eigen value of a reduced Jacobian matrix and the associated bus, branch and generator participation known as modal analysis[7]. In 1995 Thevenin's equivalent circuit of a power system network is used to analyze the stability in which Quadratic equation of model is solved to find the maximum loadability margin [8]. De Souza, et al [9] used Tangent vectors to define a clustering method for identification of voltage collapse point at any operating condition of the critical area. Tangent vector information defines a new voltage stability index i.e. Tangent vector index TVI. This paper proposes a new tangent vector analysis with improved computational performance to identify the weak area of the system using network partitioning and clustering.

In Greene, et al [10] loading margin is calculated for nominal system parameters and then by using linear and quadratic estimates the loading margin for different control actions like emergency load shedding, generator dispatch, variation in the direction of load increase is obtained. An optimal power flow algorithm [11] that incorporates voltage stability margins in which effect of limit on maximum loading point computation and voltage stability criterion included in original OPF object function is developed. Chen, et al [12] focuses a new method of calculating CSNBP based on performance index which is computed by a guided continuation method. The method computes the voltage collapse point much faster than standard continuation.

El-Sheikhi [13] investigates the effect of inserting FACT devices in power system on voltage stability near the voltage collapse operation. Effect of shunt and series compensation on steady state stability is observed and is noted that increase in compensation level increase the Eigen value of the reduced Jacobean matrix indicating a better effect on voltage stability. Haque [14] used voltage stability boundary (VSB) in P-Q plane with two bus equivalent of the original system to improve the computation time. VSB gives active power, reactive power and apparent power margins. In 2004 [15] developed a performance based index relating reactive power equation and full sum of derivatives of Jacobian matrix. In [16] L.



Wang and Y. Liu gives an on line voltage stability assessment where From both the active and reactive paths weak power draining buses and corresponding participant power generating buses are decided. Karbalaeei, et al [17] used SNBP to determine voltage collapse. Problem is converted into optimization problem. It is considered that SNBP will occur at a point where P and Q will get maximized, this is taken as objective function and then solution is obtained using loss function as cost function. Sharma and Ganness [18] used modal analysis to find critical modes corresponding to minimum Eigen value. Highest participation factor is assigned to the critical mode corresponding to most critical system bus to provide relative measure of the system stability. Arya, et al [19] proposed a newly developed line voltage stability index for protection against voltage collapse. By using the collapse criteria i.e. at the collapse point the determinant of Jacobian is zero $[J]=0$, a mathematical relation is made and is observed at collapse point to define a index. Using this relay characteristic has been derived. Finally the stability constrained is made.

Arya, et al [20] gives an algorithm for computing shortest distance to voltage collapse i.e. CSNBP using PSO technique which is population based inspired by the social behavior of animals. The combination and the direction of the load which tends to collapse of the system are hence obtained using positional and velocity change of particles in PSO. In 2008 K. Ramlingam and C.S. Indulkar presents the method of determining the voltage stability boundaries for a power system with voltage sensitive loads using P-Q curves is presented [21]. Aghamohammadi, et al [22] introduced a new approach for estimation and improvement of voltage stability margin using sensitivity analysis of voltage stability assessment using neural network. Jalboub, et al [23] provide a review of some static voltage stability indices for determination of static voltage stability margin of the power system prior to voltage collapse, and concluded that best location for compensation is the weakest bus of the system.

Phadke, et. al [24] determined loading margin from the point of voltage collapse. It estimates voltage stability margin using SNBP point. The problem of determining closest SNBP is converted into optimization problem and solved using real coded genetic algorithm. Kumaraswamy, et al [25] derived an indicator from the fundamental Kirchhoff's law which predicts the voltage instability or the proximity of collapse. It estimates voltage collapse margin point for different loading conditions at different buses. Paper presented a real time based voltage stability indicator for monitoring of power system to locate the vulnerable location of the system. In 2012 F.A.Althowibi and M.W. Mustafa [26] presented efficient indices to calculate voltage stability and to predict voltage collapse and establish a sensitive formula to detect or predict the point of voltage collapse. In [27] real time analysis for voltage stability assessment using linear discrimination analysis is done and proved that the method is sufficient to measure the stability criterion real time. For real time stability analysis PMUS are used which should be placed on the highest sensitive load bus, to determine the location participation factor are used than using LDA assessment the voltage stability can be applied for online monitoring for wide area operation. In 2014 [28] proposed Artificial Neural Network to accurately calculate stability margin for proper planning and operation of power system using L stability indices. [29] gave a circuit based approach where network reconfiguration is used to predict voltage stability in both normal and faulty condition. A two bus equivalent model which does not require post power flow solution processing of the Jacobian matrix is developed in [30] equivalent nodal analysis is parallel with the model analysis, it uses geometric indices to



identify critical buses and participation factor. This method is proved to be computationally robust and efficient and suitable in online applications. [31] Focuses on determination of branch active power and its use to identify the critical bus and criticality of various branches. This method is comparatively less complex and uses PFE equations to solve active powers only. It proved that before voltage collapse, critical branch take place and their number increases towards collapse. Thus this information can be used for assessment of voltage stability.

IV. DISCUSSION AND FINDINGS

It has been found from the review that Voltage stability is very important term used in power system engineering. Always at every level power system engineer wants to run the system at constant frequency and voltage. The constant voltage condition, if violates give rise to voltage instability problem. Low voltage can result in loss of stability and voltage collapse and ultimately to cascading power outages. This situation is contributed by various factors like the adoption of higher transmission voltages, decrease in reactive power output of large generating units and shift in power flow patterns associated with changing fuels cost and generating availabilities. Voltage stability analysis is required to avoid such collapse conditions to develop on line voltage control algorithm based on some form of optimal (active or reactive) power flow formulation. Parameter which affects the voltage stability analysis may Emergency load shedding, Reactive power support, Variation in the direction in load increase, Inter area re-dispatch, Change to load model and load composition, FACT devices, Generator Re-dispatch etc.

New voltage stability analysis techniques are being introduced using optimization methods that determine optimal control parameters to maximize load margins to voltage collapse and to give the best location of FACT devices to be inserted for stability improvement.

V. CONCLUSION AND FUTURE RESEARCH DIRECTION

The study revealed that the voltage stability analysis is still a fruitful research area and very supportive statements have been traced for the need of further research on voltage stability analysis methods during the review. Following are the main guidelines collected from the study

- PV and QV analysis uses indicators by which it is easy to locate the weak area of the system. Simulation results detects the stressed condition of line with degree of accuracy identifies the weakest bus prone to voltage collapse.
- Two bus equivalent model of the power system after application of Thevenin's theorem calculates the voltage stability limit at base case operating point. The value found is close to true value and requires less computation.
- Modal analysis is a new useful method providing relative measures of the system to the stability limit and correctly predicting the critical buses and weak transmission branches in the power system.
- V-I polynomial become a very simple and straightforward method of estimating the maximum permissible loading and static voltage stability limit.



- Tangent vector analysis using partitioning technique along with continuation power flow identifies the critical area with respect to the collapse point at any loading condition.
- Line voltage stability index has been used to devise a protective scheme against voltage collapse. It gives the impedance criteria for numerical relays. And can be incorporated in impedance relay.
- By the sensitivity analysis, the voltage stability point of a general network can efficiently be determined. With respect to reactive power security evaluation the distance to voltage collapse can be used as a measure of system security.
- Static bifurcation theory is suitable framework for the definition, classification and analysis of voltage collapse phenomena. Computation of CSNBP provides the load pattern which gives the operating point touches one of the infinite collapse points which lie on the transfer limit surface.

This study has put forward the problems and requirements of today's interconnected, stressed and complex power system where voltage stability is foremost concern. Various analysis and methods are employed to access the voltage stability with the aim to locate the weak area of the system, to identify the weakest bus prone to voltage collapse, to estimate the maximum permissible loading limit, to find the load pattern which may lead to voltage collapse, to compute CSNBP.

During this review and analysis the factor which mainly affects the study involves concept of "fast and accurate computation".

REFERENCES

- [1] B.H. Lee and K.Y. Lee, "A study on voltage collapse mechanism in electric power systems," IEEE Trans. On Power Systems, vol.6, pp.966, 1991.
- [2] Q.Wang and V.Ajjarapu, "A critical review on Preventive and corrective control against voltage collapse," Electric Power Components and Systems, vol.29, pp.1133, 2001.
- [3] H.G. Kwatny, A. Pasrija, and L. Bahar, "Static bifurcation in electric power networks: Loss of steady state stability and voltage collapse," IEEE Trans. on Circuit and Systems, vol. 33, pp.981, 1986.
- [4] I.Dobson, H.Glavitsch, C.Liu, Y.Tamura, and K.Vu, "Voltage collapse in power systems," IEEE Circuits and Devices, vol.8, pp.40, 1992.
- [5] C.W.Taylor, Power System Voltage Stability, 2nd ed., McGraw Hill, 1994.
- [6] N. Flatabo, R. Ognedal, and T.Carlsen, "Voltage stability condition in a power transmission system calculated by sensitivity methods," IEEE Trans. on Power Systems, vol.5, pp.1286, 1990.
- [7] B.Gao, G.K.Morison, and P.Kundur, "Voltage stability evaluation using modal analysis," IEEE Trans. on Power Systems, vol.7, pp. 1529, 1992.
- [8] M.H. Haque, "A fast method for determining the voltage stability limit of power system," Electric Power System Research, vol.32, pp.35, 1995.
- [9] A.C.Z. De Souza, C. A. Canizares, and V.H.Quintana, "A new technique to speed up voltage collapse computations using tangent vectors," IEEE Trans. on Power Systems, vol.12, pp.1380, 1997.



- [10] S.Green, I.Dobson, and F.L.Alvarado, "Sensitivity of a loading margin to voltage collapse with respect to arbitrary parameters," *IEEE Trans. on Power Systems*, vol.12, pp.262, 1997.
- [11] W.Rosehart, C. Canizares, and V.Quintana, "Optimal power flow incorporating voltage collapse constraints," *IEEE Power Engineering Society Summer Meeting*, vol.2, pp.820 , 1999.
- [12] K.Chen, A.Hussain, M.E.Bradley, and H. Wan, "A performance index guided continuation method for fast computation of saddle node bifurcation in power system," *IEEE Transaction on Power Systems*, vol.18, pp.753, 2003.
- [13] F.A. El-Sheikhi, Y. M saad, S.O. Osman, and K. M. El-Arroudi, "Voltage stability assessment using modal analysis of power system including flexible AC transmission system (FACTS)," *IEEE conference on Power Engineering*, 2003.
- [14] M.H. Haque, "Novel method of assessing voltage stability of power system using stability boundary in P-Q plane," *Electric Power System Research*, vol 64, pp 35, 2003.
- [15] A.C.Andrade, F.P.M. Barbosa, "A new method for detecting the point of voltage collapse," *39th International Universities Power Engineering Conference*, vol.2, pp.1004, 2004.
- [16] L. Wang, Y. Liu , and Z. Luan, "Power Transmission Paths Based Voltage Stability Assessment," *IEEE/PES Transmission and Distribution Conference and Exhibition: Asia and Pacific*, pp.1 ,2005.
- [17] F. Karbalaei, S. Jadid, and M. Kalanter, "A novel method for fast computation of saddle node bifurcation in power system using an optimization technique," *Energy Conservation and Management*, vol.47, pp.582, 2006.
- [18] C. Sharma and M.G. Ganness, "Determination of power system voltage stability using modal analysis," *POWERENG*, pp.381, 2007.
- [19] L.D. Arya, S.C.Choube, and M. Shrivastava, "Technique for voltage stability assessment using newly developed line voltage stability index," *Energy Conservation and management*, vol.49, pp.267, 2008.
- [20] L. D. Arya, S. C. Choube, M. Shrivastava, and D.P. Kothari, "Particle swarm optimization for determining shortest distance to voltage collapse," *Electric Power and Energy Systems*, vol.29, pp.796, 2007.
- [21] K. Ramalingam, and C.S. Indulkar, "Determination of Steady State Voltage Stability limit using PQ curves for voltage sensitive loads," *Joint International conference on Power system Technology and IEEE Power India conference*, *POWERCON*, pp.1,2008.
- [22] M.R. Aghamohammadi, S.Hashemi, and M.S.Ghazizadeh, "A novel approach for improving voltage stability margin by sensitivity analysis of Neural network," *IEEE IPEC*, 2010.
- [23] M. K. Jalboub, A. M. Ithal, H. S. Rajamani, and R. A. Abd-Alhameed, "Determination of static voltage stability margin of the power system prior to voltage collapse," *International IEEE multi conference on Systems, Signals and Devices*, 2011.
- [24] A.R. Phadke, M. Fozdar and K.R. Niazi, "A new technique for computation of closest saddle node bifurcation point of power system using real coded genetic algorithm," *Electric Power and Energy Systems*, vol.33, pp.1203, 2011.



- [25] I. Kumaraswamy, W.V. Jahnvi, T. Devraju, and P. Ramesh, "An optimal power flow (OPF) method with improved voltage stability analysis," Proceedings of World Congress on Engineering, vol.2, 2012.
- [26] F.A. Althowibi, M.W. Mustafa, "Power System Network Sensitivity to Voltage Collapse," IEEE International Power Engineering and Optimization Conference (PEOCO), pp379, 2012.
- [27] H. Innah, D.A.Asfani, T.Hiyama, "Voltage stability assessment based on discrimination principle," 22nd Australasian Universities Power Engineering Conference (AUPEC), pp.1, 2012.
- [28] T.Peter, R.P. Sajith, "Voltage stability assessment in power systems using Artificial Neural Networks," 2014 Annual International Conference on Emerging Research Areas: Magnetics, Machines and Drives (AICERA/iCMMD), pp.1, 2014.
- [29] S.Chitra, N.Devarajan, "Circuit theory approach for voltage stability assessment of reconfigured power network," IET Circuits, Devices & Systems, vol.8, pp.435, 2014.
- [30] D.H.A.Lee, "Voltage Stability Assessment Using Equivalent Nodal Analysis," IEEE Trans. on Power Systems, vol.PP, pp.1,2015.
- [31] G.Cao, L.Chen, and K. Aihara, "Power System Voltage Stability Assessment Based on Branch Active Powers," IEEE Trans. on Power Systems, vol.30, pp.989, 2015.



LITHIUM ION BATTERY WITH INBUILT FIRE EXTENGUISHER

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ABSTRACT:

Now a days one of the biggest issue that we are facing with respect to our mobile phones is its battery explosion.

Although the energy densities of batteries continue to increase ,safety problem (explosion And fires) associated with the use of highly flammable liquid organic electrolytes remain a big issue, significantly hindering further practical application of the next generation of high energy batteries.

The encapsulation of a flame retardant inside a protective polymer shell has prevented direct dissolution of the retardant agent into the electrolytes, which would have negative effect on battery performance.

During thermal runaway of the lithium –ion battery, the protective polymer shell would melt ,triggered by the increased temperature ,and the flame retardant would be released ,thus effectively suppressing the combustion of the highly flammable electrolytes.

KEYWORD: PVDF-HFP,TPP,LIB

INTRODUCTION

The seperator which is presently used in the lithium-ion batteries is made up of non-woven fabrics which includes a single polyolefin or a combination of polyolefin such as polyethylene, polypropylene, polyamides, polyvinylidene fluoride(PVDF) and polyvinyl chloride(PVC).All these materials are usually toxic in nature and incapable of preventing explosion in batteries. The solution proposed to prevent this issue is preparing a battery which has fire retarding capability.

Integrating flame-retarding capabilities into a battery sounds like an out-there concept.Different approaches have included making the battery's separator, the polymer membrane that rests between the cathode and anode,from advanced flame-retardant composite materials. Such efforts have tended to compromise the battery's performance,and have been unable to completely eradicate the risk anyhow.

It has been found to be a better way forward as the battery design packs a common flame retardant called triphenyl phosphate(TPP) inside a shell of microfibers,which is crafted with a technique called electrospinning.

RELATED TECHNOLOGY AND CHEMICALS

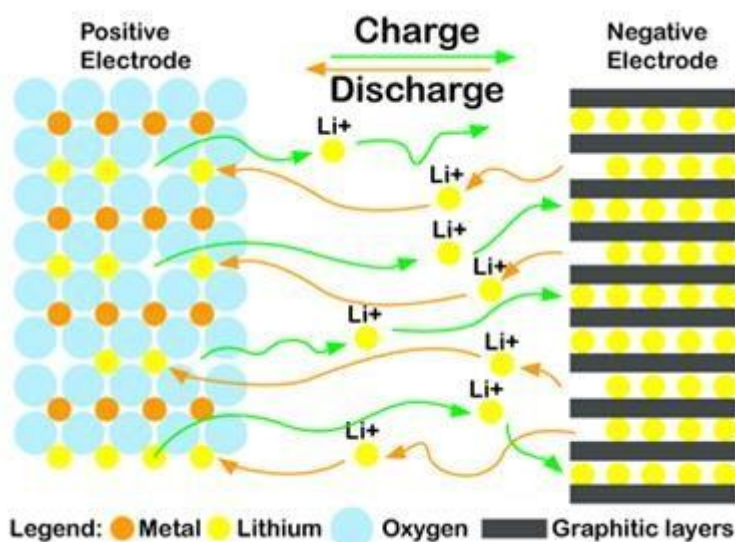
1.LITHIUM-ION BATTERY



A lithium-ion battery or Li-ion battery (abbreviated as LIB) is a type of rechargeable battery in which lithium ions move from the negative electrode to the positive electrode during discharge and back when charging.

Li-ion batteries use an intercalated lithium compound as one electrode material, compared to the metallic lithium used in a non-rechargeable lithium battery. The electrolyte, which allows for ionic movement, and the two electrodes are the constituent components of a lithium-ion battery cell.

Lithium-ion batteries are common in home electronics. They are one of the most popular types of rechargeable batteries for portable electronics, with a high energy density, tiny memory effect[8] and low self-discharge.

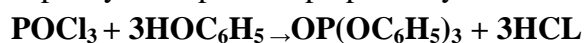


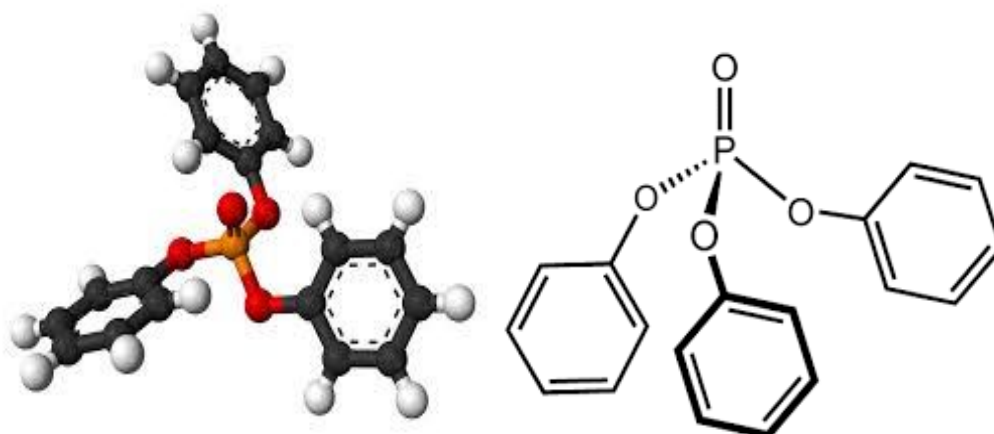
There are two electrodes on opposite sides. One electrode holds positively charged ions and is called cathode. The cathode is filled with lithium and that is where the “fuel” is stored. The opposite electrode holds negatively charged ions and is called anode. During charging, lithium ions move from the cathode to the anode. When the battery is in use, the lithium moves in opposite direction. In between are chemicals called electrolytes that conduct the current by helping ions move more easily between two sides.

2. TRIPHENYL PHOSPHATE

Triphenyl phosphate (TPhP) is a chemical compound with the formula $OP(OC_6H_5)_3$. This colourless solid is the ester of phosphoric acid and phenol. It is used as a fire retardant in a wide variety of setting and products. Triphenyl Phosphate exhibits low acute toxicity.

Triphenyl Phosphate is prepared by the reaction of phosphorus oxychloride and phenol:



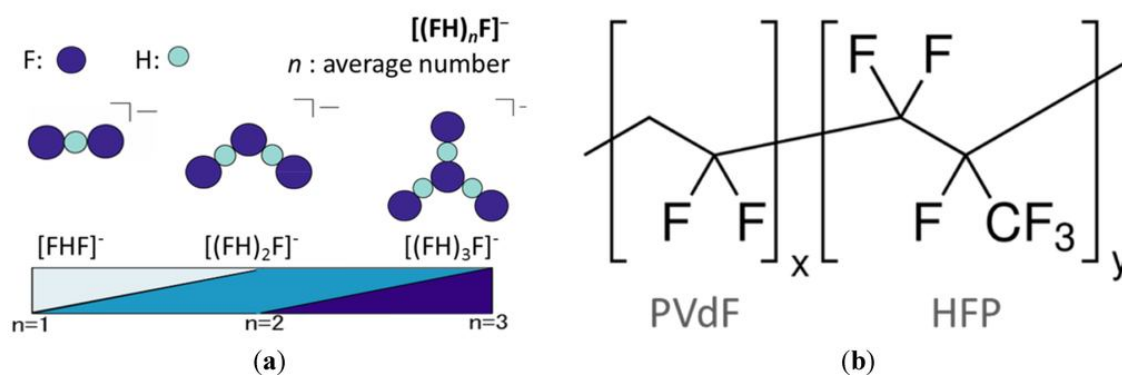


MECHANISM OF TRIPHENYL PHOSPHATE AS A FLAME RETARDANT

During thermal decomposition, phosphoric acid is formed. This reacts to form pyrophosphoric acid, which, when in its condensed phase, acts to block heat transfer. TPHP is only active as an additive flame retardant in its gas phase. It is one of the most effective flame retardants for certain polymers.

3. PVDF-HFP (POLYVINYLIDENE FLUORIDE-HEXA FLUOROPROPYLENE)

The composite polymer electrolyte (CPE) membranes, comprising of poly(vinylidene fluoride-hexafluoropropylene) (PVdF-HFP), aluminum oxyhydroxide, $(\text{AlO}[\text{OH}]_n)$ of two different particle sizes $7 \mu\text{m}/14 \text{ nm}$ and $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ as lithium salt were prepared using solution casting technique.



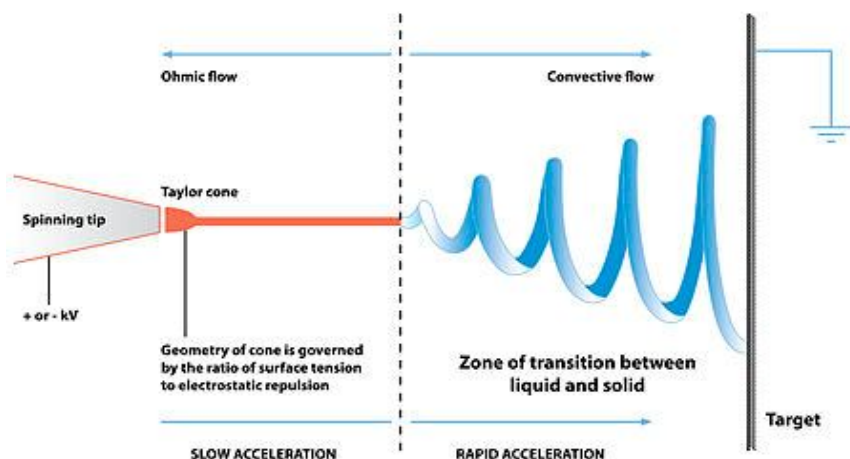
FEATURES AND BENEFITS:

Excellent thermal stability, chemical and abrasion resistance, impervious to UV degradation, self-extinguishing and retains properties on aging. Improved flexibility at subzero temperatures, stress crack resistance and elongation to break over poly(vinylidene fluoride).



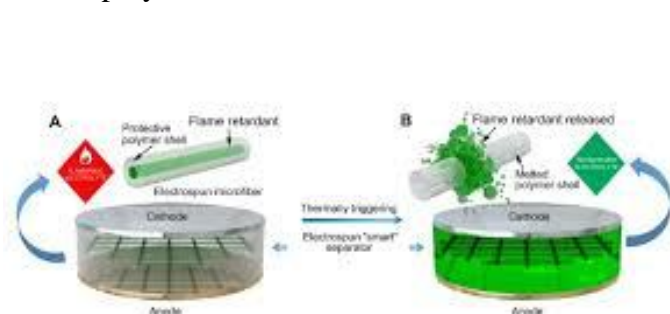
4. ELECTROSPINNING

Electrospinning is a fiber production method which uses electric force to draw charged threads of polymer solutions or polymer melts up to fiber diameters in the order of some hundred nanometers. Electrospinning shares characteristics of both electrospraying and conventional solution dry spinning of fibers. The process does not require the use of coagulation chemistry or high temperatures to produce solid threads from solution. This makes the process particularly suited to the production of fibers using large and complex molecules. Electrospinning from molten precursors is also practiced; this method ensures that no solvent can be carried over into the final product.



DESIGN AND WORKING:

When lithium ion batteries overheat, they can burn through clothing, burst into flames and even explode. This problem can be overcome by adding flame retardants directly into the batteries. Such batteries can be designed by packing a common flame retardant called triphenyl phosphate (TPP) inside a shell of polymer microfibers, which is crafted with a technique called electrospinning.



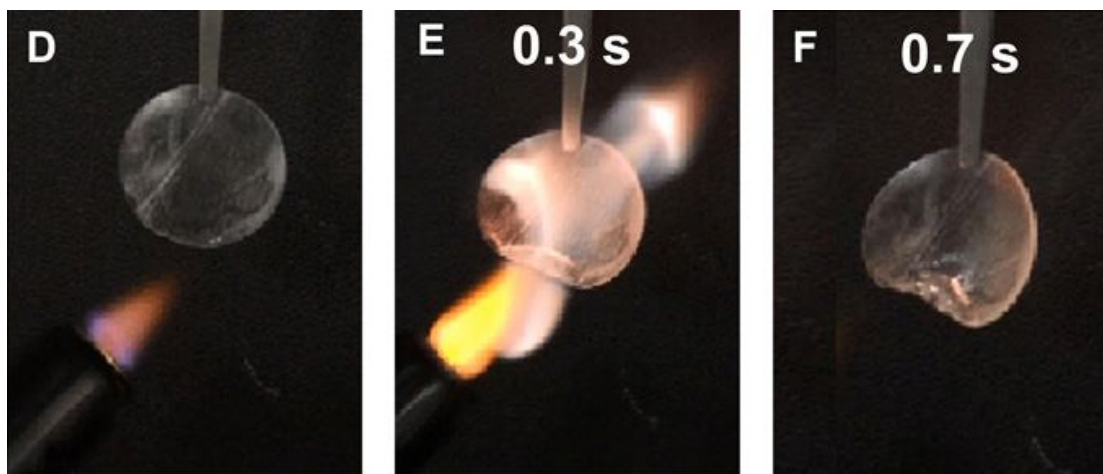
During normal battery operation, the flame retardant stays encapsulated within plastic fibres. When the battery operating normally, the electrospun microfiber shell serves to encase the TPP and stop it from leaking into the battery's electrolyte and ruining its electrochemical performance. If the separator gets



hotter than 150 degrees Celsius, the plastic melts, releasing the flame retardant. In experiments, chemical completely quenched flaming electrolyte in 0.4sec.

Using smart separators, battery electrochemical performance will not be affected by the flame retardant under normal conditions.

However, once there is a potential thermal runaway, the flame retardant will be activated and will nip the fire explosion in the bud.



Photograph showing the flammability of the TPP@PVDF-HFP separator wetted by the electrolyte. The respective times, counted from the time when the electrolyte started to burn, are indicated in each picture. Diameter of separator is 1.6cm.

CONCLUSION

By using such kind of batteries with inbuilt fire extinguisher, we can make our surroundings safe and secure. This technology will increase the battery life and its performance too.

These batteries will give certain assurance to the users that the temperature, while using the mobiles or laptops, will be maintained, as required.

FUTURE SCOPE

These modified lithium-ion batteries can be used as replacement for the standard lithium-ion batteries wherever it is used, which will decrease the chances of its explosion.

It can also be used as flame retardant in phenolics and phenylene oxide based resin for the manufacturing of electrical and automobile components.

REFERENCE

1. https://www.google.co.in/search?q=lithium+ion+batteries&rlz=1C1CHBF_enIN733IN733&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjAi9vWgN7SAhUKKY8KHdFUDwEQ_AUICSgC&biw=1366&bih=662#imgcl=LXokXVRRydSVoM



2. https://www.google.co.in/search?q=triphenyl+phosphate&rlz=1C1CHBF_enIN733IN733&source=lnms&tbm=isch&sa=X&sqi=2&ved=0ahUKEwj1jOmOgd7SAhWks48KHUCbBfoQ_AUIBigB&biw=1366&bih=662#imgrc=aZQZl8nm115vuM
3. https://www.google.co.in/search?q=pvdf-hfp&rlz=1C1CHBF_enIN733IN733&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjAqubohd7SAhWKM48KHYZaB7kQ_AUICCgB&biw=1366&bih=662
4. https://www.theregister.co.uk/2017/01/17/li_ion_self_extinguishing_battery/



ENHANCING PRIVACY AND AUTHORIZATION CONTROL SCALABILITY IN THE GRID THROUGH ONTOLOGIES

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ABSTRACT

The use of data Grids for sharing relevant data has proven to be successful in many research disciplines. However, the use of these environments when personal data are involved (such as in health) is reduced due to its lack of trust. There are many approaches that provide encrypted storages and key shares to prevent the access from unauthorized users. However, these approaches are additional layers that should be managed along with the authorization policies. We present in this paper a privacy-enhancing technique that uses encryption and relates to the structure of the data and their organizations, providing a natural way to propagate authorization and also a framework that fits with many use cases. The paper describes the architecture and processes, and also shows results obtained in a medical imaging platform.

Index Terms: Grid, ontologies, open grid services architecture (OGSA), security, Web service resource framework (WSRF).

I. INTRODUCTION

ATA SECURITY is a key requirement for biomedical Grid applications. Dealing with the different national legal regulations and procedures accepted by the medical community [1] requires a careful approach.

One of the challenges for biomedical application is to provide efficient high-level interfaces, depending on the applications that enable access to Grids for nonexperts, ensuring transparent access to medical resources through services compatible with medical practice. As part of the interfaces, a flexible architecture for the management of the privacy of data is needed, compatible with medical practice and with preexisting medical information systems.

Besides, the talks that were delivered by the authors of the Grids: The Top Ten Questions give us one concluding remark that describes many of the Grid production platforms today: Until security is made



easier to use, it will not be used [2]. Grid security systems are complex enough to be considered an obstacle in the successful Grid adoption. The proposed architecture introduces new concepts and methods that need to be expressed in the natural terms of the application community or it will be considered a new barrier.

A virtual organization (VO) [3] is formed from different real entities (e.g., medical centers, hospitals, governmental centres), and probably also from different communities (e.g., physicians and researchers working in specific projects). Access to data is normally organized around VO membership

Medical imaging grid middlewares using virtual communities for sharing, transferring, and processing Digital Imaging and Communications in Medicine (DICOM) medical images in a distributed environment [4] are starting to be adopted by the medical community. DICOM [5] is the most common standard for medical images. A single DICOM file contains both a header (which stores information about the patient's name, the type of scan, image dimensions, structure report, etc.), as well as all of the image data (which can contain information in three dimensions) or structured reports in DICOM structured reporting objects (DICOM-SR) [6]. TRENCADIS is a middleware for managing DICOM-SR [6] that has been used as part of the Valencian Cyberinfrastructure of Oncological Medical Images (CVIMO) [7] deployment, in which five hospitals in Valencian region collaborate to share DICOM studies and DICOM structured reports. Three ontologies have been created in CVIMO, which define the three oncological target areas implied (i.e., lung, liver, and central nervous system). Each area can only access the parts of DICOM studies defined in the ontology that a user belongs to.

The main objective of this paper is to provide Grid middlewares such as TRENCADIS, with efficient and reliable privacy protection for sensitive data. This paper presents a model for long-term storage and management of encrypted data in distributed environments. Furthermore, the paper outlines how this model is implemented to preserve the privacy of patient information in Grid-based collaborative computational infrastructures for biomedical applications.

This paper delineates a dependable security framework in overextended organizations. Throughout the assembly of this framework, organizations will encounter different degrees of data integrity and confidentiality.

The specific objectives of the paper are:

- 1) to propose an on-the-fly cryptographic infrastructure to protect privacy from users with administrative privileges;
- 2) to provide a flexible architecture for organizing key management for long-term storage of encrypted data;
- 3) to propose a model applicable in different environments, compatible with current Grid middlewares;
- 4) to provide an access control mechanism for encryption keys based on ontological groups and roles.



The paper is organized as follows. Section II illustrates related works. Section III describes the security model and an insight into the security issues presented in previous papers [34], [35]. Section IV shows a real deployment of the security model that has been applied in the CVIMO project. After that, results about the model deployed in a controlled environment are described. Finally, conclusions are presented.

II. RELATED WORKS

Computational Grids offer a number of benefits and opportunities to biomedicine, healthcare, and other biomedical domain areas [8]. Several recent systems focused on new health-related applications are analyzed.

The Medical Data Manager (MDM) [9] is a data management service designed to handle medical images on Grids, strongly based to the glite middleware. The MDM aims at guaranteeing patient's privacy by keeping private data in acquisition centers. However, this approach comes along with higher complexity in the specification and maintenance of the access policies. Grant-ing full access right to information objects (both image data and header attributes from a DICOM file) requires achieving a number of capabilities kept by different services in the form of access control lists (ACLs). This approach has deficiencies in systems where the potential users will not be known beforehand. The higher flexibility of attribute-based approaches enables the model presented in this paper to deal efficiently with these requirements.

The EncFile [10] is an encrypted file management system for biomedical applications in the Enabling Grids for E-science (EGEE) [11] project. Although EncFile is not linked to the EGEE Grid components, the system has been implemented over LCG2 [12].

A Grid-based architecture for computer-aided diagnosis was presented in [13]. In order to protect information against unauthorized disclosure, the authors propose an encrypted storage component described in [14]. Although the prototype was validated on a large experimental platform, the architecture has not been tested in real environments.

The Secure Storage Service provides a set of tools to manage confidential information in an encrypted format in a Grid computing environment [15]. This service has been developed for the gLite [16] middleware. The Secure Storage Service aims to solve the insider abuse problem, also preventing the administrators of the storage elements to access the confidential data in a clear format; however, it does not specify a means to protect the decryption keys from being accessed by administrators. Moreover, the Secure Storage Service associates an ACL with the decryption key. This ACL contains all users authorized to access the encrypted file. This approach does not scale well as the number of users increases.

Identifying data resources is a fundamental problem within large-scale Grid environments. While



traditional solutions enable users from one organization to access data belonging to other organizations by sharing metadata, this may not be acceptable for certain organizations due to privacy concerns.

The MDM client library provides applications programming interfaces (APIs) for requesting files based on the metadata attached to the DICOM image. The metadata is internally extracted from the DICOM headers and placed into specialized catalogues.

The role of ontologies [17] in the context of Grid computing for obtaining, comparing, and analyzing data is increasing. Ontologies can be used to localize datasets within collaborative environments and to build on-the-fly collections of data files based on attributes of the ontology.

Our proposal uses ontologies that define the information that is interesting for a given area or group [4]. In CVIMO, ontology attributes match DICOM fields (headers or DICOM-SR tags) and can be used for filtering, indexing, and searching DICOM objects in virtual collections.

There are number of efforts to produce access control languages and standards based on XML (e.g., extensible access control markup language (XACML) [18]) and authorization assertion protocols (e.g., security assertion markup language (SAML) [19]). While SAML provides a mechanism for making authentication and authorization assertions and a mechanism for conveying them, XACML provides the language that defines the rules needed to make the necessary authorization decisions.

XACML has been applied with great success [20] for implementations of the attribute-based access control (ABAC) model. In ABAC, access decisions are based on attributes of the requestor and resource, and users need not be known by the resource before sending a request. ABAC is scalable and flexible, and thus, is more suitable for distributed, open systems than identity-based access control models [21].

Finally, there are promising results on applying Semantic Web standards for protecting Grid [22] and Web services [23].

III. SECURITY MODEL

A. GRID ARCHITECTURE

Most of the current Grid middlewares are based on Web services protocols. The Open Grid Services Architecture (OGSA) [24] is a specification in progress that aims at defining a standard and open architecture for Grid-based applications.

The Globus Toolkit is a realization of OGSA, which can be used to develop Grid applications. Globus Toolkit Version 4 (GT4) provides services implemented on top of the Web Service Resource Framework (WSRF) [25], a specification that extends Web services with stateful services and other features. The



services of the architecture presented in this paper are all based on OGSA/WSRF.

B. GRID SECURITY INFRASTRUCTURE

The security services of Grids are not altogether different from those of other distributed system paradigms. Specifically, an effective security model must ensure a set of security primitives: identity verification, authorization, access control, data integrity, data confidentiality, and availability

Modern Grid middlewares provide the security infrastructure, usually by means of the Globus Security Infrastructure (GSI) [26], which is a set of tools, libraries, and protocols used in Globus to securely access resources. Almost all Grid components and Grid middlewares use the GSI for authentication. GSI also provides mechanisms that deal with secure connections as well as message protection.

GSI lacks from guaranteeing the reliability of the information stored, in terms of authenticity and confidentiality.

On the other hand, in computational Grids, authorization has an importance beyond its common security meaning. Proper Grid authorization eases the administration of the shared resources and provides coherence to the system by consistently preserving the relationships of the participants.

Grid authorization is closely related to the VO concept. The VO administrators define hierarchy relationships (e.g. groups, subgroups) in the VO, different privileges (e.g., roles, capabilities) to resources, and define membership in the groups. They are also in charge of controlling access to the Resource Providers (RPs) (e.g., services in an OGSA approach) on the basis of users' credentials (e.g., groups, roles, capabilities) and the agreements established between the VO participants. In addition, the RPs have their own local security policies that may override the VO policies. Last decisions on the access to resources must be on the side of the owner of the resource, but global policies enable the management of large-scale infrastructures.

In conclusion, the access control to the RPs in the collaborative Grid infrastructure is based on the membership in the group. The actions that users in a given group are allowed to perform (from the point of view of the VO) on a specific resource instance are determined by two policies: the rules that describe the group and the rules controlling the access to resources. All this is managed in the RPs by a component named GateKeeper, which takes into account resource-specific policies, normally ACLs.

The classic approach of ACLs requires that permissions are explicitly given to individuals or groups. If a piece of information should be made available to different VOs or VO groups (but not all of them), the data owner should explicitly indicate it when sharing the data. This could be complex if many data are created regularly. However, the metadata associated to a piece of information can have enough information to decide which groups should access it.



There are several attribute-based access control systems for Grid environments in the literature (i.e., Akenti [27], PER-MIS [28], Shibboleth [29], and Virtual Organization Management Service (VOMS) [30]). Group-based authorization tools (such as VOMS) enable granting different roles and permissions for a single user. VOMS manages authorization information about the members of VOs, and supplies this information as a X.509 attribute certificate. In the context of the EGEE [11] Grid infrastructure, roles are assigned to users through VOMS.

As VOMS makes use of X.509 attribute certificates to assert user's group memberships, roles, and capabilities, users must create a X.509 proxy certificate [31] before accessing the resources. A VOMS server generates the attribute extensions.

C. VO MANAGEMENT AND ONTOLOGIES

The concept of ontology as the branch of metaphysics that deals with the nature of being has been used in many areas of science and literature. In information technologies, an ontology is a vocabulary and a set of terms, rules, and relations that define with the needed accuracy a set of entities enabling the definition of classes, hierarchies, and other relations among them. The ontologies define the terms to be used to describe and represent a knowledge domain. In this sense, the ontologies organize the knowledge in a reusable way.

An Ontology Server is a service provided by the model that defines the ontologies (in any language: XML, Resource Description Framework (RDF), Web Ontology Language (OWL), etc.) and specifies the relations between VO groups and ontologies. The Ontology Server stores a unique identifier for the ontologies in the context of the VO (namely Ontology Id).

In conclusion, the VOMS server organizes the users into groups, and the Ontology Server organizes the access of groups to ontologically classified resources and data. Each group can manage multiple ontologies, and each ontology can be managed by different groups.

D. INFORMATION OBJECT STORAGE

The Information Object Storage (IOS) is a repository service provided by the model. This repository stores all the encrypted information objects required by the VO, in spite of the ontological classifications these objects can have. Furthermore, the IOS keeps the relationships between the objects and the ontologies through the Encrypted Object Unique Identifier (EOUID) that uniquely identifies the object in the Grid. In parallel, the ontologies are used for filtering, indexing, and searching encrypted objects in virtual collections. These virtual collections are also kept in the IOS.

When a user tries to retrieve an information object, the Gate-keeper at the IOS verifies: 1) first that the user's credentials identify the user as a member of a VO group; 2) second that this group is authorized on



the object’s ontologies (combining the ontology information stored in the ontology server); and 3) finally, that the local rules allow the user access to the resource.

Fig. 1 shows three ontologies that classify the objects into three subsets (Onto1, Onto2, and Onto3). Users are organized into two groups (Group 1 and Group 2), and there is one user in both groups. Group 1 is authorized to access data from ontologies 1 and 2 (which means accessing objects s2, s3, s4, and s5). Group 2 can access data from ontologies 2 and 3 (which means accessing objects s1, s2, s4, and s6). User 2 will be authorized to access data from Onto1 and Onto2, or Onto2 and Onto3, depending on the credentials exposed.

Moreover, an IOS might allow or deny the access from users of specific group (IOS 1 and Group 1 in Fig. 1). For this reason, User1, even able to manage objects from ontology 1, cannot access s2 and s3 data in IOS 1.

The key of the authorization mechanism is that ontologies and VO groups can only be created by the system administrator, which needs the agreement from the deputies of the communities to include an ontology from one group in a different group.

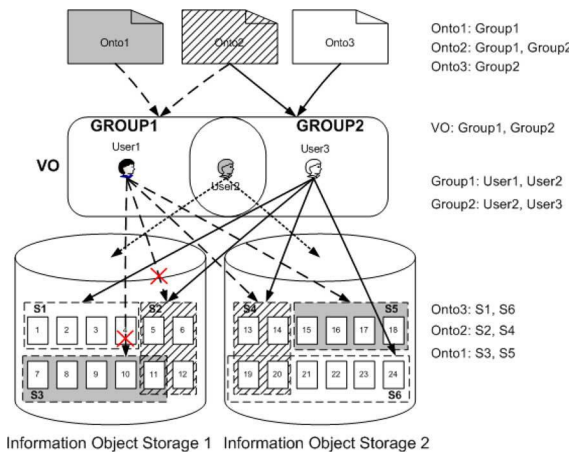


Fig. 1. Access control relation among ontologies-VO groups—information objects storage.

Finally, individual users or VO groups can be banned even pre-senting the right ontologies through a configuration file of the gatekeeper. This is a critical operation and should be performed at the resource administration level.

E. ENCRYPTION AND DECRYPTION OF DATA

The model requires a symmetric cryptographic key to en-cript and decrypt the information object, and 256-bit keys Ad-vanced Encryption Standard (AES) [32] are used. Submitters of new/updated datasets utilize separate keys for each object. Encryption and decryption operations took place on the client,



preventing the overload of application servers running the IOS.

Given that the risk of attacks is higher in servers that share multiple services (including public ones), and the impact could be higher since servers keep far more data than clients, keep-ing unencrypted information out of the IOS not only improves performance, but also helps to protect the information from unauthorized disclosure.

F. DATA INTEGRITY AND CONFIDENTIALITY

Dependable data storage and sharing among multiple orga-nizations are important features of the proposed model. The security framework guards data integrity and confidentiality, while ensuring that information objects are easily accessible for authorized users.

An integrity code protects both object's integrity as well as its authenticity by allowing users to detect any changes to the ob-ject content. We implement this functionality through a 160-bit RIPEMD message digest algorithm. The AES-encrypted blocks of data are used as input for the digest function, joining the en-cryption/decryption and validation in a single step.

The encrypted objects are stored in the IOS, while redundant copies of the integrity code are kept in secure storages, ensuring that authorized users can compare the integrity code with the digest of the encrypted object.

A message integrity code provides integrity. Additional mea-sures for authenticity are explained in next section, as well as the reason for not encrypting the integrity code.

On the other hand, guaranteeing confidentiality of sensitive data outside the organization's borders additionally requires im-plementing a decryption key management scheme.

In our model, the management of decryption keys is per-formed through a secret sharing scheme. The key distribution is achieved by a client that divides the key in N different shares, using the Shamir's secret sharing scheme [33]. Key shares are distributed among different administrative domains that con-tribute to the responsibility of protecting data from unauthorized disclosure. Only k shares ($k < N$) are needed to reconstruct a key. Key shares are pairs of data that relate to the input and out-put of a polynomial of degree N . A sharing pair is represented as $(IDKeyPart, Key)$, where $IDKeyPart$ and Key are the input and the output (to the polynomial), respectively. Key shares for the same decryption key must be placed at different key servers.

The key server is a repository service provided by the model. Two key servers are different if and only if they are located at different administrative domains. This means that they are managed by different administrators, even if they are sharing the same VO. It also means that any user who has granted access



to a share in a given administrative domain cannot reconstruct the decryption key without obtaining permission on other $k-1$ administrative domains.

G. DISTRIBUTION OF THE KEY SHARES AND THE INTEGRITY CODE

Distribution of key shares is one of the novel contributions of this paper. By taking the participants of the secret sharing scheme in different administrative domains, the information is protected from being exposed by users granted with physical or administrator access, ensuring the confidentiality of the encrypted objects in the Grid.

Each administrative domain needs to be enclosed within the boundaries of one organization. The organization registered as a private data holder or as a private data processor must carry on with a set of legal responsibilities concerning keeping private data secure from unauthorized access or disclosure.

Key servers not only store key sharing pairs, but also keep a copy of the integrity code of the encrypted object. The distribution of the integrity code among real administrative domains ensures the integrity of the objects in the Grid, and does not necessarily need to encrypt the integrity code to provide a reliable level of assurance. In this way, it becomes possible to validate the object integrity by comparing the integrity code with its representation in the key servers. Unauthorized attempts to modify any encrypted object on the Grid will require compromising the security of a group of services deployed by different administrative domains.

Storing the integrity codes in the key servers also serves the purpose of providing the model with a reliable permission revocation mechanism. When a user is revoked from a given VO group, he or she will not be able to access the objects using the VO credentials. The problem arises when the user kept a decryption key after permission revocation and he or she could use local administrative privileges to access the data in the storage elements. In these scenarios, the authenticity and the integrity of the objects is ensured by cross-validating the copy of the integrity code within the encrypted object with the copies stored in the key servers available at different administrative domains. The complexity of compromising the integrity of an object is the problem of compromising at least k key servers located in k different administrative domains.

Useful insight into the permission revocation issue was presented in a previous paper [34].

H. ADMINISTRATIVE DOMAINS IN THE VO

The different administrative domains that kept shares of the same decryption key may be part of the same VO. The VO context is the perfect scope for the integration of independent organizations in data protection schemes. VOs are usually associated with a project related to a community where information objects are shared. The VO should agree on the values of k and N , as well as the number of key server



replicas that each party should contribute to guarantee operation. Previous works [33] have probed that a very robust key management scheme can be reached by using $N = 2k - 1$.

As the participants of the secret sharing scheme are in different administrative domains, even the minimum value the k parameter can take ($k = 2$) enhances the privacy of the data, since any user (even a local administrator of a storage) needs obtaining access on k different administrative domains in order to reconstruct a decryption key. On the other hand, with $k = 2$, only $N = 3$ different administrative domains are needed. In the context of the VO, the administrative domains could be defined as the individual organizations that control private information, and contribute with their private data to the VO.

In our model, each administrative domain is revealed by an X.509 organizational unit attribute, along with the common name attribute of the certificate authority.

I. PUBLICATION IN MONITORING AND INFORMATION SYSTEM (MIS)

The monitoring and information system (MIS) is a significant piece of Grid technology. This component could be implemented in many different ways (e.g., GMA, MDS2, and MDS4), depending on the middleware used (gLite, GT2, and GT4), while the objective is the same: to collect and deliver information about Grid resources where and when needed.

MIS simplifies the key shares distribution process among parties involved in the secret sharing scheme. Administrative domains integrated in VOs issue information about their key servers to the MIS, and the clients query the MIS for available key servers in trusted and different administrative domains.

The identification of a key server and its administrative do-main requires the Key Server's URI, the local key server identifier (IDKS) relative to the administrative domain, and the identifier of the administrative domain. This information is issued by the MIS and queried by the VO clients.

Fig. 2 shows a schematic representation of the storage and management of encrypted data in the Grid. The top of the figure shows a user interacting with the MIS of the VO. The user queries the MIS for three key servers in three different administrative domains. At the base of Fig. 3, independent organizations affiliated with the VO are represented. Each organization con-

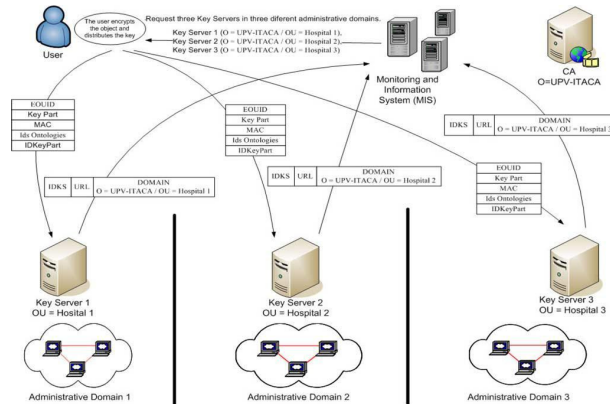




Fig. 2. Schematic representation of the storage and management of encrypted data. It shows the encryption of an information object and the distribution of the key shares among different administrative domains.

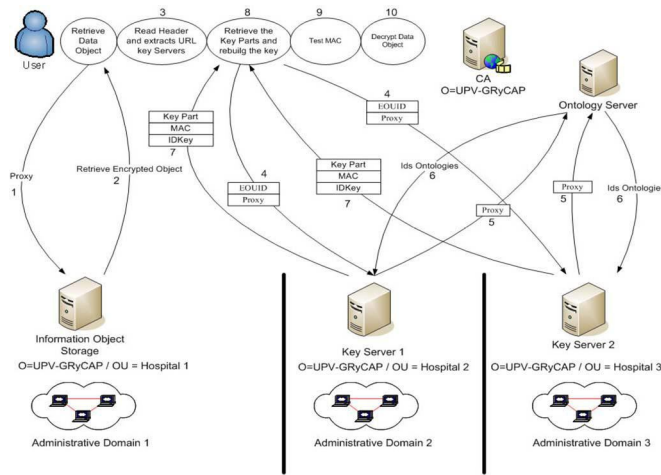


Fig. 3. Schematic representation of the reconstruction of the decryption key and the decryption and validation of the encrypted object.

tributes with its own key servers in the decryption key sharing scheme. At the top of the figure, a CA issues security credentials to the members of the VO. The key servers register the organizations in the MIS index. Through the structure of DNs, the administrative domains of the key servers are revealed. These different administrative domains are used by the encryption mechanism to ensure that different key parts are stored on different domains (as shown at the top of Fig. 2). The encrypted object is generated using a new encryption key and the information of the administrative domains.

Once the decryption key shares are distributed among the parties (additional attributes issued to the key servers will be explained in the following sections), the encrypted object is submitted to the IOS. Since the confidentiality and integrity of the information object is protected by the framework through the encryption and the integrity code, the IOS could be deployed across the whole of VO computing environment.

J. UNIQUENESS OF INFORMATION OBJECTS

Whether an encrypted information object could be moved to a different IOS (or simply, whether it could be replicated) depends on how complex is to modify the information linking the object with the IOS and with the key servers.

The EOUID is a globally unique identifier that guarantees that the encrypted information objects can be unambiguously identified. The EOUID is assigned the first time the object is encrypted, and is based on the Universally Unique Identifier (UUID) standard to guarantee to be unique in time and space.



Referring to an encrypted object by its EOUID, Grid repositories (i.e., IOS and key server) guarantees that the information derived from the object is detached from the physical location of the object in the Grid.

K. ENCRYPTED OBJECTS'S DATA FORMAT

Besides the encrypted bits, the encrypted object carries additional information. Along with the already mentioned integrity code, the encrypted object contains header fields, a body of encrypted bits, and a footer field. The prime number used to divide the key is attached to the object in a header field. The rest of the header contains the N identifiers of the administrative domains that keep shares of the decryption key. The footer field is reserved for the integrity code.

L. ACCESS CONTROL WITH ONTOLOGY ATTRIBUTES

The basic idea of access control with ontology attributes is not to define permissions directly between users and resources, but instead to use the resources' ontology attributes as the basis for authorization. Access control policies grant groups of users with different privileges to ontologically classified resources. All services in the framework must enforce these policies on users, and therefore, they must know what services in the Grid store the authorization statements that policy decision points (PDPs) will use with the attributes available about the requester and the resource to evaluate authorization.

The previous sections of this paper discussed where policies and other authorization attributes are stored in the framework: the VOMS Server is the repository where VO groups and roles are created and maintained, the ontology server stores the different authorization statements that define the relations between VO groups and ontologies, and the IOS defines the ontological classification of the information objects.

As we have seen before, the IOS could be deployed anywhere in the Grid. Therefore, an IOS outside the administrative domain is not a trusted source of ontology attributes for key servers. On the contrary, when the key server itself is a source of ontology attributes for its administrative domain, changing an encrypted object's ontology in the IOS does not affect the security of the object. Keeping a list of ontologies for the object, the key server guarantees the security of the key, thus guaranteeing the security of the encrypted object.

Besides the decryption key share, the IDKeyPart, the integrity code, and the EOUID, the object owner stores a list of ontology identifiers (Ids. Ontologies) for the encrypted object in the key server. Hereby, authorization to key shares is provided to predefined ontologies that are related to the encrypted object. In this way, ontology identifiers updates must be synchronized among key servers. Hence, this model works better for applications where ontological classification of encrypted objects varies little over time.



M. Rebuilding Keys and Decrypting information

When a Grid user wants to retrieve an encrypted object identified by its EOUID, the user is first authenticated, and then the IOS collects the attributes from the user's proxy (Fig. 3, step 1). It then consults the ontology server to find out if the user belongs to any of the VO groups allowed to access the ontologies related to the object. If authorized by the IOS, the user will retrieve the encrypted object (Fig. 3, step 2).

Once the user retrieves the encrypted object, he or she extracts the administrative domain identifiers from the header of the encrypted object (Fig. 3, step 3). Then, the user consults the MIS for the URIs of the key servers (see Fig. 2), and consults k key servers to retrieve the key (Fig. 3, Step 4).

The role of the different components of the model involved in the security scheme can be explained through an example in the terminology of the XACML standard: when a user requests the key server to retrieve a key share, the code responsible for executing the request contains a policy enforcement point (PEP) creating an access request. The access request contains the attributes that identify the user, and the encrypted object associated with the key share (ontologies), and the action being performed in the resource (retrieving a decryption key). The PEP sends this description of the attempted access to the Gatekeeper. The Gatekeeper implements a PDP that consults the ontology server for policies matching the specified group membership to the ontologies (Fig. 3, steps 5 and 6), and also consulting local security policies (e.g., resource-specific ACLs). The PDP then evaluates the access request and issues an authorization decision, sending this conclusion to the PEP. Finally, the PEP executes the code for retrieving the key share, or throws a denying exception.

If authorized, the user will retrieve k different shares and k copies of the integrity code (Fig. 3, step 7).

With the k sharing pairs, the user reconstructs the decryption key, decrypts the object, and computes the integrity code (Fig. 3, steps 9 and 10). The user verifies the computed integrity code with the code stored within the encrypted object, and with the codes retrieved from the key servers.

IV. REAL IMPLEMENTATION AND DEPLOYMENT

Radiological image and report data storage and distribution in clinical practice at intracorporative level is a well-solved is-sue with many industrial successful stories. However, sharing data for research and training is an issue that deals with additional problems, such as knowledge organization, privacy, and processing. A representative use case targeted by the present paper could be executing a perfusion analysis on all the images from patients suffering a hepatocarcinome and retrieving the flow rate coefficient images. This cannot be done in current image management systems on clinical delivery, even involving only one institution or administrative domain. Integrating multiple sources will increase the



representativeness of the study, and the integration of computing resources will enable complex postprocessing.

TABLE I
SAMPLE DATASET LOCATED IN AN
INFORMATION OBJECT STORAGE IN THE VO

Id.	Study Id.	Image Id.	Image Size (MB)
A	1.2.840.10008.5.1.4.1.1.4	1	0.5
B	1.2.840.10008.5.1.4.1.1.7	1	2.5
C	1.2.840.10008.5.1.4.1.1.1	1	5.8
D	1.2.840.10008.5.1.4.1.1.3	1	7.7

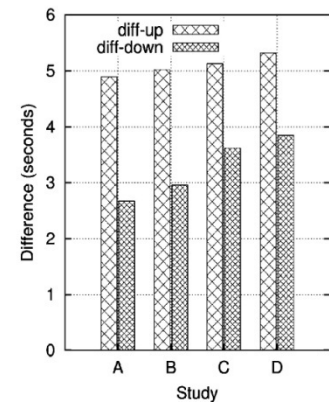
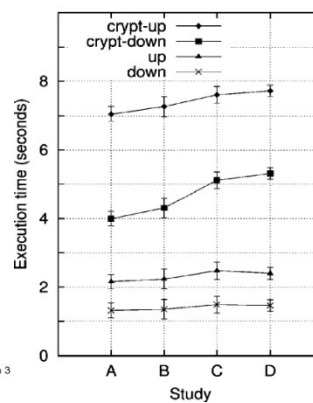
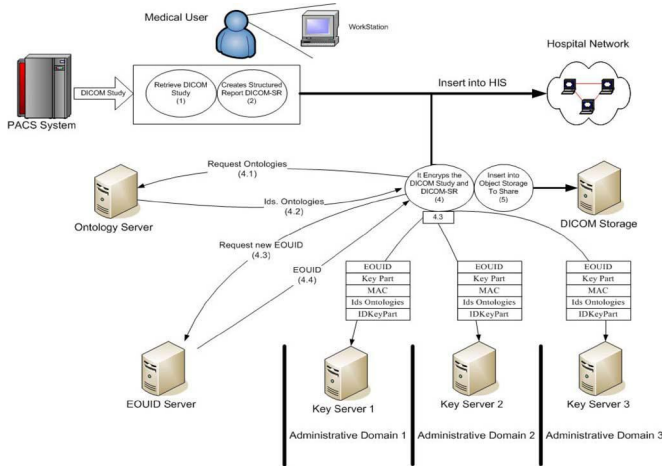


Fig. 4. Path from the creation a relevant DICOM-SR to the share it in the Grid.

The model presented in this paper has been implemented in the framework of the CVIMO [7] project. All services implemented are based on OGSA/WSRF, which constitutes the Grid architecture and infrastructure of the project. The implementation has been done using the Globus Toolkit 4, which uses MDS4 as MIS [35].

CVIMO is a project funded by the Ministry of Enterprises, University and Science of the Valencia Region. In this case, the ontologies are built from an anonymized set of attributes from DICOM headers or DICOM-SR fields. This set is controlled by the VO at a central level, and under the approval of the management of the system, so no privacy leakages appear. Relevant cases are organized into three communities related with oncology (lung, liver, and central nervous system). CVIMO does not compete with intrahospital system such as picture archiving and communication systems (PACS) or RIS/HIS systems, which are oriented to clinical daily practice, but complements them with a collaborative tool to store and share cases relevant for their research or training.

A VO named CVIMO and three VO groups have been created using a VOMS server, one for each oncological community implied. The studies relevant for each group can be defined through the ontology



using a part of their information. These ontologies are defined in XML. When a user performs a query operation, he or she can only access the information of DICOM studies or DICOM structured reports specified by the ontology that his or her groups have associated.

When a medical user selects a relevant DICOM study for sharing (point 1, Fig. 4), it first creates the structured report DICOM-SR with a given diagnostic (point 2, Fig. 4). DICOM study and DICOM-SR are sent to the IOS to share the information only with the users of the community related to the study. If this happened, the object is encrypted (point 4, Fig. 4) and then inserted into the IOS. The encryption operation implies consult-

Fig. 5. Graph of the execution time for a set of studies (left) and (right) registering and retrieving objects with and without encryption.

ing the ontologies' identifiers that the user can manage (points 4.1 and 4.2, Fig. 4) to generate an EOUID for the encrypted object (points 4.3 and 4.4, Fig. 4), and to create and distribute the encryption key (point 4.3, Fig. 4).

The implemented services in this system are the following.

- 1) Ontology Server: Keep the ontologies and the relations between VO groups and ontologies.
- 2) Key Server: Keep for each key part the associated information Message Integrity Code (MIC), EOUID, and IDs of ontologies, IDKeyPart, and the key part).
- 3) EOUID Server: This service generates the EOUIDs required to identify the encrypted objects.
- 4) DICOM Storage: This service storage the DICOM studies and DICOM-SR encrypted.

V. RESULTS AND DISCUSSION

A sample dataset from radiology studies has been created. Each file in the dataset consists of radiology image accompanied by relevant (anonymous) clinical data. Four different studies with different file sizes (see Table I) were used to create the sample set.

Images were first encrypted and stored in an IOS. Unencrypted images are also stored in the IOS to measure the differences between encrypted and unencrypted objects. The length of registering and retrieving an object in the IOS was measured in a client of the infrastructure. Fig. 5 shows the execution time for the set of studies.

In Fig. 5 (left), four different series of experimental values are represented. On one hand, "crypt-up" and "crypt-down" show the time used for registering and retrieving objects, including encrypting and



decrypting the object and key sharing. On the other hand, “up” and “down” show the time used for registering and retrieving objects without encryption. Each point in the graph represents the average time measured by the client clock. The error bars shown in the graph show the standard error calculated for each data point.

Fig. 5 (right) shows the difference D , calculated as

$$D = \text{time with encryption} - \text{time without encryption.}$$

The importance of this graph is to show that even when the difference with and without encryption tends to be greater for large-sized objects, it is possible to estimate a performance level in a given interval. For example, the results of this study show that for those objects in the interval from 0.5 to 7.7 MB, it is possible to anticipate up to four additional seconds for retrieving an object using encryption, if compared with the same process without using encryption. This is consistent with the initial studies demonstrating that the overhead due to the security model can be accepted even in an interactive use.

Grouping several key shares for different objects in a single request is also possible, so the overhead for retrieving the de-cryption keys could be optimized when several objects are used in the same study. This is a common need in medical research and training, the two main objectives of the system.

VI. CONCLUSION

Healthgrids require supporting the flow of information across hospital network boundaries. Encrypted storage is needed to ensure data privacy on different administrative domains. Sharing encrypted objects requires an infrastructure to manage, protect, and control access to the encryption keys.

However, decryption keys have a lifecycle, whose management is proposed in this paper by ontology-organized key management for long-term storage.

The novelty of the approach is to bind automatically the authorization of users to the actual data automatically through the use of ontologies that specify the data accessible and the relation of VO groups and those ontologies, instead of using the classical ACL approach. Other novelty is in the definition of a distributed security enforcement scheme that takes advantage of the ontologies for distributing and managing the encryption keys in a secure manner. DICOM fields (headers or DICOM-SR tags) used to build the ontologies are previously anonymized, guaranteeing that almost all fields can be used, and resulting in a comprehensive set of ontologies.

The information-centric approach of securing the data combined with protecting and controlling the access to the decryption keys presented in this paper have proven to be effective in the prevention of incidents of exposed data due to inconsistent encryption and key management policies, in the prevention of incidents of inaccessible data due to mismanagement of decryption keys, and in helping communities to



increase the consistency of encryption and key management policies across organization boundaries.

In addition, this paper contributes to increasing the clarity of responsibilities and also to the creation of encryption and key management policies and practices. Overhead due to encryption and decryption is not significant with respect to data transfer overhead, and those processes are performed on the client-side to improve scalability. The ontologies are connected to objects both through the IOS and the key server. Duplicating this layer of access control could penalize performance when propagating changes in the ontologies, but deliver higher scalability when the ontologies association does not change in time often. Ontology updates are performed in a lazy revocation. When the ontologies change, a new object with a new EOUID is created, reducing the need for massive re-encryption. This update management could be inefficient for objects frequently changing their ontological classification, medical imaging Grids normally deal with read-only and persistent data that minimizes this issue.

REFERENCES

- 1) I. E. Magnin and J. Montagnat, "The grid and the biomedical community: Achievements and open issues," presented at the EGEE User Forum, CERN, Geneva, Switzerland, Mar. 1–3, 2006.
- 2) J. M. Schopf, "Grids: The top ten questions," *Sci. Program.*, vol. 10, no. 2, pp. 103–111, 2002.
- 3) Ł. Skitał, R. Słota, D. Nikolow, and J. Kitowski, "Methodology for virtual organisation design and management," presented at the EGEE User Forum, CERN, Geneva, Switzerland, Mar. 1–3, 2006.
- 4) I. Blanquer, V. Hernandez, and J. D. Segrelles, "An OGSA middleware for managing medical images using ontologies," *J. Clin. Monit. Comput.*, vol. 19, pp. 295–305, Oct. 2005.
- 5) Digital Imaging and Communications in Medicine (DICOM)—Part 10: Media Storage and File Format for Media Interchange, National Electrical Manufacturers Association, Rosslyn, VA, 2008.
- 6) I. Blanquer, V. Hernandez, and D. Segrelles, "TRENCADIS—A WSRF grid middle ware for managing DICOM structured reporting objects," *Stud. Health Technol. Inf.*, vol. 120, pp. 381–391, 2006.
- 7) Ciberinfraestructura Valenciana deImagen Medica' Oncologica' (CVIMO). (2008). [Online]. Available: <http://www.grycap.upv.es/cvimo>
- 8) V. Breton, K. Dean, and T. Solomonides, Eds., "The Healthgrid white paper," in *From Grid Healthgrid—Proc. Healthgrid 2005*, *Stud. Health Technol. Inf.* vol. 112. Amsterdam, The Netherlands: IOS Press, pp. 249–321.



- 9) J. Montagnat, A. Frohner, D. Jouvenot, C. Pera, P. Kunszt, B. Koblitiz, N. Santos, C. Loomis, R. Texier, D. Lingrand, P. Guio, R. Brito Da Rocha, A. Sobreira de Almeida, and Z. Farkas, "A secure grid medical data manager interfaced to the gLite middleware," *J. Grid Comput. (JGC)*, vol. 6, no. 1, pp. 45–59, Mar. 2008.
- 10) C. Blanchet, R. Mollon, and G. Deleage, "Building an encrypted file system on the EGEE grid: Application to protein sequence analysis," in *Proc. 1st IEEE Int. Conf. Availability, Rel. Security (ARES 2006)*, pp. 965–973.
- 11) EGEE: Enabling Grids for E-science (Phase I and II). FP6 European IST Project, Contract Number INFSO-RI-508833. (2008). [Online]. Available: <http://www.eu-egee.org>
- 12) World Wide Web Computing Grid. Distributed Production Environment of Physics Data Processing. (2008). [Online]. Available: <http://lcg.web.cern.ch/LCG>
- 13) S. Varrette, J. L. Roch, J. Montagnat, J. M. Pierson, L. Seitz, and F. Lerepovost, "Safe distributed architecture for image-based computer assisted diagnosis," presented at the IEEE Int. Conf. Pervasive Serv. (ICPS 2006), Workshop Health Pervasive Syst., Lyon, France, Jun. 2006.
- 14) L. Seitz, J. M. Pierson, and L. Brunie, "Encrypted storage of medical data on a grid," *Methods Inf. Med.*, vol. 44, no. 2, pp. 198–201, Feb. 2005.
- 15) D. Scardaci and G. Scuderi, "A secure storage service for the gLite middleware," in *Proc. IAS 2007—3rd Int. Symp. Inf. Assurance Security*, Manchester, U.K., pp. 261–266.
- 16) gLite middleware. (2008). [Online]. Available: <http://www.glite.org>
- 17) M. Hadzic and E. Chang, "Role of the ontologies in the context of grid computing and application for the human disease studies," in *Proc. Int. Conf. Semantics Networked World—Semantics Grid Databases (ICSNW 2004)*, pp. 316–318.



SPECTRAL AND BIOLOGICAL ANALYSIS OF BENZOTHAZOL-2-AMINE

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ABSTRACT

Benzothiazol-2-amine is synthesized by aniline and ammonium thiocyanate and its structure was also established using FTIR, UV-Vis and ¹H-NMR spectroscopic technique. The synthesized compound was also tested for antimicrobial activity against bacterial and fungal strains.

Keywords: FTIR, NMR, Raman spectroscopy, UV-Visible spectroscopy, benzothiazole-2-amine, antibacterial activity, antifungal activity.

Introduction:

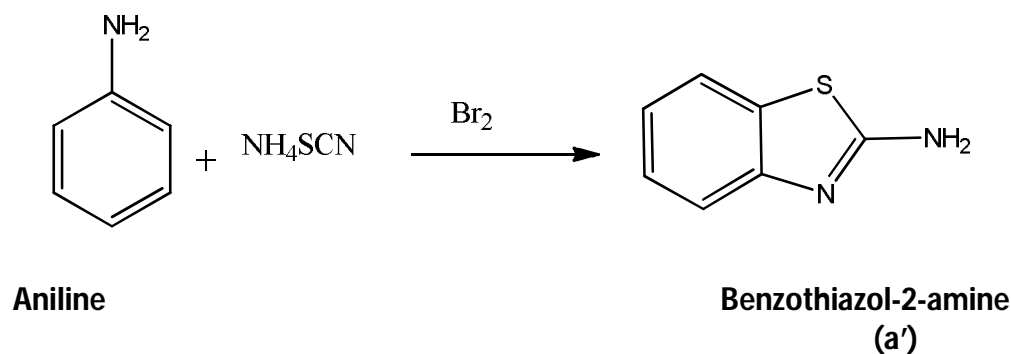
Antimicrobial agents, since their discovery have substantially reduced the threats posed by infectious diseases. The chemistry and biological study of heterocyclic compounds has been an interesting field for a long time in medicinal chemistry. Benzothiazoles are bicyclic ring system with multiple applications which have been the subject of great interest because of their biological activities. Benzothiazole derivatives are an important class of compounds, which is becoming increasingly important due to their broad spectrum of biological activities. Literature review revealed the potent inhibition of human immunodeficiency virus type 1 (HIV-1) replication by HIV-1 protease inhibition [1], anti tumor [2], analgesic and anti-inflammatory [3], antimalarial [4], antifungal [5], antibacterial [6,7] anticandidous activities and various CNS activities [8] of benzothiazoles.



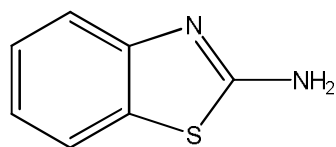
In continuation of our research program to find out bioactive benzothiazol-2-amine, the present work is an effort towards the synthesis of benzothiazol-2-amine and characterized by FTIR[9,10], ¹H-NMR[11,12], Raman spectroscopy[13,14], UV-Visible Spectroscopy[14,15] etc.

Methods and Materials:

Aniline (4.6g ,0.05mol) and ammonium thiocyanat (3.8g ,0.05 mol) were dissolved in absolute ethanol containing 4 ml of con. HCl .To this mixture bromine in glacial acetic acid (6.75ml, 0.125 mol) was added and the reaction mixture was refluxed for 1 hr. Then it was cooled in ice bath. The precipitate obtained was filtered, washed with cold water and dried. The crude product was recrystallized from ethanol. The physical properties are listed below.



Scheme 1



Chemical Formula: C₇H₆N₂S
Exact Mass: 150.03
Molecular Weight: 150.20
Elemental Analysis: C, 55.97; H, 4.03; N, 18.65; S, 21.35
Boiling Point: 595.64 [K]
Melting Point: 480.8 [K]
Critical Temp: 855.63 [K]
Critical Pres: 55.86 [Bar]
Critical Vol: 387.5 [cm³/mol]
Gibbs Energy: 382.99 [kJ/mol]
Log P: 2.43
MR: 42.35 [cm³/mol]
Henry's Law: 8.27
Heat of Form: 288.54 [kJ/mol]
tPSA: 38.38
CLogP: 1.823
CMR: 4.3433



All the reagents and solvents were generally received from commercial supplier. Reactions were done in dried glassware. Melting points were taken in open capillaries by thermonic melting point apparatus, (Campbell Electronic Mumbai, India) and are uncorrected. The purity of the newly synthesized compounds was checked by thin layer chromatography (TLC) on silica gel-G coated plates by using different solvent systems. Infrared (IR) spectra were determined on Bruker IFS-66 FTIR (Bruker Bioscience, USA) using KBr pallets and wave number (ν) was reported in cm^{-1} . The $^1\text{H-NMR}$ spectra were taken on Jeol GSX -300 FT NMR (Jeol, Tokyo, Japan) in CDCl_3 or DMSO-d_6 and chemical shifts (δ) are given in ppm. Tetramethylsilane (TMS) was used as internal reference standard. Mass spectra were recorded on Spec Finnigan Mat 8230 MS. The carbon, hydrogen and nitrogen analysis were performed on Carlo Erba-1108 (Carlo Erba, Milan, Italy), and the results were found within $\pm 0.4\%$ of the theoretical values. The electronic spectra (UV-Vis) were recorded on a Perkin-Elmer Lambda 15 UV-Vis spectrophotometer, using $10^{-3} \text{ mol}\cdot\text{dm}^{-3}$ solutions in DMF.

Antimicrobial activity

The antimicrobial activity was assayed *in vitro* by the twofold broth dilution [16] against bacteria *Escherichia coli*, *Bacillus subtilis* and *p.mirabilis* and fungus *Candida albican*, *Aspergillus niger* and *Candida krusei*. The minimal inhibitory concentrations (MIC, $\mu\text{g/ml}$) were defined as the lowest concentrations of compound that completely inhibited the growth of each strain. All compounds, dissolved in dimethylsulfoxide, were added to culture media .Mueller Hinton Broth for bacteria and Sabouraud Liquid Medium for fungi to obtain final concentrations ranging from $125\mu\text{g/ml}$ to $1.592 \mu\text{g/ml}$. The amount of dimethylsulfoxide never exceeded 1% v/v. Inocula consisted of 5.0×10^4 bacteria/ml and 1.0×10^3 fungi/ml. The MICs were read after incubation at 37°C for 24 h (bacteria) and at 30°C for 48 h (fungi). Media and media with 1% v/v dimethylsulfoxide were employed as growth controls. ampicillin and fluconazole were used as reference antibacterial and antifungal drugs, respectively.

To detect the type of antimicrobial activity, subcultures were performed by transferring 100 μl of each mixture remaining clear in 1 ml of fresh medium. The minimal bactericidal concentrations (MBC, $\mu\text{g/ml}$) and the minimal fungicidal concentrations (MFC, $\mu\text{g/ml}$) were read after incubation at 37°C for 24 h and at 30°C for 48 h, respectively.



Result and Discussion

The main focus of the present investigation is the proper assignment of the experimental frequencies to the various vibrational modes.

Aromatic compounds commonly exhibit multiple weak bands in the region $3200\text{-}2850\text{ cm}^{-1}$ due to aromatic C-H stretching vibrations. The bands due to C-H in-plane ring bending vibrations, interact somewhat with C-C stretching vibrations, are observed as a number of sharp bands in the region $1300\text{ - }1000\text{ cm}^{-1}$. The C-H out-of-plane bending vibrations are strongly coupled vibrations and occur in the region $700\text{ - }667\text{ cm}^{-1}$. Hence, the infrared bands appeared at $3256, 2922$ and 2846 cm^{-1} and the Raman band found at 2857 cm^{-1} in benzothiazole have been assigned to C-H stretching vibrations and these modes are confirmed by their TED values.

The IR and Raman bands identified at 3374 and 3271 cm^{-1} are assigned to N-H stretching mode. The N-H in-plane bending vibration is found at 1220 cm^{-1} .

The C=N stretching frequencies in the IR spectrum of benzothiazol-2-amine occur in the range $2310\text{-}1450\text{ cm}^{-1}$. In the present investigation, the IR bands observed at $2310, 1840, 1763\text{ cm}^{-1}$ have been assigned to C=N stretching vibrations. The identification of C-N stretching vibration is a difficult task since, it falls in a complicated region of the vibrational spectrum. The IR band appeared at 1243 cm^{-1} in benzothiazol-2-amine has been designated to C-N stretching vibration. The IR and Raman band appeared at $1012, 913\text{ cm}^{-1}$ in compound, has been designated to C-N in-plane bending vibration. The C-N out-of-plane bending vibration is observed at 873 cm^{-1} in Raman. These assignments are also supported by the TED values.

The carbon-carbon stretching vibrations of the title compound have been observed at $1611, 1529, 1444\text{ cm}^{-1}$. The medium Raman bands identified at 1525 cm^{-1} have been assigned to C-C in-plane bending.

The carbon-sulphur stretching vibrations of the title compound have been observed at $835, 744, 715\text{ cm}^{-1}$. The medium Raman bands identified at 680 cm^{-1} have been assigned to C-S in-plane bending. These assignments are in good agreement with the literature. (**table1**).

In the $^1\text{H-NMR}$ spectra, the singlet signal at $\delta 5.33\text{-}6.32\text{ ppm}$ is assigned to NH based on the position of this peak in the spectrum of the parent benzothiazol-2-amine. The assignment of the peak at $\delta 7.26\text{-}7.55\text{ ppm}$ of aromatic ring are found.



UV-Vis absorption spectra of benzothiazol-2-amine after the continuous prolonged irradiation (0, 5, 15, 30, 45 and 60 min) with UV-A light. Both the absorption maxima ($\lambda_{\text{max}} = 262 \text{ nm}$ and $\lambda_{\text{max}} = 222 \text{ nm}$) decrease, and a slight bathochromic shift have been detected, at the end of any particular UV-irradiating period. The log values of the absorbance maxima plotted against irradiation time yielded a linear plot, suggesting the involved kinetics to be probably of pseudo-first order, depending on the benzothiazol-2-amine concentration only (table3)

All the tested synthesized 2-amino benzothiazole derivatives showed significant antibacterial and antifungal activity. Antibacterial activity of benzothiazol-2-amine (a') and standard drug, Amphotericin, was carried out at a concentration $250 \mu\text{g/ml}$ against *E. coli*, *B. subtilis* and *P. mirabilis*. Results show the varying degree of antibacterial activity of all the compounds tested (**table 4**). From the results obtained, it is clear that of benzothiazol-2-amine exhibited less activity against *E. coli ATCC 25922*, *B. subtilis ATCC 1633* than amphotericin but *P. mirabilis* displayed antibacterial property moderate to the reference drug.

The compound benzothiazol-2-amine (a') along with reference drug, fluconazole, were also tested for antifungal activity at a concentration of $250 \mu\text{g/ml}$ against *C. albicans*, *A. niger* and *C. krusei* and it is found that synthesized is showed very weak or moderate active as compared to standard drug.

Table:1 Vibrational assignments of fundamental frequencies (cm^{-1}) of benzothiazol-2-amine.

Species	Observed Frequencies (cm^{-1})		Calculate Frequencies (cm^{-1})	Assignment
	FTIR	Raman		
a ^I	3374(s)	-	3450(s)	N-H stretching
a ^I	3271(s)	-	-	N-H stretching
a ^I	-	3209(w)	-	C-H stretching
a ^I	3256(s)	-	3350(s)	C-H stretching
a ^I	2922(s)	-	-	C-H stretching
a ^I	-	2857(w)	-	C-H stretching
a ^I	2310(m)	-	2350(s)	C=N stretching
a ^I	1840(m)	-	-	C=N stretching



a ^I	1763(s)	-	-	C=N stretching
a ^I	1611(s)	-	1650(s)	C=C stretching
a ^I	1529(s)	-	-	C=C stretching
a ^I	-	1525(w)	-	C=C stretching
a ^I	1444(ms)	-	-	C=C stretching
a ^I	1367(s)	-	-	C=C stretching
a ^I	1282(ms)	-	-	C=C stretching
a ^I	1247(s)	-	-	C-N stretching
a ^I	1197(s)	-	1200(s)	C-N stretching
a ^I	-	1167(w)	-	C-N stretching
a ^I	1012(s)	-	-	C-N stretching
a ^I	913(s)	-	-	C-N stretching
a ^I	-	873(w)	-	C-N stretching
a ^I	835(s)	-	960(s)	C-S-C in plane bending
a ^I	744(s)	-	-	C-S-C in plane bending
a ^I	715(s)	-	-	C-S-C in plane bending
a ^I	628(s)	-	650(s)	C-C-H in plane bending
a ^I	-	604(w)	-	C-C-H in plane bending
a ^I	587(s)	-	-	C-C-H in plane bending
a ^I	524(s)	-	-	C-C-H in plane bending
a ^I	-	474(w)	-	C-C-H in plane bending

Table 2: 1H-NMR data of benzothiazol-2-amine.

Compound	δ / ppm	Assignments
a ^I	5.33-6.32	m, 2H of amine
	7.26-7.55	m, 4H of benzothiazole

Table 3: Electronic spectral data in 95% ethanol and DMF, $\lambda_{\max}(\text{nm}) / \epsilon_{\max} (10^3 \text{ mol}^{-1} \cdot \text{dm}^3 \cdot \text{cm})$ benzothiazol-2-amine.



Solvent	benzothiazole2-amine			
	I	II	III	IV
Ethanol	202.5/0.62	242.5/0.32	276.5/0.35	298/0.34
DMF	-	245.6/0.71	-	305.2/0.62

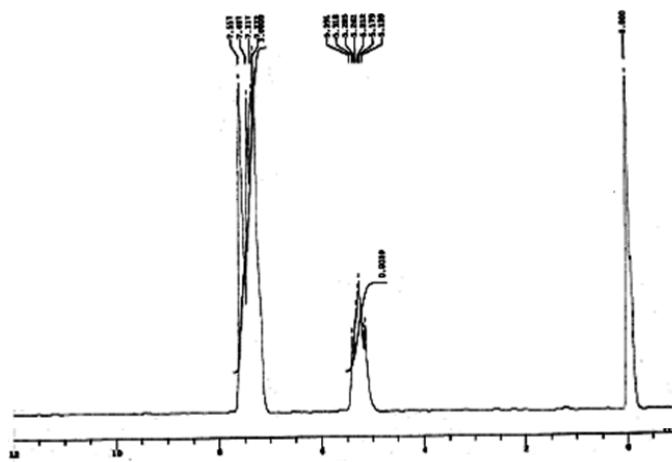
Table 4: Minimal inhibitory concentration (MIC) $\mu\text{g/ml}$ of benzothiazol-2-amine against tested bacterial and fungal strains

Compound No.	Minimal inhibitory concentration (MIC) $\mu\text{g/ml}$					
	E. coli	B. subtilis	P. mirabilis	C. albicans	A. niger	C. krusei
a ¹	12.5	12.5	6.25	12.5	25	6.25
Ampicilim	12.5	6.25	12.5	-	-	-
Fluconazole	-	-	-	6.25	12.5	3.125

Conclusion

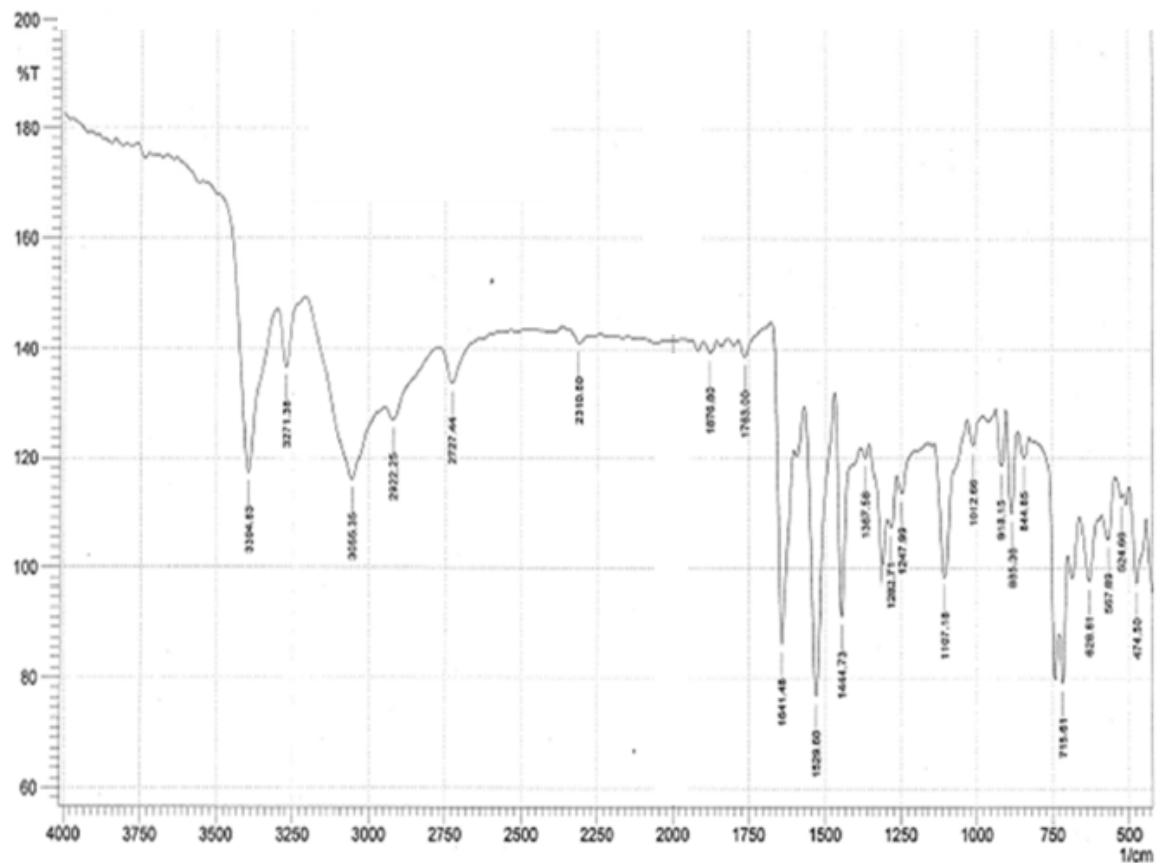
Benzothiazol-2-amine established using FTIR, UV-Vis and ¹H-NMR spectroscopic method. Vibrational and electronic spectra confirmed the synthesized compound. The compound was tested for its *in vitro* antimicrobial activity and its activity against bacteria *Escherichia coli*, *Bacillus subtilis* and *p. mirabilis* and fungus *Candida albican*, *Aspergillus niger* and *Candida krusei* compared to ampicillin and fluconazole, respectively.

¹H-NMR Spectroscopy of Benzothiazol-2-amine





FTIR-Raman Spectroscopy of Benzothiazol-2-amine



Acknowledgments. The authors are thankful to Sophisticated Analytical Instrument Facility, Indian Institute of Technology Madras, Chennai, India for spectral and elemental analysis and Head, Department of Microbiology, L. L. R. M. Medical College, Meerut, India for antifungal and antibacterial activities. This paper is the part of Ph.D. thesis of Leeladhar.

References

1. Yaseen A., Al-Souda, Haitham and Al- Sa'donia. *Z. Naturforsch.* 2006, 62b, 523 – 528
2. Suvarna Kini, SP Swain, AM Gandhi. *Indian Journal of Pharmaceutical Sciences*, 2007,69 (1), 46-50.
3. BM Gurupadayya, M Gopal, B Padmashali, YN Manohara. *Indian Journal of Pharmaceutical Sciences*, 2008, 70 (5), 572-577.
4. Paul W. Bowyer, Ruwani S and Gunaratne, *Biochem J.* 2007, 1,408, 2, 173–180.



5. Mittal S., Samotra M.K., Kaur and Gita Seth. Phosphorus, Sulfur and Silicon and the Related Elements, 2007, 182, 9, 2007, 2105 – 2113.
6. Rocío Pozas, Javier Carballo, Clementina Castro and Julieta Rubio., Bioorganic & Medicinal Chemistry Letters, 2005, 15, 5, 1417, 1421.
7. Rana Arpana , Siddiqui Nadeem and Khan Suroor A., European journal of medicinal chemistry, 2008, 43, 1114-1122.
8. Mellekjaer L, Blot WJ, Sorensen HT, Thomassen L, McLaughlin JK, Nielsen GL, Olsen JH. Br J Clin Pharmacol. 2002 ;53(2):173-81.
9. T.M. Gireesh, R.R. Kamble T. Taj, *Pharmaceutical Chemistry Journal*, **2011**, 45(5), 313.
10. S. Dhanya, A.M. Isloor, P. Shetty, K. Satyamoorthy, A.S.B. Prasad, *Med. Chem. Res.*, **2011**, 20, 1074.
11. N.S. Begum, D.E. Vasundhara, C.R. Giriraj, G.D. Kolavi, V.S. Hegde, I.M. Khazi, *Journal of Chemical Crystallography*, 2007, 37(3), 193.
12. Periandy, B; Mohan, S. *Asian Journal of Chemistry* 8.4 (1996): 707-713.
13. S. Mohan, N. Sundaraganesan J. Mink *Spectrochimica Acta Part A: Molecular Spectroscopy*, 1991, 47(8), 1111-1115.
14. A. El kihela , E.M. Essassib , P. Bauchatc *Arabian Journal of Chemistry* 2012, 5(4), 523–526.
15. Carla I. Nieto, Pilar Cabildo, M. Ángeles García, Rosa M. Claramunt, Ibon Alkorta and José Elguero *Beilstein J. Org. Chem.* 2014, 10, 1620–1629.
16. A. A. Syed and Ayesha Syeda *Indian J Pharm Sci.* 2008, 70(4), 507–510.
17. Kamma.Madhavi, N. Raghavendra Rao, N. Srinivasa rao, B.Raju. *World J. Pharm sci.* 2013, 2(6), 6569-6578.
18. Vikas Kumar, Pratibha Singh, *Der Pharma Chemica*, 2010, 2(3), 52-62.

**SPECTRAL AND BIOLOGICAL EVALUATION OF 5-METHYL-1,3,4-THIADIAZOL-2-AMINE****Rovin**Research Scholar
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IIMT Engineering College, Meerut**Leeladhar Singh**Research Scholar,
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IIMT Engineering College, Meerut**ABSTRACT**

In the current study, a compound 5-Methyl-1,3,4-thiadiazol-2-amine was synthesized by reaction thiosemicarbazide, acetic acid and hydrochloric acid. The structure of the synthesized compound was confirmed based on ¹H-NMR, IR, UV-Vis and mass spectral data. The synthesized compounds were screened for antimicrobial activity against *Escherichia coli*, *Bacillus subtilis* and *Staphylococcus aureus* and fungus *Candida albican*, *Aspergillus niger* and *Candida krusei*.

Keywords: FTIR, NMR, Raman spectroscopy, UV-Visible spectroscopy, Thiadiazole, antimicrobial activity.

Introduction

In recent decades, the problems of multi-drug resistant microorganism have reached on alarming stage in many countries around the world. A number of recent clinical reports describe the increasing occurrence of meticillin-resistant and other antibiotic-resistant human pathogenic microorganisms in United State and European countries. Infections caused by these microorganisms pose a serious challenge to the medical community and need for an effective therapy has led to an escalating search for novel antimicrobial agents.

[1]

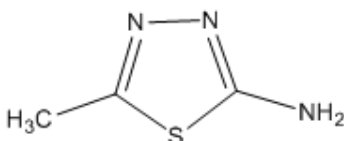
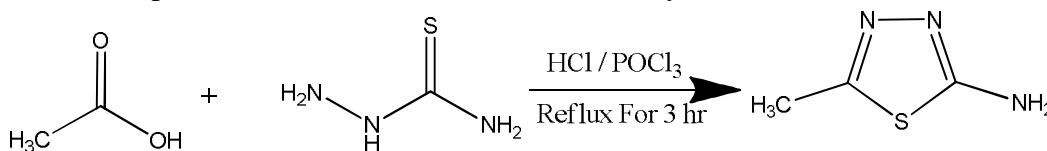
Compounds containing heterocyclic ring systems continue to attract considerable interest due to their wide range of biological activities. Amongst them five membered heterocyclic compounds occupy a unique place in the realm of natural and synthetic organic chemistry. Five membered heterocyclic like 1, 3, 4-thiadiazole and their derivatives contain interesting biological activities. When various functional groups are attached to 1,3,4-thiadiazole nucleus, the resulting compounds interact with biological receptors and exhibit outstanding properties. Compounds containing 1, 3, 4-thiadiazole nucleus have been reported as antitumor agent [2], potent inhibitors of 5-lipoxygenase and cyclooxygenase [3], antimicrobials [4], anti-



tuberculosis [5, 6], anti-inflammatory [7], antidepressant and anxiolytics [8], anticancer [9, 10], antihelmintic [11] etc. In continuation of our research program to find out bioactive thiadiazole derivative. The present work is an effort towards the synthesis of 5-Methyl-1,3,4-thiadiazole-2-amine and characterized by FTIR[12], ¹H-NMR[14,], Raman spectroscopy[15], UV-Visible spectroscopy[16] etc.

Methods and Materials:

A mixture of thiosemicarbazide (2.73 g, 30 mmol), acetic acid (30 mmol), and hydrochloric acid(15.21 g, 75 mmol) was refluxed for 3h. After cooling the reaction mixture was neutralized to pH 7 with aqueous sodium hydroxide. The product that obtained is filtered and recrystallized from water [17].



Chemical Formula: C₃H₅N₃S

Exact Mass: 115.02

Molecular Weight: 115.16

m/z: 115.02 (100.0%), 116.02 (5.2%), 117.02 (4.6%)

Elemental Analysis: C, 31.29; H, 4.38; N, 36.49; S, 27.84

Boiling Point: 538.84 [K]

Melting Point: 474.56 [K]

Critical Temp: 765.13 [K]

Critical Pres: 69.68 [Bar]

Critical Vol: 290.5 [cm³/mol]

Gibbs Energy: 319.71 [kJ/mol]

Log P: 1.38

MR: 32.3 [cm³/mol]

Henry's Law: 2.73

Heat of Form: 212.82 [kJ/mol]

tPSA: 50.74

CLogP: 0.0425998

CMR: 2.908

Analytical data of 5-methyl-1,3,4-thiadiazole-2-amine



All the reagents and solvents were generally received from commercial supplier. Reactions were done in dried glassware. Melting points were taken in open capillaries by thermionic melting point apparatus, (Campbell Electronic Mumbai, India) and are uncorrected. The purity of the newly synthesized compounds was checked by thin layer chromatography (TLC) on silica gel-G coated plates by using different solvent systems. Infrared (IR) spectra were determined on Bruker IFS-66 FTIR (Bruker Bioscience, USA) using KBr pellets and wave number (ν) was reported in cm^{-1} . The $^1\text{H-NMR}$ spectra were taken on Jeol GSX -300 FT NMR (Jeol, Tokyo, Japan) in CDCl_3 or DMSO-d_6 and chemical shifts (δ) are given in ppm. Tetramethylsilane (TMS) was used as internal reference standard. Mass spectra were recorded on Spec Finnigan Mat 8230 MS. The carbon, hydrogen and nitrogen analysis were performed on Carlo Erba-1108 (Carlo Erba, Milan, Italy), and the results were found within $\pm 0.4\%$ of the theoretical values. The electronic spectra (UV-Vis) were recorded on a Perkin-Elmer Lambda 15 UV-Vis spectrophotometer, using $10^{-3} \text{ mol}\cdot\text{dm}^{-3}$ solutions in DMF.

Antimicrobial activity

The antimicrobial activity was assayed *in vitro* by the twofold broth dilution [18] against bacteria *Escherichia coli*, *Bacillus subtilis* and *Staphylococcus aureus* and fungus *Candida albican*, *Aspergillusniger* and *Candida krusei*. The minimal inhibitory concentrations (MIC, $\mu\text{g/ml}$) were defined as the lowest concentrations of compound that completely inhibited the growth of each strain. All compounds, dissolved in dimethylsulfoxide, were added to culture media .Mueller Hinton Broth for bacteria and Sabouraud Liquid Medium for fungi to obtain final concentrations ranging from $125\mu\text{g/ml}$ to $1.592\mu\text{g/ml}$. The amount of dimethylsulfoxide never exceeded 1% v/v. Inocula consisted of 5.0×10^4 bacteria/ml and 1.0×10^3 fungi/ml. The MICs were read after incubation at 37°C for 24 h (bacteria) and at 30°C for 48 h (fungi). Media and media with 1% v/v dimethylsulfoxide were employed as growth controls. Chloroamphenicol and fluconazole were used as reference antibacterial and antifungal drugs, respectively.

To detect the type of antimicrobial activity, subcultures were performed by transferring 100 μl of each mixture remaining clear in 1 ml of fresh medium. The minimal bactericidal concentrations (MBC, $\mu\text{g/ml}$) and the minimal fungicidal concentrations (MFC, $\mu\text{g/ml}$) were read after incubation at 37°C for 24 h and at 30°C for 48 h, respectively.

Result and Discussion



Spectral analysis

The hetero aromatic structure shows the presence of C-H stretching, in-plane bending vibrations in the regions $3000\text{-}2700\text{ cm}^{-1}$ and $900\text{-}1200\text{ cm}^{-1}$ respectively. In this region the bands are not affected appreciably by the nature of the substituents. The FTIR bands at 2988 , 2785 , and 2707 cm^{-1} and FT-Raman bands at 2827 , and 2803 cm^{-1} in 5-methyl-1,3,4-thiadiazole-2-amine is assigned to C-H stretching modes. The bands at 1195 , 1167 , 1073 , 1043 cm^{-1} have been assigned to C-H in-plane bending vibrational modes.

The IR and Raman bands identified at 3258 and 3101 cm^{-1} are assigned to N-H stretching mode. The N-H in-plane bending vibration is found at 1373 and 1329 cm^{-1} .

The C=N stretching frequencies in the Raman spectrum of 5-methyl-1,3,4-thiadiazole-2-amine in the range $2650\text{-}2250\text{ cm}^{-1}$. In the present investigation, the Raman bands observed at 2605 , 2255 cm^{-1} have been assigned to C=N stretching vibrations. The very strong IR peak and the strong Raman peak observed at 1530 cm^{-1} is assigned to C-N stretching mode.

The medium Raman bands identified at 915 and 860 cm^{-1} have been assigned to C-C in-plane bending.

The carbon-sulphur stretching vibrations of the title compound have been observed at $686\text{-}649\text{ cm}^{-1}$. The medium Raman bands identified at 612 cm^{-1} have been assigned to C-S in-plane bending.

In the $^1\text{H-NMR}$ spectra, the singlet signal at $\delta\ 6.950$ ppm is assigned to NH based on the position of this peak in the spectrum of the parent thiadiazole-2-amine molecule. The assignment of the peak at $\delta\ 2.436$ ppm of three proton of CH_3 molecule is obtained.

UV-Vis absorption spectra of 5-methyl-1,3,4-thiadiazole-2-amine after the continuous prolonged irradiation (0, 5, 15, 30, 45 and 60 min) with UV-A light. Both the absorption maxima ($\lambda_{\text{max}} = 248\text{ nm}$ and $\lambda_{\text{max}} = 255\text{ nm}$) decrease, and a slight bathochromic shift have been detected, at the end of any particular UV-irradiating period. The log values of the absorbance maxima plotted against irradiation time yielded a linear plot, suggesting the involved kinetics to be probably of pseudo-first order, depending on the 5-methyl-1,3,4-thiadiazole-2-amine concentration only

Antimicrobial activity



Antibacterial activity of 5-methyl-1,3,4-thiadiazole- 2-amine(a¹) and standard drug, chloroamphenicol, was carried out at a concentration 250 µg/ml against *E. coli* ATCC 25922, *B. subtilis* ATCC 1633 and *S. aureus* ATCC 25923. Results show the varying degree of antibacterial activity of all the compounds tested (table 4). From the results obtained, it is clear that 5-methyl-1,3,4-thiadiazole- 2-amine possess less activity against *E. coli* ATCC 25922, *S. aureus* ATCC 25923 than chloroamphenicol but *B. subtilis* ATCC 1633 displayed antibacterial property moderate to the reference drug.

The compound 5-methyl-1,3,4-thiadiazole- 2-amine (a¹) along with reference drug, fluconazole, were also tested for antifungal activity at a concentration of 250 µg/ml against *C. albicans* ATCC 2091, *A. niger* ATCC 9029 and *C. krusei* ATCC 6518, and it is found that synthesized is showed very weak or moderate active as compared to standard drug.

Table:1 Vibrational assignments of fundamental frequencies (cm⁻¹) of 5-Methyl-1,3,4-thiadiazole-2-amine

Species	Observed Frequencies (cm ⁻¹)		Calculate Frequencies (cm ⁻¹)	Assignment
	FTIR	Raman		
a ¹	3258(s)	-	3265(s)	N-H stretching
a ¹	-	3101(w)	-	N-H stretching
a ¹	2988(s)	-	2950(s)	C-H stretching
a ¹	-	2827(w)	-	C-H stretching
a ¹	2785(s)	-	-	C-H stretching
a ¹	2707(s)	-	-	C-H stretching
a ¹	-	2605(w)	-	C=N stretching
a ¹	2324(s)	-	2355(s)	C=N stretching
a ¹	-	2255(w)	-	C=N stretching
a ¹	1530(s)	-	1545	C-N stretching
a ¹	1432(ms)	-	-	C-N stretching
a ¹	1373(s)	-	1378	N-H in plane bending
a ¹	1329(s)	-	-	N-H in plane bending
a ¹	1195(s)	-	1138	C-H in plane bending
a ¹	-	1167(w)	-	C-H in plane bending



a ^I	-	1073(w)	-	C-H in plane bending
a ^I	-	1043(w)	-	C-H in plane bending
a ^I	975(w)	-	968	C-C in plane bending
a ^I	-	915(w)	-	C-C in plane bending
a ^I	-	860(w)	-	C-C in plane bending
a ^I	686(w)	-	645	C-S-C in plane bending
a ^I	649(w)	-	-	C-S-C in plane bending
a ^I	-	612(w)	-	C-S-C in plane bending
a ^I	521(w)	-	-	C-C-H in plane bending

Table 2: ¹H-NMR data of 5-Methyl-1,3,4-thiadiazole-2-amine

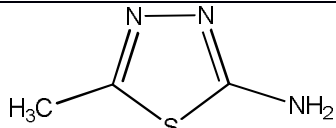
Compound	δ / ppm	Assignments
	2.436	s, 3H of CH ₃
	6.950	s, 2H of NH ₂

Table 3: Electronic spectral data in 95% ethanol and DMF, λ_{\max} (nm) / ϵ_{\max} (10³ mol¹.dm³.cm)

Solvent	5-Methyl-1,3,4-thiadiazole-2-amine			
	I	II	III	IV
Ethanol	201.5/2.61	252.5/1.63	396.5/2.21	256.00/2.82
DMF	-	261.6/2.8164	-	402.0/1.4227

Table 4: Minimal inhibitory concentration (MIC) μ g/ml of 5-Methyl-1,3,4-thiadiazole-2-amine against tested bacterial and fungal strains

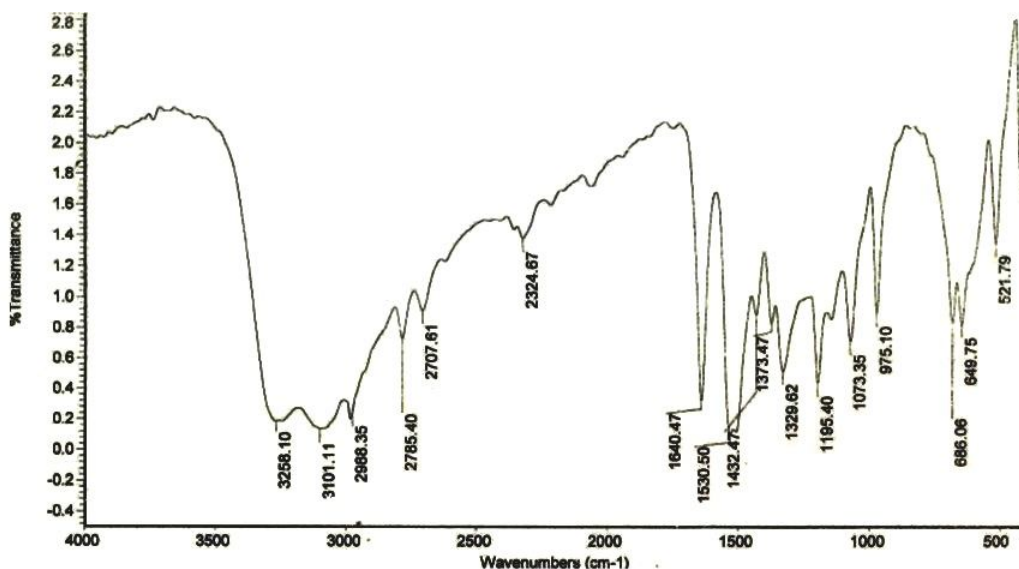
Compound No.	Minimal inhibitory concentration (MIC) μ g/ml					
	E. coli	B. subtilis	S. aureus	C. albicans	A. niger	C. krusei
a ^I	6.25	3.125	12.5	12.5	6.25	3.125
Chloroamphenicol	12.5	6.25	12.5	-	-	-
Fluconazole	-	-	-	6.25	25	6.25



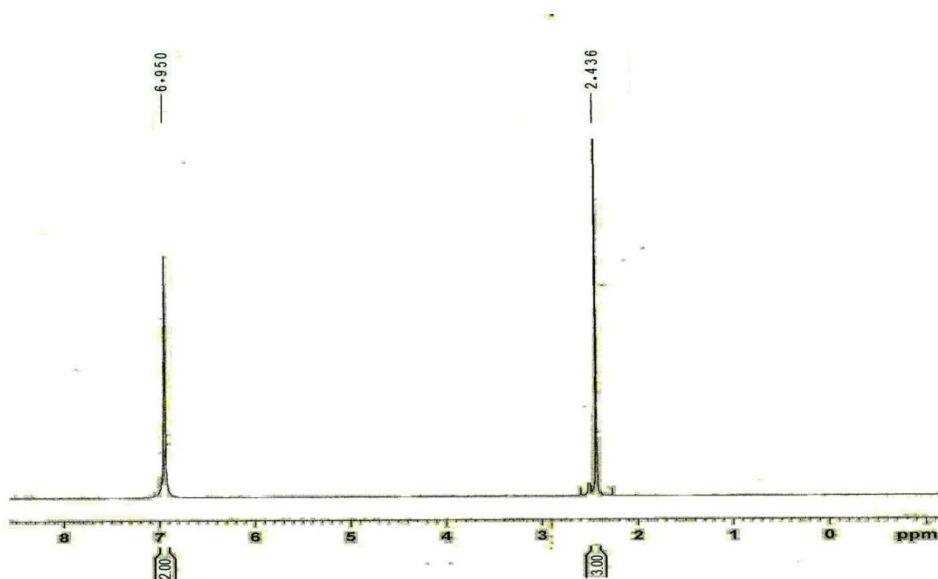
Conclusion

5-methyl-1,3,4-thiadiazole-2-amine established using FTIR, UV-Vis and $^1\text{H-NMR}$ spectroscopic method. Vibrational and electronic spectra confirmed the synthesized compound, 5-methyl-1,3,4-thiadiazole-2-amine. The compound was tested for its *in vitro* antimicrobial activity and its activity against bacteria *Escherichia coli*, *Bacillus subtilis* and *Staphylococcus aureus* and fungus *Candida albican*, *Aspergillus niger* and *Candida krusei* compared to chloramphenicol and fluconazole, respectively.

FTIR-Raman Spectroscopy of 5-Methyl-1,3,4-thiadiazole-2-amine



$^1\text{H-NMR}$ Spectroscopy of 5-Methyl-1,3,4-thiadiazole-2-amine





Acknowledgments. The authors are thankful to Sophisticated Analytical Instrument Facility, Indian Institute of Technology Madras, Chennai, India for spectral and elemental analysis and Head, Department of Microbiology, L. L. R. M. Medical College, Meerut, India for antifungal and antibacterial activities. This paper is the part of Ph.D. thesis of Rovin.

REFERENCES

1. R. Sharma, C.L. Sharma, B. Kapoor, *Indian J. Med. Sci.*, **2005**, 59, 120.
2. M. Barboiu, M. Cimpoesu, C. Guran, C. T. Supuran, *Metal based drug*, **1996**, 3 (5), 227.
3. D.H. Boschelli, D.T. Connor, D.A. Bornemeier, R.D. Dyer, J.A. Kennedy, P.J. Kuipers, G.C. Okonkwo, D.J. Schrier, C.D. Wright, *J. Med. Chem.*, **1993**, 36, 1802.
4. A.A. Aly, R. El-Sayed, *Chem. Pap.*, **2006**, 60 (1), 56.
5. E.E. Orucü, S. Rollas, F. Kandemirli, N. Shvets A.S. Dimoglo, *J. Med. Chem.*, **2004**, 47, 6760.
6. T.S. Zhivotova, A.M., Zhivotova, O.V. Dryuk, A. Zh Seitembetova., *Russian Journal of Applied Chemistry*, **2008**, 81(2), 259.
7. J. Sainy, G.P. Mishra, R. Sharma, S.C. Chaturvedi, *Pharmaceutical Chemistry Journal*, **2009**, 43(1), 19.
8. F. Clerici D Pocar, *J. Med. Chem.*, **2001**, 44, 931.
9. T.M. Gireesh, R.R. Kamble T. Taj, *Pharmaceutical Chemistry Journal*, **2011**, 45(5), 313.
10. S. Dhanya, A.M. Isloor, P. Shetty, K. Satyamoorthy, A.S.B. Prasad, *Med. Chem. Res.*, **2011**, 20, 1074.
11. N.S. Begum, D.E. Vasundhara, C.R. Giriraj, G.D. Kolavi, V.S. Hegde, I.M. Khazi, *Journal of Chemical Crystallography*, **2007**, 37(3), 193.
12. Periandy, B; Mohan, S. *Asian Journal of Chemistry* 8.4 (1996): 707-713.
13. S. Mohan, N. Sundaraganesan J. Mink *Spectrochimica Acta Part A: Molecular Spectroscopy*, 1991, 47(8), 1111-1115
14. A. El kihela, , E.M. Essassib, P. Bauchatc *Arabian Journal of Chemistry* 2012, 5(4), 523–526.
15. Carla I. Nieto, Pilar Cabildo, M. Ángeles García, Rosa M. Claramunt, Ibon Alkort and José Elguero *Beilstein J. Org. Chem.* 2014, 10, 1620–1629.
16. A. A. Syed and Ayesha Syeda *Indian J Pharm Sci.* 2008, 70(4), 507–510.
17. Kamma.Madhavi, N. Raghavendra Rao, N. Srinivasa rao, B.Raju. *World J. Pharm sci.* 2013, 2(6), 6569-6578.
18. Vikas Kumar, Pratibha Singh, *Der Pharma Chemica*, 2010, 2(3),52-62.



AN EFFICIENT FACE PARTS DETECTION TECHNIQUE FOR CCTV SURVEILLANCE

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ABSTRACT

The use of Closed-Circuit Television (CCTV) for surveillance is becoming important day by day. Human face detection is one of the key requirements for intelligent CCTV systems. There are numerous application areas in which face detection can be applied. In this paper, we propose a technique that performs detection of different facial parts such as Eye Pair, Nose and Mouth and can achieve fast, accurate detection that is robust to changes in illumination and background. The experimental results demonstrate the significant performance improvement using the proposed approach over other existing techniques. It can be seen that the proposed method is very efficient and has significant value in surveillance application.

Keywords: Surveillance, Human Face Detection, Security, CCTV.

1. INTRODUCTION

In recent years, the use of Closed-Circuit Television (CCTV) for video surveillance has grown to an unprecedented level. Especially after the 9/11 terrorist attack in New York and 26/11 terrorist attack in Mumbai, video surveillance has become part of everyday life. Hundreds of thousands of cameras have been installed in public areas all over the world in places such as shopping malls, hospitals, academic institutions, train stations, airports, car parks, automatic teller machines (ATMs), vending machines and taxis. There are approximately 500,000 CCTV cameras in the London area alone and 4,000,000 cameras in the UK [1]. However, currently there is no efficient system to fully utilize the capacity of such a huge CCTV network. Most CCTV systems rely on humans to physically monitor screens or review the stored videos. This is inefficient and makes proactive surveillance impractical [2]. The fact that police only found activities of terrorists from the recorded videos after the attacks happened shows that existing surveillance systems, which depend on human monitoring, are neither reliable nor timely [3, 4]. Therefore, need for a fully automatic intelligent CCTV system is increasing day by day.



Human face detection is one of the key requirements for intelligent CCTV systems [5, 6]. Face detection is a computer technology that determines the location and size of human face in digital image. In this, facial features are detected and any other objects like trees, buildings and bodies etc. are ignored from the digital image. It can be regarded as a specific case of object-class detection, where the task is to find the location and size of all objects in an image that belongs to a given class [7-8]. Face detection is a necessary first step in all of the face processing systems and its performance can severely influence on the overall performance of recognition.

This paper is organized as follows. Section 2 gives a literature survey, section 3 describes the proposed algorithm, section 4 describes experiments and results and section 5 is conclusion of this paper.

2. LITERATURE SURVEY

There are generally two types of approaches to detect facial part in the given image that are feature base and image base. Feature based approach tries to extract features of the image and match it against the knowledge of the face features. While image based approach tries to get best match between training and testing images.

A Feature Based Approaches

(a) Active Shape Model

Active shape models focus on complex non-rigid features like actual physical and higher level appearance of features [9]. Means that active shape model is aimed at automatically locating landmark points that define the shape of any statistically modelled object in an image. The training stage of an active shape model involves the building of a statistical facial model from a training set containing images with manually annotated landmarks. Active shape model is classified into three groups i.e. snakes, Point distribution model, deformable templates.

(b) Low Level Analysis

Low level analysis is based on low level visual features such as colour, intensity, edges, motion, etc. It involves Skin Colour Base [10], Motion Base [11-12], Gray Scale Base [13-14] and Edge Base [15-16];

(c) Feature Analysis

These algorithms aim to find structural features that exist even when the pose, viewpoint, or lighting conditions vary, and then use these to locate faces. These methods are designed mainly for face



localization. There are different methods available to support feature analysis such as Viola Jones Method [17], Gabor Feature Method [18-19] and Constellation Method [20-21].

(B) Image Based Approach

Different techniques come under image based approach such as Neural Network [22-24], Support Vector Machine (SVM) [25-26] and Principle Component Analysis (PCA) [27-28].

3. PROPOSED METHOD

The basic principle of the proposed algorithm is to scan a sub-window capable of detecting face parts across a given input image. The standard image processing approach would be to rescale the input image to different sizes and then run the fixed size detection through these images. This approach turns out to be rather time consuming due to the calculation of the different size images. In the proposed method, scale invariant feature is devised which is constructed using the integral image and some simple rectangular features similar to Haar features. The proposed method is briefly defined below.

3.1 Scale invariant feature selection

The first step of the proposed algorithm is to turn the input image into an integral image. This is done by making each pixel equal to the entire sum of all pixels above and to the left of the concerned pixel. This is shown in Fig. 1.

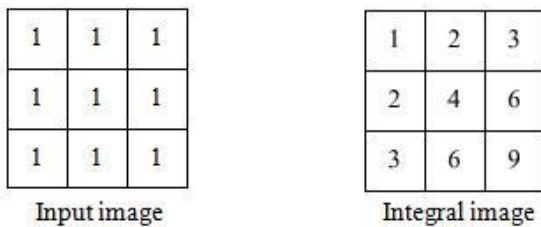
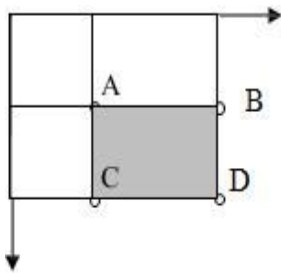


Fig. 1: The integral image.

This allows calculation of the sum of all pixels inside any given rectangle using only four values. These values are the pixels in the integral image that coincide with the corners of the rectangle in the input image. This is shown in Fig. 2.



$$\text{Sum of grey rectangle} = D - (B + C) + A$$

Fig. 2: Sum calculation.

Since both rectangle B and C include rectangle A the sum of A has to be added to the calculation.

3.2 The modified AdaBoost algorithm

As stated above there can be calculated approximately 160.000 feature values within a detector at base resolution. Among all these features few are expected to give almost consistently high values when on top of a face. In order to find these features proposed method uses a modified version of the AdaBoost algorithm.

Image Based Approaches

AdaBoost is a machine learning boosting algorithm capable of constructing a strong classifier through a weighted combination of weak classifiers. (A weak classifier classifies correctly in only a little bit more than half the cases.) To match this terminology to the presented theory each feature is considered to be a potential weak classifier. A weak classifier is mathematically described as:

Where x is a 24×24 pixel sub-window, f is the applied feature, p the polarity and θ the threshold that decides whether x should be classified as a positive (a face) or a negative (a non-face).

Since only a small amount of the possible 160.000 feature values are expected to be potential weak classifiers the AdaBoost algorithm is modified to select only the best features. The proposed modified AdaBoost algorithm is presented in Fig. 3.

An important part of the modified AdaBoost algorithm is the determination of the best feature, polarity and threshold. There seems to be no smart solution to this problem and the proposed method suggest a simple brute force method. This means that the determination of each new weak classifier involves evaluating each feature on all the training examples in order to find the best performing feature.

- a) Given sample images $(x_1, y_1), \dots, (x_n, y_n)$ where $y_i = 0$ for negative samples and $y_i = 1$ for positive samples.
- b) Initialize weights $w_{1,i} = \frac{1}{2^i}$ for $y_i = 0$ and $w_{1,i} = \frac{1}{2^i}$ for $y_i = 1$ where m is the number of negatives samples and L is the number of positives samples.
- c) For $t = 1, \dots, T$:
 - o Normalize the weights

$$w_{t,i} \approx \frac{w_{t,i}}{\sum_{j=1}^n w_{t,j}}$$

- o Select the best weak classifier with respect to the weighted error:

$$\mu_t = \min_{f,p,\theta} \sum_i w_i |g(x_i, f, p, \theta) - y_i|$$

- o Define $g_t(x) = g(x, f_t, p_t, \theta_t)$ where f_t, p_t and θ_t are the minimizers of μ_t .
- o Update the weights:

$$w_{t+1,i} = w_{t,i} \beta^{1-\epsilon_i}$$

where $\epsilon_i = 0$ if sample x_i is classified correctly and $\epsilon_i = 1$ otherwise, and

$$\beta_t = \frac{\mu_t}{1 - \mu_t}$$

- d) The final strong classifier is

$$Classifier(x) = \begin{cases} 1 & \text{if } \sum_{t=1}^T \alpha_t g_t(x) \geq \frac{1}{2} \sum_{t=1}^T \alpha_t \\ 0 & \text{otherwise} \end{cases}$$

where $\alpha_t = \log \frac{1}{\beta_t}$

Fig. 3: The modified Adaboost algorithm.



3.3 Classification

The basic principle of the proposed algorithm is to scan the detector many times through the same image – each time with a new size. Even if an image should contain one or more faces it is obvious that an excessive large amount of the evaluated sub-windows would still be negatives (non-faces). This realization leads to a different formulation of the problem:

Instead of finding facial parts, the algorithm should discard non-facial parts.

The thought behind this statement is that it is faster to discard non-facial parts than to find facial parts. With this in mind a detector consisting of only one (strong) classifier suddenly seems inefficient since the evaluation time is constant no matter the input. Hence the need for a cascaded classifier arises.

The sequential classifier is composed of stages each containing a strong classifier. The job of each stage is to determine whether a given sub-window is definitely not a facial part or maybe a facial part. When a sub-window is classified to be a non-facial part by a given stage it is immediately discarded. Conversely a sub-window classified as a maybe-facial part is passed on to the next stage in the cascade. It follows that the more stages a given sub-window passes, the higher the chance the sub-window actually contains a face. The concept is shown with two stages in Fig. 4.

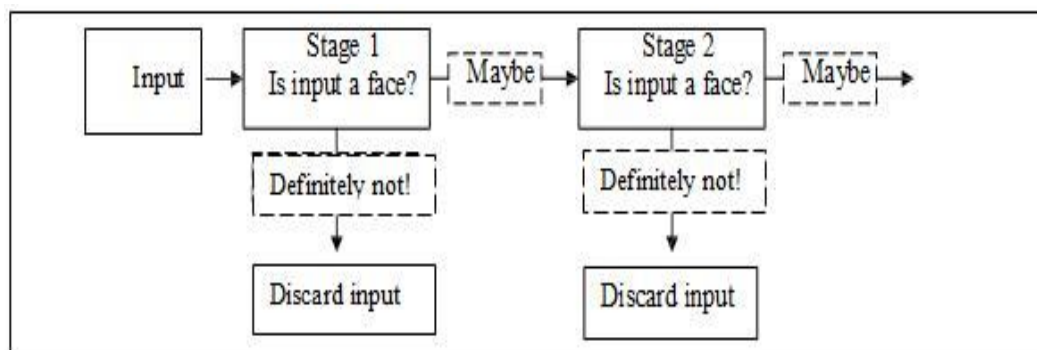


Fig. 4: Classification approach.

The proposed method also refers to the cascaded classifier as an attentional cascade. This name implies that more attention (computing power) is directed towards the regions of the image suspected to contain faces. It follows that when training a given stage, say n , the negative examples should of course be false negatives generated by stage $n-1$.



This paper presents some of the considerations regarding the implementation of the proposed method along with final results.

4.1 Creating positive samples

The face training set consisted of approximately 1000 hand labelled face images scaled and aligned to a base resolution of 24×24 pixels. The face training set consisted of approximately 1000 hand labelled face images scaled and aligned to a base resolution of 24×24 pixels. Fig 4 shows a sample of positive images.



Fig. 5: Sample positive images.

The variance normalization is suggested as a mean of reducing the effect of different lighting conditions. Fig. 6 shows a sample of normalized image.



Fig. 6: Normalized image.

4.2 Creating negative samples

For the training of the different stages in the sequence classifier negative samples are also required. A negative sample is basically just an image not containing a face. This criterion may at first seem easy to



fulfil, but ideally the negative examples should represent all sorts of non-facial textures that the proposed method can be expected to meet. Sample negative images are shown in Fig. Classification 7.



Fig. 7: Sample negative images.

4.3 Training the classifier

Each stage in the sequence classifier was trained using a positive set, a negative set and for performance measurement an evaluation set. For each stage the positive set and the evaluation set was the same while the negative set was especially designed for exactly that stage. As described earlier false positives are preferred over false negatives and since the AdaBoost algorithm aims at minimizing false negatives it needs a little tweaking. A procedure that gradually lowers the classifier threshold of a stage until a given performance requirement is used.

Since the evaluation set in this project only consists

of positive samples the true positive rate became **the key measurement for a stage's performance.**

Secondary, the false positive rate was estimated by letting the existing sequential classifier evaluate the current negative examples. Normally it is not advisable to use the training data as evaluation data, but due to the sequential structure it can be allowed in this case. Especially for the higher stages the negative training sets were generated by running through literally millions of examples and thus ensuring training sets almost identical to the real world data the classifier is expected to encounter.



4.4 Visual Results



8 (a)



8 (b)



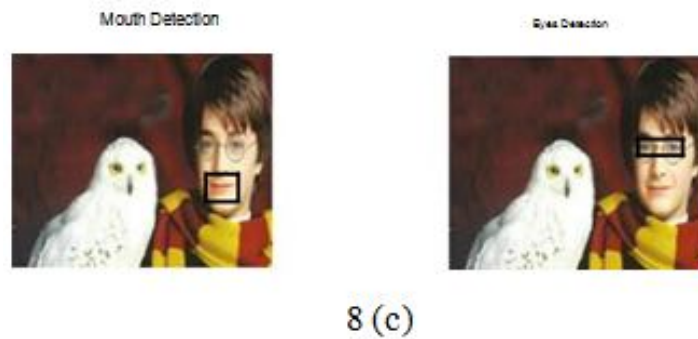


Fig. 8 (a) is standard 'Lena' image for which the proposed method is capable of recognizing different facial parts nose, mouth and eyes accurately.

Fig. 8 (b) is a movie image with variable illumination for which the proposed method is capable of recognizing different facial parts nose, mouth and eyes accurately.

Fig. 8 (c) is a movie image which contains two objects. One is human and other is non-human, in this case also the proposed method is capable of recognizing different facial parts nose, mouth and eyes accurately.

From all the above figures in Fig. 8, we can see that there are several challenges present such as change in illumination conditions, variation in face pose, variation in facial expressions, variation in age of persons and complex background. But we get correct detection results for all the above challenges.

However, the proposed method has a limitation that it does not work well with occluded faces. If the eyes are occluded for example, the method will usually fail. The mouth is not as important and so a face with a covered mouth will usually still be detected.

4.5 Objective Results

For objective evaluation of the proposed method we have considered four parameters. These parameters are True Positive Rate (TPR), False Negative Rate (FNR), False Positive Rate (FPR) and True Negative Rate (TNR).

Table 1: Evaluation results.



Sr. No.	Images	Positive evaluation set		Negative evaluation set	
		TPR	FNR	FPR	TNR
1	50	0.9740	0.0260	0.3815	0.6185
2	100	0.9740	0.0260	0.4157	0.5843
3	150	0.9740	0.0260	0.4919	0.5081
4	200	0.9740	0.0260	0.4864	0.5136
5	250	0.9740	0.0260	0.2272	0.7728
6	300	0.9740	0.0260	0.3321	0.6679
7	350	0.9740	0.0260	0.3970	0.6030
8	400	0.9720	0.0280	0.3538	0.6462
9	450	0.9700	0.0300	0.3943	0.6057
10	500	0.9700	0.0300	0.4133	0.5867
11	550	0.9680	0.0320	0.2804	0.7196
12	600	0.9680	0.0320	0.3053	0.6947
13	650	0.9680	0.0320	0.4333	0.5667
14	700	0.9680	0.0320	0.4881	0.5119
15	750	0.9680	0.0320	0.2366	0.7634
16	800	0.9680	0.0320	0.4393	0.5607
17	850	0.9730	0.0270	0.3548	0.6452
18	900	0.9680	0.0320	0.3053	0.6947
19	950	0.9740	0.0260	0.2272	0.7728
20	1000	0.9720	0.0280	0.3538	0.6462

On observing Table 1, it can be seen that TPR is very high (almost near to 1) and FNR is very less (almost near to 0). Similarly, TNR is high and FPR is low. Hence, it is clear that the proposed method performs well in terms of True Positive Rate (TPR), False Negative Rate (FNR), False Positive Rate (FPR) and True Negative Rate (TNR). All results have been obtained in a very less computation time. Therefore, time complexity is also very less for the proposed method.

5 CONCLUSION

We presented an approach for facial parts detection which minimizes computation time while achieving high detection accuracy. The approach was used to construct a facial parts detection system which provided high accuracy in less computation time.

The proposed method presents new algorithms, representations, and insights which are quite generic and may have broader application in computer vision and image processing. The first contribution is a new a technique for computing a rich set of image features using the integral image. In order to achieve true scale invariance, almost all face detection systems must operate on multiple image scales. The integral image, by eliminating the need to compute a multi-scale image pyramid, reduces the initial image processing required for face detection significantly. Using the integral image, face detection is completed in almost the same time as it takes for an image pyramid to be computed.



A set of detailed experiments on difficult face detection images. These images include faces under a very wide range of conditions including: illumination, scale, pose, and camera variation. Experiments on such a large and complex set of images are difficult and time consuming. Experiments show that the proposed method is highly efficient for face images.

The proposed approach is efficiently tested on face images. However, it may be extended to other various real life applications like object detection, face detection, and pedestrian detection, etc. for biometric recognition in surveillance systems.

REFERENCES

- [1] Wu, Yu-Lung, and Chi-Jui Chang. "Surveillance of public space: CCTV, privacy and sense of safety." *Global Journal for Research Analysis*, vol. 5, no. 4 (2016).
- [2] Brands, Jelle, Tim Schwanen, and Irina Van Aalst. "What are you looking at? Visitors' perspectives on CCTV in the night-time economy." *European Urban and Regional Studies*, vol. 23, no. 1 (2016): 23-39.
- [3] Sousa, William H., and Tamara D. Madensen. "Citizen acceptance of police interventions: an example of CCTV surveillance in Las Vegas, Nevada." *Criminal Justice Studies*, vol. 29, no. 1 (2016): 40-56.
- [4] Makin, David A., Gary Jenkins, and Michael Gaffney. "Civilizing Surveillance Practices: The Pullman Police Department Public Safety Camera Monitoring Internship Program." *Journal of Applied Security Research*, vol. 11, no. 3 (2016): 249-266.
- [5] Wilber, Michael J., Vitaly Shmatikov, and Serge Belongie. "Can we still avoid automatic face detection?" In *2016 IEEE Winter Conference on Applications of Computer Vision (WACV)*, pp. 1-9, 2016.
- [6] Yang, Shuo, Ping Luo, Chen-Change Loy, and Xiaoou Tang. "Wider face: A face detection benchmark." In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, pp. 5525-5533. 2016.



- [7] Umbaugh, Scott E. Digital image processing and analysis: human and computer vision applications with CVIptools. CRC press, 2016.
- [8] Russ, John C. The image processing handbook. CRC press, 2016.
- [9] J. C. Gower, Generalized Procrustes Analysis, Psychometrika, vol. 40, no. 1, pp. 33-51, March 1975.
- [10] Jairath, Shrey, Samarth Bharadwaj, Mayank Vatsa, and Richa Singh. "Adaptive Skin Color Model to Improve Video Face Detection." In Machine Intelligence and Signal Processing, pp. 131-142. Springer India, 2016.
- [11] M. Jones, P. Viola, D. Snow, Detecting pedestrians using patterns of motion and appearance, Tech. rep., Mitsubishi Electric Research Laboratories, TR2003-90 (2003).
- [12] J. L. Crowley, F. Berard, "Multi-model Tracking of faces for Video Communications".
- [13] B. K. Low, M. K. Ibrahim, "A Fast and Accurate Algorithm Facial Feature Segmentation", 1997.
- [14] B. Heisele, T. Poggio, M. Pontil, Face detection in still gray images, Tech. rep., Center for Biological and Computational Learning, MIT, A.I. Memo 1687 (2000).
- [15] Sharif M., Raza M. and Mohsin S., Face Recognition Using Edge Information and DCT, Sindh Univ. Res. Jour. (Sci.Ser.), 43(2), 209-214 (2011) --29
- [16] S. Anila, N. Devarajan, Simple and Fast Face Detection System Based on Edges, International Journal of Universal Computer Sciences, vol. 1, no. 2, pp. 54-58 (2010)
- [17] Paul Viola, Michael Jones, Robust Real- Time Face Detection, International Journal of Computer Vision 57(2), 137–154, 2004.
- [18] Muhammad SHARIF, Adeel KHALID, Mudassar RAZA, Sajjad MOHSIN Face Recognition using Gabor Filters, Journal of Applied Computer Science & Mathematics no. 11 (5) /2011, Suceavapp 53-57. --32
- [19] Rahman M. T. and Bhuiyan M. A., Face Recognition using Gabor Filters, 11th IEEE International Conference on Computer and Information Technology, 2008. ICCIT 2008, 510-515 (2008) --33



- [20] M. C. Burl, T. K. Leung, and P. Perona, Face localization via shape statistics, in Int. Workshop on Automatic Face and Gesture Recognition, Zurich, Switzerland, June 1995.
- [21] W. Huang, Q. Sun, C. P. Lam, and J. K. Wu, A robust approach to face and eyes detection from images with cluttered background, in Proc. Of International Conference on Pattern Recognition, 1998.
- [22] A. Krizhevsky, I. Sutskever, G. E. Hinton, Imagenet classification with deep convolutional neural networks, in: Advances in neural information processing systems, 2012, pp. 1097– 1105.
- [23] C. Zhang, Z. Zhang, Improving multiview face detection with multi-task deep convolutional neural networks, in: Applications of ComputerVision (WACV), 2014 IEEE Winter Conference on, IEEE, 2014, pp. 1036–1041.
- [24] Y.-N. Chen, C.-C. Han, C.-T. Wang, B.-S. Jeng, K.-C. Fan, A cnn-based face detector with a simple feature map and a coarse-to-fine classifier, Pattern Analysis and Machine Intelligence, IEEE Transactions on (99) (2009) 1–1.
- [25] M. Ratsch, S. Romdhani, T. Vetter, Efficient face detection by a cascaded support vector machine using haar-like features, in: Pattern Recognition Symposium, 2004.
- [26] P. Wang, Q. Ji, Multi-view face detection under complex scene based on combined svms, in: Proc. of ICPR, 2004.
- [27] Shah J., Sharif M., Raza M. and Azeem A., A Survey: Linear and Nonlinear PCA Based Face Recognition Techniques, The International Arab journal of Information technology, 10(6), (2013).
- [28] Susheel Kumar K., Bhaskar Semwal V. and Tripathi R., Real time face recognition using adaboost improved fast PCA algorithm, (2011).



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*Printed published and owned by **Mr. Atul Mangal***

Published from:

Mangalmay Institute of Management & Technology

Plot No. 8 & 9, Knowledge Park - II, Greater Noida - 201310

*Edited by: **Dr. Tushar Kanti***

Printed at : All Time Offset Printers,

E-53, Sector-7, Noida-201301