PROCEEDINGS OF

NATIONAL CONFERENCE ON

RECENT TRENDS OF ENGINEERING, SCIENCE AND MANAGEMENT

(NCRTESM 2022)

Technology Transformation for Growth and Sustainability

22-23 APRIL 2022

ORGANIZED BY

GURU GOBIND SINGH EDUCATIONAL SOCIETY'S TECHNICAL CAMPUS

Kandra, Chas, Bokaro, Jharkhand 827013

IN ASSOCIATION WITH

JHARKHAND UNIVERSITY OF TECHNOLOGY

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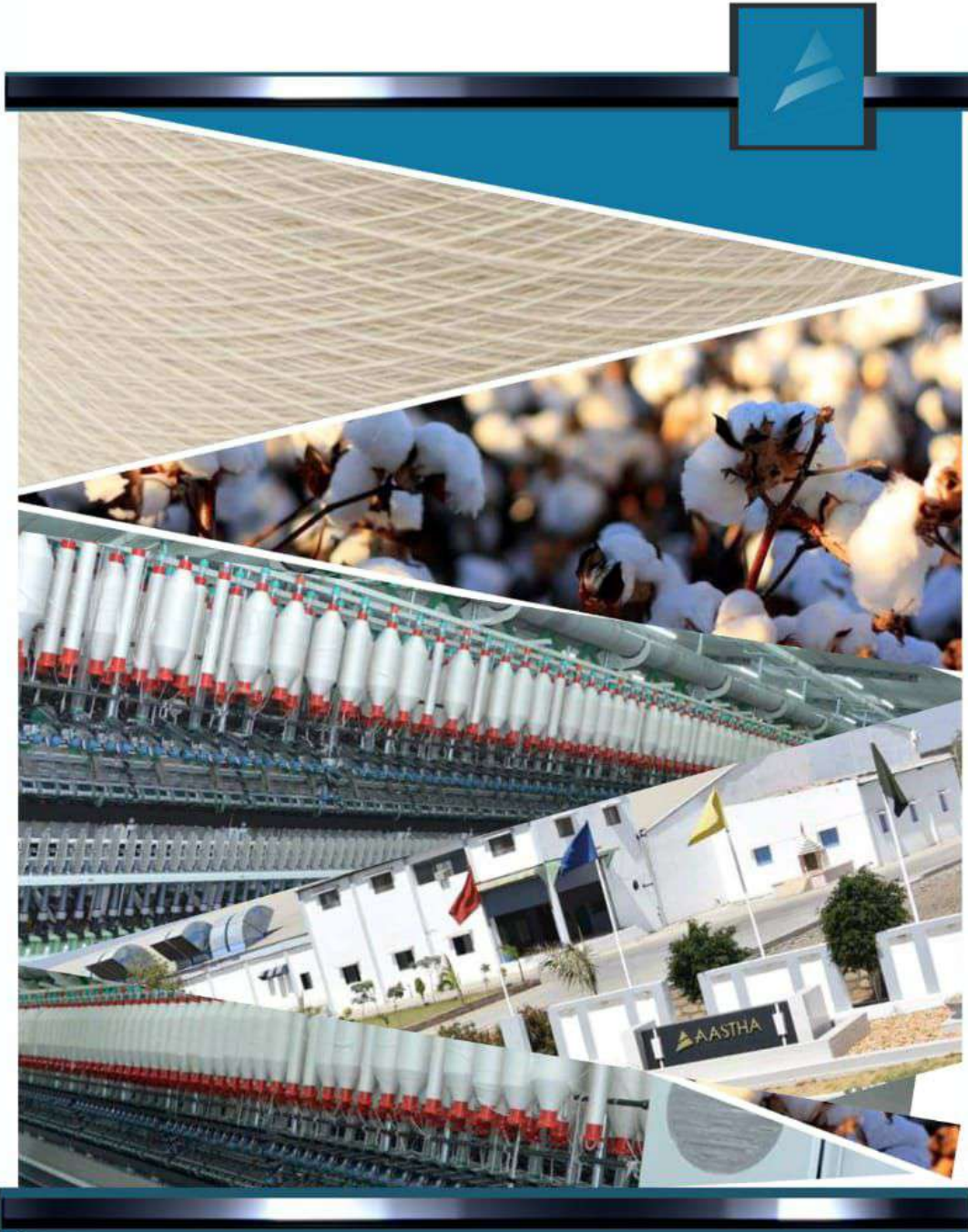
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Technology Transformation for Growth and Sustainability

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Proceedings

of

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Recent Trends of Engineering, Science and Management
(NCRTESM – 2022)

theme

"Technology Transformation for Growth and Sustainability"

22-23 April, 2022

Organized by

Guru Gobind Singh Educational Society's Technical Campus
Chas, Bokaro – 827013, Jharkhand, India

in association with

Jharkhand University of Technology
Namkum, Ranchi - 834010, Jharkhand, India

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Message from Vice-Chancellor, JUT

Prof. (Dr.) Vijay Pandey
Professor, MED, BIT, Sindri, Dhanbad
Vice Chancellor, JUT, Ranchi
Director – Curriculum Development, JUT, Ranchi

Guru Gobind Singh Educational Society's Technical Campus (GGSESTC), Bokaro in association with Jharkhand University of Technology (JUT), Ranchi is organising "**National Conference on Recent Trends of Engineering, Science and Management (NCRTESM-2022)**" on 22nd and 23rd April, 2022. I welcome academicians, faculty members, scholars, participants and students to this conference for sharing their learning on a single stage. JUT is an autonomous body intended to impart higher, technical education and skill development and other such programs in the state of Jharkhand, India. Through the present conference, we, GGSESTC, Bokaro and JUT, Ranchi, aim to bring together leading scientists, researchers and research scholars to exchange and share their experiences and research results about all aspects of Engineering, Applied Science & Management. It also provides a premier interdisciplinary and multidisciplinary forum for researchers, industry practitioners and educators to present and discuss the most recent innovations, trends, concerns, practical challenges encountered, and the solutions adopted in the field of all Engineering, Applied Science & Management domain.

JUT appreciates GGSESTC for its continuous efforts in making its students industry ready. GGSESTC is making its students strong and capable in the technical & management fields, along with making them aware towards social issues and environmental concerns through varieties of technical and cultural programs. The National Conference, NCRTESM-2022 is another gem on the crown of GGSESTC which is providing a huge opportunity not only to its students to participate, and meet national level academicians, scholars and faculty members, but also going to offer networking opportunities to all participants to interact with scientists and researchers as well as sponsors and exhibitors. The purpose of this conference is very clear and concise- to integrate interdisciplinary inquiry to enable delivery of best applications.

Nowadays the academia and researchers are not only pondering but also experiencing the overwhelming outcomes of interdisciplinary researches. The various thematic sessions of NCRTESM-2022 will showcase important Technological & Management advances and highlight their significance and challenges in this world of fast changes. The keynote speakers at NCRTESM-2022

will foster discussions and inspire participants from all over India to initiate Research and Development collaborations within and across disciplines for the advancement of Technology and Management studies.

I am looking forward to the conference NCRTESM-2022 and I am sure we all shall share a pleasant and fruitful learning experience.

Prof. (Dr.) Vijay Pandey

Message from President, GGES

Shri Tarsem Singh
President, GGES, Bokaro, Jharkhand

On behalf of Guru Gobind Singh Educational Society, the promotors of this **National Conference on Recent Trends of Engineering, Science and Management (NCRTESM-2022)** in association with Jharkhand University of Technology, Ranchi on 22nd and 23rd April, 2022, I would like to extend my warm welcome to all researchers, academicians, attendees and students.

In our days, there were hardly any colleges of repute in town. As we achieved great success in promotion of education through our schools, the society established GGSESTC which is recognised as a premier higher technical education institution of the region and state.

We strongly believe that every student is a unique person with his or her own set of abilities, needs and aspirations. Besides academic excellence, the college is committed to inculcate in all its students, strong ethics and values of integrity, politeness, kindness and respect for elders. I firmly believe that education should foster confidence, discipline, clarity in thought and decision-making ability to set and achieve goals, and above all a sense of social responsibility as a life-long process.

The unique GGSESTC pedagogy is backed up with state of art infrastructure. This brings excellence in learning, training and placements. The students are groomed to think out of the box and imbibe skills of articulation, innovation and team work. In this way we uphold our commitment towards nation building.

The main goal of organizing this conference is to share and enhance the knowledge of each and every individual in this fast-moving era of information.

I would like to extend my gratitude to Jharkhand University of Technology, Ranchi for their support towards the NCRTESM-2022.

I congratulate the Director, all Faculty members and all students for organising this National Conference. I am sure that their endeavours will be widely discussed and the participants will have meaningful interaction and exchange of information and learning during the course of National Conference. I wish the NCRTESM-2022 a grand success.

Shri Tarsem Singh

Message from Director, DTE, Ranchi

Prof. (Dr.) Arun Kumar
Director, DTE, Ranchi, Jharkhand

I congratulate GGSESTC, Bokaro for organising **National Conference on Recent Trends of Engineering, Science and Management (NCRTESM-2022)** in association with Jharkhand University of Technology, Ranchi. To keep up with the growth of technological revolution in the fields of Engineering, Science & Management, NCRTESM-2022 is going to provide ample opportunities for discussion and innovation.

DTE, Jharkhand intends to promote creation of education and research centres of excellence in Science, Technology, Engineering and Management, Town Planning, Applied Science and such other programmes. Technical Education Directorate is committed to provide world class technical education in the state through its transparent monitoring and assistance to all government & affiliated Engineering, Polytechnic, Pharmacy, Management & Hotel Management colleges under its jurisdiction of Jharkhand state. On the other hand GGSESTC is providing quality education to its students and making them technically and professionally sound. The present National Conference, NCRTESM-2022, is a step ahead. Here, the participants will get exposure to tremendous ideas as well as learning opportunities.

A majority of today's services and products have some element of Engineering involved in their conception at least, paving the way to long, fulfilling and healthy lives for the people influenced by them. Engineering disciplines integrate scientific principles with practice oriented research, providing systems and processes for the same. On the other hand, Management is required in every field of activity. It may be concerned with hospitals, industry, commerce, education or government.

Engineering & Management can be treated as the basis of a healthy and peaceful society. In many cases, the seed of a new technology is developed within the scientific community; other times this occurs as business-oriented research and development. While the business community often employs a collaborative work environment like that of collaboration with science, it has a different emphasis, namely, bringing products and services to market, as opposed to building knowledge, and so adheres to a different set of standards than the scientific community.

The conference NCRTESM-2022 focuses on a wide spectrum of topics and subject areas in Engineering, Science and Management. It is thus a zenith, where technology and skill meet opportunities and guidance.

Prof. (Dr.) Arun Kumar

Message from Director, BIT, Sindri

Prof. (Dr.) D. K. Singh
Professor, ECE, BIT, Sindri, Dhanbad
Director, BIT, Sindri, Dhanbad

The fields of Engineering, Science and Management are going through continuous and rapid evolution. Science is actually the basis of all Engineering. Science builds knowledge of how the natural world works, Engineers use that knowledge to develop useful technologies and these technologies may, in turn, provide key observations and tools that help scientists build even more knowledge of the natural world. Engineers often rely on multiple rounds of testing, evidence collection, and design modification in order to optimize the performance of a new technology. For example, more than 20 years of evidence gathering went into the development of a safe and effective polio vaccine. Recently, our scientists went through unprecedented hard work to meet the challenges of Pandemic Period. Development of any vaccine is typically measured in years, not months. But as the COVID-19 pandemic raged on, scientists are racing against time and broke records to develop an immunization programme that provided complete protection against the virus which they successfully developed. However research in this regard is still going on.

Management is universal in the modern industrial world and there is no substitute for good management. On one hand, management minimizes industrial and employee disputes and contributes to sound industrial relations and on the other hand it leads to better economic prosperity through production. It helps in achieving Group Goals. Management arranges the factors of production, assembles and organizes the resources, integrates the resources in effective manner to achieve goals. It also builds social prosperity by giving impetus to economic growth.

Engineering, Science and Management together are a successful combination of subjects. I congratulate GGSESTC, Bokaro for organising "**National Conference on Recent Trends of Engineering, Science and Management (NCRTESM-2022)**". GGSESTC has been consistently working hard and consequently bringing benefits to its students. The students of Engineering and Management have got a great opportunity that a National Conference of such dimensions is being organised in their college and they can learn effortlessly and enhance their knowledge.

I hope NCRTESM-2022 will become an important National Conference for academicians, faculty members, scholars and students as it is dedicated to bring out latest trends in Engineering, Science and Management. I express my best wishes to GGSESTC and JUT for the success of NCRTESM-2022.

Prof. (Dr.) D. K. Singh

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Message from Secretary, GGES

Shri Surendra Pal Singh
Secretary, GGES, Bokaro, Jharkhand

I am indeed delighted to welcome you all to the two days' **National Conference on Recent trends on Engineering and Management-2022 (NCRTSEM-2022)** themed on "Technology Transformation for Growth and Sustainability" organized by GGSESTC, Kandra, in association with Jharkhand University of Technology on 22nd and 23rd April, 2022.

Guru Gobind Singh Educational Society's Technical Campus (GGSESTC) has started its journey of academic excellence in the year 2011. The Technical Campus is promoted by Guru Gobind Singh Educational Society. The Society has many schools running under its umbrella at various parts of the country. The society established Guru Gobind Singh Educational Society's Technical Campus at Bokaro, Jharkhand in 2011.

We at GGSESTC focus on individual development of our students in technical learning as well as inculcating soft skills by conducting & organising various training programmes, industrial visits workshops, seminars, guest lectures by eminent professionals from renowned Institutes, Colleges & Industries.

The vision and mission of our institute is to provide world class education, training and research opportunities in fields of Technology, Management and other disciplines to students and to became a centre of academic excellence and be an ecosystem vehicle for aspiring technologists and entrepreneurs.

The post covid world is not the same as it was before. Things have changed and many technological and socio-economic reforms have been brought in. These reforms come with a number of challenges and one such challenge is sustainability of development through technological transformation.

NCRTSEM-2022 is one such initiative by GGSESTC that has been organized in both online and offline modes. The purpose of this conference is to understand the paradigm of sustainable development and technology transformation along with modern-day trends to localize their applications in today's fast paced world.

This conference welcomes researchers, academicians, and experts from different fields of technology and facilitates them to interact and exchange their ideas for sustainable growth.

This conference aims to provide an interactive platform to promote and present new researches and their results in the diverse fields of Science, Engineering and Management

I appreciate the efforts and hard work of the organizing committee for this important national conference which shall benefit all participants and stakeholders. I extend my best wishes for the success of NCRTESM-2022. Thank you!

Shri Surendra Pal Singh

Message from Director, GGSESTC

Prof. (Dr.) Priyadarshi Jaruhar
Director, GGSESTC, Bokaro

I welcome Hon'ble Vice Chancellor, Jharkhand University of Technology, Ranchi, Prof. (Dr.) Vijay Pandey, Hon'ble President GGES Shri Tarsem Singh, Hon'ble Secretary, GGES Shri Surendra Pal Singh, Hon'ble Director Technical Education, Jharkhand Prof. (Dr.) Arun Kumar, Hon'ble Director BIT Sindri Prof. (Dr.) D. K. Singh, respected academicians and eminent researchers, faculty members and dear students to Guru Gobind Singh Educational Society's Technical Campus for **National Conference on Recent Trends of Engineering, Science and Management (NCRTESM-2022)**. I especially express my gratitude to Hon'ble Vice Chancellor, JUT for providing their valuable association for this noble academic cause.

The aim of this national conference is to provide an outreach platform to eminent academicians, technologists, scientists, entrepreneurs and management researchers to present latest research and development in their respective fields. Dr. Mashalkar, first chairman of Academy of Scientific and Innovative Research (AcSIR), an institute established for the purpose of granting doctoral and post-doctoral degrees, has famously said - "publish or perish". He encouraged academic presentations, conferences and publications of research.

Dr. A. P. J. Abdul Kalam, Hon'ble President and missile man of India breathed his last while delivering a lecture at IIM, Shillong. During one of his technical presentations in Kolkata, he set aside presidential protocol to openly invite queries from the participants and replied to them directly.

India has a proud legacy of most eminent scientists and researchers like Dr. Shanti Swaroop Bhatnagar, first Director of CSIR, first chairman of UGC who was awarded Padma Bhushan and who is also known as father of research laboratories in India, always encouraged and promoted scientific and industrial research among young scientists;

Dr. Homi Jehangir Bhabha, Vikram Ambalal Sarabhai, C. N. Rao and others were instrumental in the post-independence development and revolution of science, technology and research in India.

Eminent physicists C. V. Raman and Jagdish Chandra Bose, Botanist Birbal Sahni, Astrophysicist Meghnad Saha, Mathematicians Srinivas Ramanujam and S. S. Abhayankar, Statistician P. C. Mahalanobis, Space Scientists Venkataraman Radhakrishnan and S. Chandrashekhar, Ornithologist

Salem Ali, Engineer Mokshagundam Visvesvaraya and others gave expansion to scientific contemplation in modern India.

Most recently, path-breaking research and development work has been done by the likes of Microbiologist Amit Singh, Structural Biologist Arun Kumar Shukla, Chemical Scientist Kanishka Vishwas, Computer Scientist Devdeep Mukhopadhyay, Bio-Engineer Rohit Srivastava and others.

In the field of Management, Vikram Sarabhai did pioneering work by establishing Indian Institutes of Management. Little needs to be said about our skills and talents in Management when Global leading companies have Indian CEOs like, Google – Sundar Pichai, Mirosoft Corporation Satya Nadella, IBM Group – Arvind Krishna, Twitter – Parag Agarwal and so the list goes on.

It gives me great pleasure to share with you that NCRTESM–2022 has received research papers from all over India. As the name of this national conference suggests, the research topics herein span a vast range of subjects including Textiles, Refrigeration, Advanced Energy, Smart Traffic Control, Routing techniques, Geometric Programming, E-banking Authentication, Cyber safety, Thermodynamic Analysis, Communication skills, Higher & Technical Education, Role of Foreign Direct Investment, Job Satisfaction and Employee Performance, etc.

I desire not to take any more time now. Hence, I once again welcome and thank on behalf of GGSESTC, all our eminent guests, participants, faculty members and students who are here to make this National Conference successful.

Prof. (Dr.) Priyadarshi Jaruhar

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Contents

Paper Presentation

Abstracts of Poster Presentation

Thermodynamic Analysis of Recompressions CO_2 Brayton Cycle Utilizing Waste Heat recovered from Marine Gas Turbine

[*]Abhijeet Sahoo[1], [*]Mukul Jain[2], Dr. Sanjay[3]

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Abstract: Gas turbines are extensively used to power high speed marine transportation including cargo vessels, commercial and luxury transport, naval fleet etc. Gas turbines have come to replace traditional steam and diesel-powered marine engines because of relative higher efficiency and compactness. However, the major disadvantage associated with gas turbines is the wastage of thermal energy in form of higher exhaust temperatures. This article analyses the potential of making the gas turbine hybrid with a recompression supercritical Carbon Dioxide (CO_2) Brayton cycle utilizing waste heat from the exhaust of the marine gas turbine. The proposed cycle has a maximum temperature of 500 ^{0}C and maximum pressure of 20 MPa. The cycle has been analyzed against key operating parameters like maximum temperature, minimum temperature, and pressure ratio. The thermal efficiency of the proposed cycle is 37.88% and that of the hybrid cycle (Gas turbine with super critical CO_2 Brayton cycle) is 62.46%. The power output of the cycle is 5277 kW which improves the power output of the gas turbine by almost 14.3 % to 42.2 MW. Second law efficiency of the proposed cycle is close to 60.54%.

Keywords- Recompression cycle; Waste heat recuperation; sCO2 cycle; Marine gas turbine; Component-wise exergy destruction

1.   Introduction

The thermal energy source from the exhaust of the gas turbine has immense potential for utilization due to the significantly high temperature of the exhaust gases and large flow rates. A supercritical CO_2 power cycle is an in-vogue with numerous advantages, including superior thermophysical properties at supercritical pressure and temperatures ideal for integration as the bottoming/low-temperature cycle with gas turbine being the topping/high-temperature cycle. Generally, thermal energy from gas turbine exhausts is recouped through a heat recovery steam generator which has a significant size and the steam generated is used in the marine vessel suitably. sCO2 power cycle incorporates supercritical carbon dioxide as working fluid instead of air in a Brayton cycle layout. As the name suggests, the working fluid is operated at supercritical pressures and temperatures. In the supercritical state, the fluid properties of carbon dioxide are significantly affected. The compressor work is much less due to operation beyond the supercritical point. Near the critical point, thermophysical properties of carbon dioxide change significantly with temperature.

Table 1 represents few working fluids. Interesting inference is, that out of all fluids CO_2 has a modest critical temperature and moderate critical pressure. This property makes it more suitable out of the listed fluids to be used as a working fluid.

The other properties which make CO_2 more desirable than other fluids is listed below:

   a)   It is non-toxic, non-corrosive, largely inert
   b)   It is abundantly available
   c)   It has zero ODP (Ozone Depletion Potential)

The idea about supercritical CO_2 cycle was first proposed by Sulzer [15] in 1950 after presenting results following analysis of a partially condensing CO_2 cycle. G Angelino [2] suggested modifications to the original cycle developed by Sulzer. He proposed the regeneration, recompression, pre-compression and precooling cycles as modifications to the original cycle. The modifications were proposed to address the problem of high internal irreversibility in the heat exchangers. Feher [4] analyzed potential working fluids such as CO_2, helium etc. to explore the possibility to replace air as the working fluid. He suggested that an sCO2 Brayton cycle utilizing waste heat from nuclear reactor can be used for designing a compact electric generator. V Dostal [3] did a comprehensive study about supercritical sCO2 cycles in his PhD thesis. The effect of variable operating parameters was investigated extensively and results were presented. He reported that a recompression sCO2 Brayton cycle operating at a turbine inlet temperature of 550 ^{0}C had efficiency in the range of 46-50%. Since the interest of this article is waste heat recovery from marine gas turbine, works of researchers in this field has been reviewed ahead. Walnum et al. [17] analyzed the supercritical CO_2 cycle utilizing waste heat recovered from

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LM2500+G4 marine gas turbine. They reported a combined efficiency of 45% at 60 %-part load of gas turbine. Hou et al. [5] studied a combined recompression-regeneration sCO_2 cycle for waste heat recovery of LM2500+ marine gas turbine. They reported a power output of 10.25 MW from the supercritical layout and improvement of stand-alone gas turbine thermal efficiency by 12.38%. Sharma et al. [13] conducted an investigation of recompression-regeneration sCO_2 cycle utilizing waste heat from LM2500 marine gas turbine. They reported a power output of 5148 kW at an optimum pressure ratio of 2.47 for zero pressure losses in the heat exchangers. Singh et al. [12] did thermodynamic analysis of fuel cell integrated recompression sCO_2 cycle for a desired power output of 440 kW for application into aircraft auxiliary power unit. Singh et al. [11] analyzed the recompression cycle for waste heat utilization from nuclear reactor to power an autonomous underwater vehicle having 40 kW-hr power requirement. Sarkar [10] applied the second law of thermodynamic analysis to a recompression sCO_2 cycle and inferred that the heat exchangers exhibited maximum exergy destruction.

2.Mathematical modelling

Assumptions

Thermodynamic modeling of each cycle component has been done considering following assumptions: -

1. Steady-state heat transfer and no heat loss to the ambient.
2. Pressure loss across the components is neglected.
3. Inlet condition to the compressor is taken near the critical values of the working fluid.
4. The potential and kinetic energy changes of the working fluid are neglected.
5. The ambient condition is taken as 298.15 K (T_{amb}) and 0.1013 MPa (P_{amb}).
6. The dead state for exergy analysis is taken as 308.15 K (T_0) and 0.1 MPa (P_0).

Exhaust Gas Analysis

The specific heat of exhaust gas for the given fuel composition [1] at constant pressure is given in the polynomial form below [16]

$$(c_p)_g = (a_1 + b_1 T - c_1 T^2 + d_1 T^3)/v \tag{1}$$

Where T is in K & T>800 K, $(c_p)_g$ is in kJ/kg-K &

$$(c_p)_g = (a_2 - b_2 T + c_2 T^2 - d_2 T^3)/v \tag{2}$$

Where T is in K & 590 K<T<800 K, $(c_p)_g$ is in kJ/kg-K &

The enthalpy and entropy of the flue gases at different temperatures has been calculated by the generalized equations given below:[11]

$$h = \int_{T_0}^{T} (Cp)_g \, dT \tag{4}$$

$$\theta = \int_{T_0}^{T} \frac{(Cp)_g \, dT}{T} \tag{5}$$

$$s = \theta - Rln\frac{P}{P_0} \tag{6}$$

Main compressor (MNC) -

The isentropic efficiency is given as -

$$\eta_{MNC} = \frac{h_{2s} - h_1}{h_2 - h_1} \times 100 \tag{8}$$

Work required for the Main compressor -

$$W_{MNC} = (h_2 - h_1) \times \dot{m}_c \tag{9}$$

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Re-compressor (REC) -

The isentropic efficiency is given as:

$$\eta_{REC} = \frac{h_{10s} - h_6}{h_{10} - h_6} \times 100 \tag{10}$$

Work input to the Re-compressor-

$$W_{REC} = (x) \times \dot{m}_c \times (h_{10} - h_6) \tag{11}$$

HTR:

Effectiveness of HTR is given as

$$\varepsilon_{HTR} = \frac{h_5 - h_8}{h_4 - h_8} \times 100 \tag{12}$$

Energy balance of HTR is written as

$$h_8 + h_4 = h_5 + h_9 \tag{13}$$

LTR:

Effectiveness of LTR is given as –

$$\varepsilon_{LTR} = \frac{h_7 - h_2}{h_9 - h_2} \times 100 \tag{14}$$

Energy balance for HTR is written as:

$$(x) \times (h_7 - h_3) = h_9 - h_6 \tag{15}$$

Turbine:

The isentropic efficiency is given as:

$$\eta_{TUR} = \frac{h_3 - h_4}{h_3 - h_{4s}} \times 100 \tag{16}$$

Work output from the turbine:

$$\dot{W}_{TUR} = \dot{m}_c \times (h_3 - h_4) \tag{17}$$

Primary Heat Exchanger (PHE):

Heat input in the power cycle –

$$\dot{Q}_{in} = \dot{m}_c \times (h_3 - h_5) \tag{18}$$

Net work done by the cycle is written as:

$$\dot{W}_{net} = \dot{W}_{TUR} - (\dot{W}_{MNC} + \dot{W}_{REC}) \tag{19}$$

Thermal efficiency/Energetic efficiency of the cycle:

$$\eta_{th} = \frac{W_{net}}{\dot{Q}_{in}} \times 100 \tag{20}$$

Exergetic Analysis

The general expression for specific exergy flow at each state point from the second law of thermodynamics is given as:[12]

$$e_k = (h_k - h_0) - T_0(s_k - s_0) \tag{21}$$

Where k denotes the cycle state points from 1-10

Total exergy input to the cycle is given as

$$\dot{E}_{in} = \dot{Q}_{in} \times \left(1 - \frac{T_0}{T_{g,in}}\right) \tag{22}$$

In the above expressions $T_{g,in}$ is assumed constant for calculation purposes

A non-dimensional fraction i_j is defined which is the ratio of exergy destruction of j_{th} component and total exergy input rate to the cycle given below:[10]

$$i_{TUR} = [\dot{m}_c(e_3 - e_4) - \dot{W}_{TUR}] / \dot{E}_{in} \tag{30}$$

$$i_{MNC} = [(x\dot{m}_c) \times (e_1 - e_2) + \dot{W}_{MNC}] / \dot{E}_{in} \tag{31}$$

$$i_{REC} = [(1 - x) \times \dot{m}_c \times (e_6 - e_{10}) + \dot{W}_{REC}] / \dot{E}_{in} \tag{32}$$

$$i_{HTR} = [\dot{m}_c[(e_8 - e_5) + (e_4 - e_9)]] / \dot{E}_{in} \tag{33}$$

$$i_{LTR} = [\dot{m}_c[(e_2 - e_7) + (1 - x) \times (e_9 - e_6)]] / \dot{E}_{in} \tag{34}$$

$$i_{PC} = [(\dot{x}m_t) \times (e_6 - e_1)] / \dot{E}_{in} \tag{35}$$

$$i_{PHE} = [\dot{E}_{in} + \dot{m}_c(e_5 - e_3)] / \dot{E}_{in} \tag{36}$$

From the second law of thermodynamics, second law efficiency of the cycle is given as ratio of net work done to the total exergy input to the cycle.

$$\eta_{II} = \frac{\dot{W}_{net}}{\dot{E}_{in}} \tag{37}$$

Another expression to determine the efficiency is given as [10]:

$$\eta_{II} = 1 - \sum_{j=1}^{7} i_j \tag{38}$$

1 to 7 denotes the cycle components listed in order from equation (30) to (36) where 1 corresponds to TUR and so on.

If the expressions for second law efficiency in equations (37) and (38) are equal, then it signifies a proper exergy balance.

Results and Discussion:

An original and generic computer code was developed in EES [7] to simulate the cycle performance. The values of specific enthalpy and entropy was calculated from the property library in EES developed using the literature in [14].

Figure 3 shows the variation of cycle performance with respect to minimum cycle temperature. The principal reason for compressing at supercritical point is to take advantage of high densities of working fluid (CO_2). Near the critical point region, thermo physical properties like specific heat, density etc. undergoes large variation. Due to high density of CO_2 in this region, compression work becomes less leading to more power output. As seen from the figure, both the curves show a decreasing trend as we move away from the critical temperature i.e, almost 305 K. The sharp variation near the critical point for both the curves is because of abrupt changes of properties near the critical region.

Figure 4 shows the variation of cycle performance with respect to maximum cycle temperature. Any working fluid possesses higher enthalpy content at higher pressures and temperatures as compared to low temperature and pressure states. This increases the capacity to extract more useful work for the same flow rates, hence energetic efficiency increases. Moreover, with increase of temperature, quality of energy increases which is depicted in the increasing trend of the exergetic curve.

Figure 5 exhibits the variation of thermodynamic performance with cycle pressure ratio (r_p). As already established in the literature by Manente et al. [9], the pressure ratio range of 2.5-3.0 is ideal for sCO2 cycle operation. As evident from the energetic curve, energetic efficiency undergoes an increment of 21.6% and 35% when 'r_p' increases from 2.0 to 2.5 and 3 respectively. Moreover, both the curves show a decreasing trend after 'r_p' 5. For a fixed value of turbine inlet temperature and compressor inlet temperature, increase in 'r_p' results in increase of compressor outlet temperature but reduction in turbine outlet temperature. The subsequent effect is decrease in turbine work output and increase in compressor work input. Since, the cycle turbomachinery work at supercritical pressures, increasing the pressure ratio will lead to larger plant footprint which is undesirable in shipboard scenarios.

Figure 6 represents the part load performance for the cycle. On board ship parameters do not always adhere to maximum working parameters. Hence part load characteristics has been studied in this article. The load essentially means the flow rate of exhaust gas which affects the sCO2 cycle performance significantly as depicted in the figure 6. The heat input is linear with load, because load variation has been considered linearly. The thermal efficiency of sCO2 cycle increases with increase in load because of availability of more heat for cycle operation.

Figure 7 represent the exergy destruction rates across cycle components. The primary heat exchanger which recovers waste heat from exhaust gases shows the maximum exergy destruction rate at 26% of total followed by the cooler at 25.7%. The reason is attributed to the fact that both the heat exchangers deal with different fluids at dissimilar heat capacities and unalike pressures. The LTR contributes almost 16% to exergy destruction followed by the HTR at 6%. The heat exchangers and recuperators contribute a total of almost 74% of exergy destruction and the rest is observed in the rotating cycle components. More exergy destruction is observed in the turbine as compared to the compressors, because of larger temperature differences in the former.

Table 1 Critical point data for various fluids [4,6]

Fluid	Formula	Critical pressure (MPa)	Critical temp. (°C)
Carbon-dioxide	**CO_2**	**7.38**	**31.2**
Water	H_2O	22.05	374
Ammonia	NH_3	11.28	132.4
Perfluoro propane	C_3F_8	2.675	71.89
Sulfur-dioxide	SO_2	7.88	157.5
Sulfur-hexafluoride	SF_6	3.765	45.56
Nitrogen	N_2	3.4	-147
Nitrous Oxide	N_2O	7.23	36.4
Helium	He	0.23	-271

Table 3 Gas Turbine specifications [8]

Term	ISO condition
Power Output	36.977 MW
SFC	213 g/KW-hr
Heat rate	9098 KJ/KW-hr
Inlet air flow	93.5 Kg/s
Exhaust gas flow	93 Kg/s
Exhaust gas temperature	549 ^{0}C
Power turbine speed	3600 rpm
Pressure ratio	24.2
Thermal efficiency of gas turbine	39.57%

Table 2 Fuel composition [1]

Components of flue gas	Mass by percentage
Methane (CH_4)	86.21%
Ethane (C_2H_6)	7.20%
Nitrogen (N_2)	5.56%
Carbon Dioxide (CO_2)	1.03%

Table 4 Standard operating and design conditions

Table 5 Thermodynamic properties at defined state points for the recompression sCO_2 Brayton cycle, at standard operating and design conditions

Term	Set value
Exhaust gas flow	93 Kg/s
Exhaust gas temperature	822.15 K
Exhaust gas pressure	0.1084 MPa
Maximum cycle temperature (T_3)	773.15 K
Minimum cycle temperature (T_1)	313.15 K
Ambient temperature (T_{amb})	298.15 K
Maximum cycle pressure (P_{max})	20 MPa
Minimum cycle pressure (P_{min})	8 MPa
Ambient pressure (P_{amb})	0.101325 MPa
Cooling water inlet temperature	298.15 K
Cooling water outlet temperature	323.15 K
sCO_2 turbine isentropic efficiency	90%
sCO_2 compressor isentropic efficiency	86%
Effectiveness of HTR, LTR, PHE	75%
FSR(x)	0.7

State point	Pressure (MPa)	Temperature (K)	Enthalpy (kJ/kg)	Entropy (kJ/kg K)	Flow rate (kg/s)
1	8	313.2	-103.9	-1.08	58.15
2	20	379.2	-66.8	-1.07	58.15
3	20	773.2	466.5	-0.08	83.08
4	8	667.8	354.4	-0.06	83.08
5	8	636.5	298.8	-0.31	83.08
6	8	393.9	39.86	-0.66	83.08
7	20	490.9	115.2	-0.64	58.15
8	20	490.9	115.2	-0.64	83.08
9	8	510.3	175	-0.36	83.08
10	20	490.9	115.2	-0.64	24.92

Figure 1: Configuration of Recompression sCO_2 Brayton Cycle
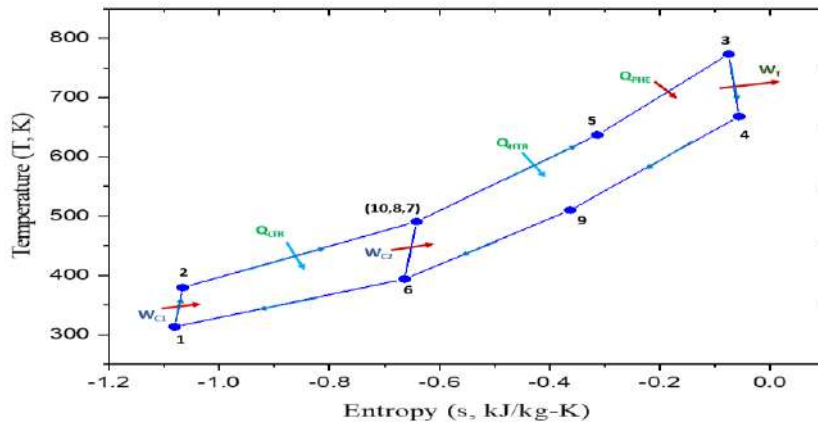
Figure 2: T-s diagram of Recompression sCO_2 Brayton Cycle
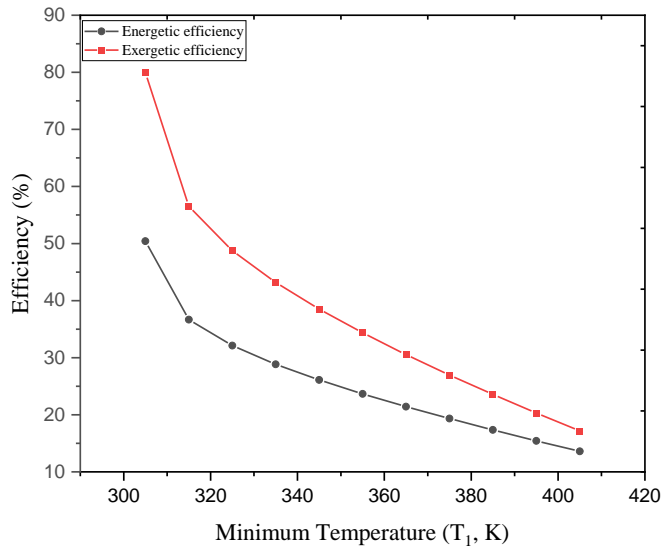
Figure 3: Variation of thermodynamic performance with minimum temperature.
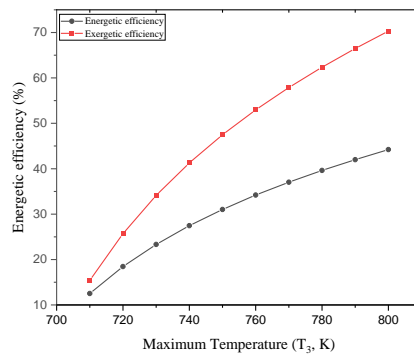
Figure 4: Variation of thermodynamic performance with maximum temperature.
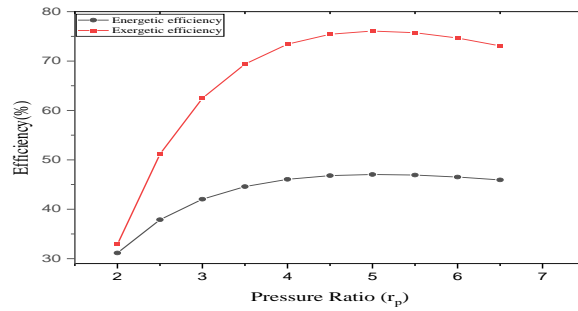
Figure 5: Variation of thermodynamic performance with pressure ratio.
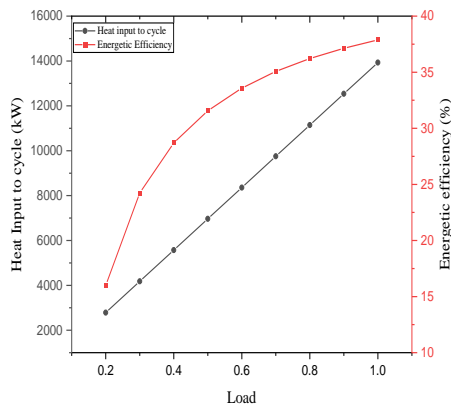
Figure 6: Effect of Gas Turbine Load variation on Corresponding Heat input and Thermal Efficiency.
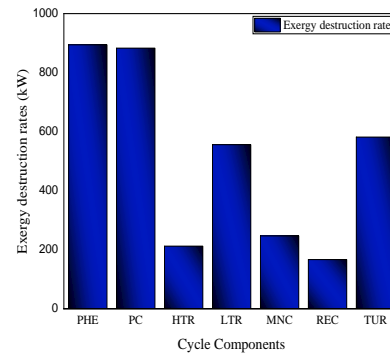
Figure 7: Component wise Exergy destruction rates.

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A Study on Factors Influencing Job Satisfaction and Its Impact on Employees Job Performance in Multi-purpose Co-operative Societies in Goa

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Abstract:

The research aims to analyse the significant factors that influence employee job satisfaction in the Multi-Purpose Cooperative Society (M.P.C.S.) and study the impact on employee job performance. The primary data was collected through personal interviews with employees. Secondary data was collected from the office of the Registrar of co-operatives. . A sample of 84 employees was randomly selected from 40 active multi-purpose co-operative societies out of 59 registered with the Registrar of co-operatives. The data was then analysed with regression and factor analysis. The study found the four major factors that influence employees' job satisfaction, i.e. salary and promotion, recognition, work environment and job security. Out of These, recognition, work environment, and job security are the most effective and significant factors that positively impact job performance. The study concludes that M.P.C.S. should provide a timely increment in employees' salaries so that the employees will perform better than he does now. Employees will also serve best when they have a sense of job security and are motivated by their senior or managers. Thus, employee satisfaction will lead to work efficiency and effective productivity, thus ultimately achieving the organisational goal.

Keywords: Co-operatives, employees, multi-purpose, performance, satisfaction.

1. Introduction:

Co-operative means are working together. "Co-operation is for self-help and the mutual help of fellow beings. It is formed through joint efforts of financially weak or unstable. It cannot stand on its own, therefore coming together to overcome their financial disability arising due to inadequate resources and not getting profits and thus improving their economic conditions" (Katju, 2005). Co-operative banks are a particular type of banking in which people voluntarily co-operate with each other with an idea to promote their mutual interest (Sakharam, 2014).

It is mainly started as small grass-root organisations in North America, Western Europe and Japan in the middle of the last century. Back in 1771-1858, a Welshman who made his fortune in the cotton trade believed in putting his workers in a good environment with access to education for themselves and their children; his belief turned into a great success in the cotton mill Scotland (Sakharam, 2014). This is how; the first co-operative store was opened. Robert Owen initiated the organisation of co-operatives and ultimately became the "father of Co-operation". Later, people like William King and a host of British leaders took steps to organise co-operatives. However, all these turned out to be failures (M. Karthikeyan, 2012). A group of 28 artisans in the year 1844 established the first modern co-operative business, "the Rochdale Equitable Pioneers Society", while working in the cotton mills in the town of Rochdale in England, which forms the basis of a co-operative moment today (Sakharam, 2014). Co-operative societies have significantly evolved over the last 200 years and are playing a vital role in the socio-economic development of the country as well as the world (Altman, 2009). It is a voluntary network that owns and controls the enterprise to produce and distribute goods and services for the benefit of the locals and financially weaker segments of society. It is usually organised by farmers, employees, consumers and is considered a non-profit organisation (Mallah, 2015).

1.1 Co-operative Movement in India

The Indian co-operative movement was started with the primary objective of helping needy and poor impoverished farmers under the burden of significant debts. To conduct agricultural activities, farmers need short term, medium-term or long-term credit. Still, these small agriculturists do not have a property to be seen as a security to avail loan from financial institutions or banks (Naqvi, 2014). Due to this, they have to rely on private agencies like Mahajan or Sahukars, professional and non-professional money lenders, landlords, friends and relatives. These private agencies charge actual interest rates in lending money, which further increases the indebtedness of farmers. This scenario continues from one generation to another. Therefore, it won't be wrong to say that Indian farmers are born in debt, live in debt and die in debt (Naqvi, 2014).

These problems of farmers were considered Government and other Indian leaders and further appointed Mr Nicholas to find the solution. After studying the agricultural credit organisations of Europe and America, a brief report was submitted which concluded that every village must have a Raiffeise (Naqvi, 2014).

The co-operative movement was initiated bypassing the co-operative society act in 1904 to encourage thrift, co-operation and self-help among farmers, artisans and people with limited resources. Societies so formed were given legal status and were authorised to raise funds. Due to deficiencies in the current co-operative act, it was reframed again, and a new act was passed in 1912 (Chunilal, 2014).

1.2 Multi-purpose Co-operative

The states are conscious of developing co-operative societies to re-organise rural life. Among Co-operative bodies working in rural life, multi-purpose societies have rightly come to occupy an important place (Agrawal, 2012). A co-operative involved in only one activity is called a single purpose co-operative society, and if society undertakes multiple functions, it is called a multi-purpose co-operative. A co-operative society established to achieve various objectives is called a multi-purpose co-operative society. (Edwinraj et al., 2013)

Multi-purpose co-operatives divide villagers' needs, activities, and assets into mutually exclusive parts such as credit, production sale, etc. Under this co-operative, emphasis is placed on the concentrated and all side development of rural areas (Agrawal, 2012). It helps its agriculturalists access the input they require to grow crops, such as providing credit, giving agricultural implements on rent, keeping livestock, and then helping them process and market their product (Edwinraj et al., 2013).

The primary objectives of multi-purpose co-operative societies are to promote self-help and co-operation among the members and assist them in thy tide over their financial difficulties. M.P.C.S. help members purchase and own agricultural implements, machinery or animals for hire to its members and assist their economically backward class by helping them financially and technically establish small scale or cottage industries, businesses, services, etc.

1.3 Cooperative Movement in Goa

The ideas of the people about co-operation in Goa were so old. Goans started co-operative activities in the form of "communidades" centuries ago as early as the Portuguese came to Goa (Patil, 1999). The Co-operative Movement was launched in the union territories of Goa, Daman and Diu; way back in the year 1962for the advancement of the weaker and poor section of the society (The Office of the Registrar of Co-operative Societies, 2020). However, an official co-operative movement in Goa began late with the institution of the office of the Registrar of Co-operative Societies on 17th November 1962, soon after the liberation from the Portuguese regime on 19th December 1961 (Patil, 1999).

Soon after 1962, the movement spread over different sectors such as dairy farming, agriculture, fisheries, credit, consumers, housing, industry, and other Co-operative societies. All the co-operative societies running in Goa are registered and governed under the Goa Co-operative Societies Act, 2001 and the Co-operative Societies Rules 2003 (The Office of the Registrar of Co-operative Societies, 2020). The primary objective of the Registrar of co-operatives is to see that the co-operative societies are organised and managed as per the basic co-operative principles and works to promote the economic interests and welfare of the people. The co-operation department also provides guidance and backing for the progress and advancement of Co-operatives in the State (The Office of the Registrar of Co-operative Societies, 2020).

Table No 1: Growth of M.P.C.S. Goa

Year	No. of Societies	No. of Members	No. of societies in loss	No. of societies in profit	No. of societies with no profit/loss
2012 – 2013	5	451	3	2	0
2013 – 2014	20	13,209	0	13	7
2014 – 2015	36	14,485	6	25	5
2015 – 2016	44	25,415	18	25	1
2016 – 2017	48	24,094	7	29	12
2017- 2018	52	20,675	4	30	18

Source: Compiled from Registrar of Cooperatives societies, Goa.

Table no 1 shows a significant increase of Multipurpose Co-Operative Societies (M.P.C.S.)) i.e. from 5 MPCS (2012-2013) to 52 MPCS (2017-2018). On average, the growth in the number of M.P.C.S. was at 10 % annually from 2012-to 2018. The member's composition grew from 451 to 21,850. The data shows that numbers of societies making profits are growing, i.e. from 2 Co-operatives it has come up to 30 societies. There are 18 societies in the year 2018 working at no profit/loss level, whereas 4 Co-operatives are running into losses. Goa's

Co-operative society has grown in number, types, membership size, etc. It can be seen from the above data that the performance of multi-purpose Co-operatives has shown a positive growth from year to year.

As per the author's survey in 2019, 59 M.P.C.S. registered at the Registrar of Co-operatives Panjim Goa office. Only 40 are actively working, and 19 Co-operatives are stagnant and on the edge of closing down. The researcher, through this study, also found that Creative Multi-purpose Co-operative society Sanquelim-Goa is the first Multi-purpose Co-operative society formed in the year 2009.

Table no 2: Zone wise M.P.C.S. in Goa

Zone	No. of Co-operatives
Bicholim	16
Mapusa	19
Panjim	4
Ponda	13
Margao	3
Quepem	4
Total	59

Source: Compiled from Registrar of Cooperatives societies, Goa.

Table no 2 shows zone wise distribution of M.P.C.S. in Goa. It can be observed there are 39 Co-operatives societies registered in North Goa, i.e. from Bicholim, Mapusa and Panjim and 20 co-operative societies registered in south Goa, i.e. from Ponda, Margao and Quepem. There are altogether 59 multi-purpose co-operatives registered in Goa.

1.5 Theoretical Perspective

Human resources are considered an essential asset to any organisation because the success of any organisation mainly depends on its human resource. Similarly, employees of co-operatives are also valuable assets to their societies or bank (Mobarak et al., 2014).

1.5.1 Employee's Job Satisfaction

Satisfaction is a very subjective term and is variedly described by different employees (Walia, 2019). Satisfaction among employees enables a higher level of organisational commitment among satisfied employees and achieves success growth and development (Gebrekiros et al., 2015). Job satisfaction of employees plays a crucial factor in determining job performance (Vrinda et al., 2015).

1.5.2 Employee's Job Performance

Employee performance is a significant factor in every organisational success. The prosperity of any organisation depends mainly on the employee's qualities, capabilities and skills, which can be measured by their performance (Thapa et al., 2017). Therefore, efficient human resource management, maintaining employee satisfaction, and measuring employee performance are thus crucial tasks for every organisation (Mobarak et al., 2014).

2. Review of Literature

An extensive literature review was conducted to know the research work undertaken. Books, journals, and articles published in newspapers for the literature study were reviewed. The most prominent of them are discussed as under:

Jitmun et al. (2020) studied the factors that influence the membership in dairy co-operatives in Thailand. With 385 randomly selected dairy co-operative farmers and a binary logit regression model, the study revealed that herd size, education, and farming experience positively influence membership in dairy co-operatives.

Kifle Sebhatua (2020) has analysed the effect of co-operative's size on conflicts, fraud and distrust in Ethiopian agricultural co-operatives. The sample for the study consists of 511 agricultural co-operatives from 12 districts of the Tigray region in northern Ethiopia. A structured questionnaire was used, and thus data were analysed using descriptive statistics, t-test, chi-square test, and correlation. It is found that co-operative size matters the social performance of consumer co-operative in terms of the trust. There are chances of experiencing conflicts and fraud in large co-operatives.

Garg et al. (2018) aimed to study job satisfaction among the managers at various hierarchical levels and whether it has intrinsic or extrinsic job satisfaction that enhances work engagement. The sample of 148 managers was undertaken and analysed with descriptive statistics and regression. The study concluded that private bank managers have intrinsic job satisfaction, and thus the positive relationship between job satisfaction and work engagement.

Gerwen et al. (2018) examined the relationship between skills and co-operative behaviour of employees. The study results that training promotes collective behaviour among highly skilled workers through contextualised laboratory experiments.

Chareonwongsak (2017) has investigated the factors that affect the motivation of the co-operative's board of directors using structural equation modelling. Primary data was collected through a questionnaire, whereas secondary sources provided financial and non-financial indicators of co-operative in Thailand. The study shows that factors that motivate the board of directors include board authority and function, board meeting quality, board members' skills, financial compensation, and transparency.

Thapa et al. (2017) has attempted to find the most influencing factors of employee performance in commercial banks of Nepal. Data were collected from 200 employees working in commercial banks in Kathmandu valley through an unstructured questionnaire and analysed with a descriptive statistic, ANOVA, correlation, and one-sample t-test. It is found that employees are satisfied where they are working. The study also shows that work-life balance, incentives and rewards, work environment, employer branding, career growth and organisational culture have a significant relationship between commercial banks and employee performance. The results further revealed no meaningful relationship between retention and motivation.

Muleye (2017) has extensively analysed factors contributing to members' satisfaction with their co-operatives in Ethiopia's South Wollo zone. Using 95 surveys, the data were analysed with factor analysis, descriptive statistics and correlation, and the Kruskal-Wallis test. The study concludes that to improve members' happiness, co-operatives should work on managing and administering resources.

Wiwiek (2015) has attempted to analyse the impact of servant leadership on organisational culture, organisational citizenship behaviour (O.B.C.), organisational commitment and employee's performance in women co-operatives. The sample consisted of 40 respondents involving managers and employees of women co-operatives. Descriptive analysis and Partial least square method were used to analyse the collected data. The research shows that servant leadership significantly impacts organisational culture and citizenship behaviour but has not impacted employees considerably; organisational commitment has no effect on employee performance, or O.B.C. and O.B.C. have impacted employees' performance.

Humayun et al. (2014) studied the factors influencing job satisfaction among bankers and learned the techniques that keep employees motivated to work. The response of 100 employees was collected through a questionnaire with various methods. The result showed a significantly positive relationship between reward and recognition, satisfaction with supervision and compensation. The result also showed a very positive and significant relationship between job satisfaction and intrinsic balance.

Mobarak et al. (2014) has evaluated the level of job satisfaction of employees working in Janata Bank Limited. The primary data was collected through survey method with the sample of 20 employees and found that job preference, co-operation among co-workers, working environment, working facilities, salary satisfaction, increment satisfaction, welfare facilities, other facilities, performance appraisal system, behaviour of boss, career development organism, and promotion system significantly influence job satisfaction of employees working in Janata Bank Limited.

3. Identification of Research Gap

The literature review was carried out to have an idea of findings of earlier work on the co-operative sector in India and abroad and to know the tools adopted therein. Various articles from research journals, reports, and unpublished thesis were reviewed, which revealed that there are many articles published and research is undertaken to know the satisfaction of employees working in banking and co-operative sectors; there are also studies based on a factor that affects the motivation of managers and board of directors working for co-operative societies. Most of these studies are done in other countries, and very few are done in India in general and specifically to M.P.C.S. However, no study in Goa seems to be carried out concerning employee satisfaction level and its impact on employee job performance in multi-purpose cooperative societies.

4. Significance of The Study

The present study will highlight factors that affect employees' job satisfaction and their impact on job performance. Hence, the study will be beneficial for the officials of M.P.C.S. to understand the factors that influence the employees and thus help them take specific selective actions to raise the employee's job satisfaction and performance.

5. Objectives of the Study

 I. To identify the factors influencing employees' job satisfaction in M.P.C.S.
II. To study the impact of job satisfaction on employee job performance.

6. Hypotheses of the Study

$H0_1$: There is no significant impact of job satisfaction on employee job performance.

7. Research Methodology

7.1 *Sample size:* As per the list provided by the head office of Registrar of Co-operatives Panjim-Goa, there are 38 M.P.C.S. in north Goa whereas 21 M.P.C.S. in south Goa, of which a total of 40 M.P.C.S. are actively

working and thus having a maximum 2-3 employees in each active M.P.C.S. Therefore, a total of 84 employees was randomly selected from active M.P.C.S.

7.2 *Period of study and Source:* The present study period is from July 2019 to February 2020. The required data was collected through primary as well as secondary sources. Primary data was collected by interviewing employees personally. In contrast, the secondary data is contained in historical information collected from Govt. offices such as the Head office of the Registrar of co-operatives and the Zonal office of co-operative societies.

7.3 *Tools and technique:* The data is analysed using S.P.S.S. (Statistical Package for the Social Science) software through regression and factor analysis.

7.4 *Variables:* The variables for the study are based upon different research work done by various researchers on employee's performance and job satisfaction. (Walia, 2019), which has studied the effect of salary, promotion, recognition and job security on employees performance. (Vrinda et al., 2015), have studied determinants of job satisfaction, i.e. personality, work environment, social influence and demographic profile. (Mobarak et al., 2014), have investigated the relationship between job satisfaction and reward and recognition, satisfaction with supervision and compensation. Based upon the referred articles, the variables are selected for the present study.

8. Results and Interpretation

8.1 Factors influencing employees' job satisfaction in M.P.C.S.

The factor analysis technique is used to find the significant factors affecting employees' job satisfaction in M.P.C.S. It is a statistical method used to reduce many variables into fewer factors (Weeraratne, 2016).

Table No 3: Showing factors influencing employee's job satisfaction in M.P.C.S.

Factors	F1	F2	F3	F4
Salary is sufficient to maintain decent social status	0.871			
Can fulfil all monetary requirements of Family with this salary	0.846			
Have been duly promoted always	0.808			
Feel promotions are appropriately given	0.713			
Appreciation by the manager or management increases the zeal to perform.		0.756		
Recognition of hard work helps you perform better.		0.751		
Opportunities are provided to earn, learn and Grow.		0.726		
Seniors take into account work performance.		0.68		
Salary hikes motivate to perform well.		0.657		
Challenges provided by co-operative			0.835	
I feel my job is permanent.			0.672	
Schemes and policies provided by a Co-op. to its employees			0.532	
There is no threat to Job even if they do not perform the job on time.				0.943
Cronbach's Alpha	0.794			
Kaiser-Meyer-Olkin Measure	0.714			
Bartlett's Test of Sphericity	0.000			
Eigenvalues	2.891	2.869	1.723	1.135
% of Variance	22.242	22.07	13.25	8.727
Cumulative %	22.242	44.31	57.57	66.29

Source: Compiled using Primary Data

If the Cronbach's Alpha value falls between 0.7 and 0.9, it can be concluded that the data is highly reliable (Weeraratne, 2016). The present test gives a value of 0.794, as seen from the above table. This indicates that the data collection for the factors influencing employees to work in M.P.C.S. is highly reliable and relevant for the study's purpose. The K.M.O. and Bartlett's test, which measures the sampling adequacy, is 0.714, higher than the value of 0.5, and the p-value is 0.000, which is less than 0.05, at a 5% level of significance.

After running factor analysis, the four most prominent factors are obtained, i.e. salary and promotion, recognition, work environment, and job security. The sub-points show the factor mix that contains loaded elements, each variable on each factor obtained by a best linear combination of variables. These factors loadings are the means of interpreting the role of each variable in defining the critical level of respondents.

The total variance has also been explained by clubbing all the factors and thus found the cumulative variance is 66.294, which is presented to the extent of 66.294%, respectively.

**8.2 Impact of job satisfaction on employee's job performance**

Regression analysis is performed to determine the correlation between two or more variables having cause and effect relationships (Gulden et al., 2013). Therefore, for this purpose, the researchers have applied regression analysis and thus taken employees' job performance as dependent variables and factors influencing job satisfaction, i.e. salary and promotion, recognition, work environment, and job security, considered independent variables.

Table No. 4: Showing the impact of job satisfaction on employee's job performance

Variables	Unstandardised Coefficients			R Square	Adjusted R Square
	Beta	**T**	**Sig.**		
(Constant)	1.053	1.894	0.062	0.307	0.272
Salary and Promotion	-.060	-0.603	0.548		
Recognition	.416	3.030	0.003		
Work Environment	.336	2.842	0.006		
Job Security	.153	2.149	0.035		

[Source: Compiled using primary data]

Here, the semiotic models of pie chart and barograph shows about the unstandardized co-efficient of employees job performance
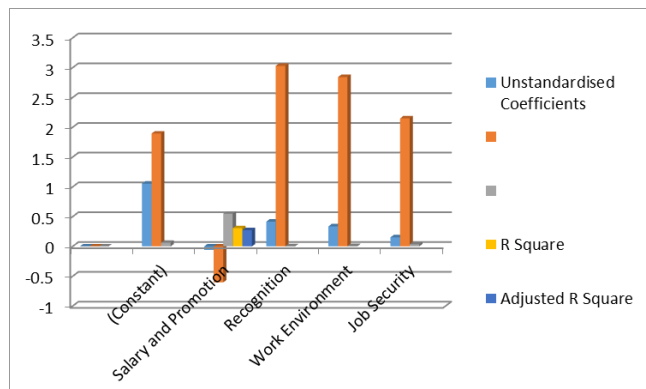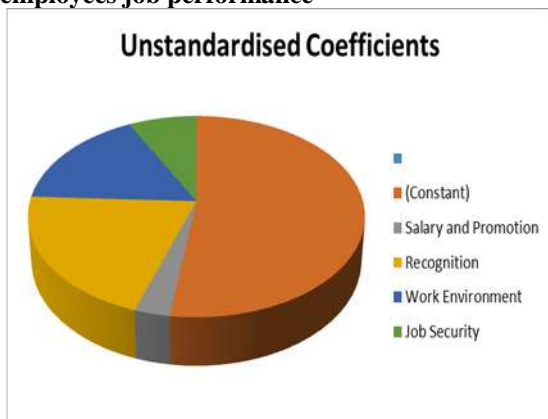
Semiotic Model of Pie Chart for Unstandardized Coefficient

Semiotic Model of Bar graph for Unstandardized Coefficient

H0₁: There is no significant impact of factors influencing employee job satisfaction such as salary and promotion, recognition, work environment, and job security on employee's job performance of M.P.C.S. From table no. 4, the observed adjusted R square value is 0.272, which indicates that independent variables explain variation in job performance to 27.2%. The p-value of recognition is shown as 0.003, the work environment is 0.006, and job security is 0.035, which is less than 0.05 at a 5% level of significance. This indicates that we reject the null hypothesis, which means a significant impact of recognition, work environment, and job security on employees' job performance working in M.P.C.S. in Goa.

The coefficient value of these variables shows a direct and Positive impact on employees' job performance. On the other hand, the p-value of salary and promotion is 0.548, which is more than 0.05 at a 5% level of significance. Hence the researcher fails to reject the null hypothesis, which indicates no significant impact of salary and promotion on an employee's job performance in M.P.C.S. in Goa.

9. Findings and Conclusion

Based on the above data analysis, the present study's findings show that Cronbach's alpha value lies between 0.7 and 0.9, indicating that the data collected is highly reliable an relevant for the current study. Further, the four factors, i.e. salary and promotion, recognition, work environment, and job security, influence employees' job satisfaction. As a result, the study revealed out of the four factors, only here factors found to be substantial, i.e. recognition, work environment and job security, which has shown a positive impact on employees' job performance. In contrast, salary and promotion do not significantly affect employees' job performance in M.P.C.S.

Thus, it can be concluded that all the variables considered under study mainly point towards four significant factors which are essential to every employee, i.e. salary and promotion, recognition, work environment and job

security. Therefore, the managerial staff and the B.O.D. of M.P.C.S. should constantly and accurately look forward to understanding the employees better. Therefore, M.P.C.S. should provide a timely increment in employees' salaries so that employees will perform better than what he performs now. Proper infrastructure should be given a preference and technological updates at the workplace and other incentives to affect employee satisfaction and performance. Employees also perform best when they have a sense of job security and are motivated by their senior or managers. Employee satisfaction will lead to the efficiency and effectiveness of the work, thus ultimately leading to achieving the organisational goal.

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Application of GA for Optimization of Linkage System of Hydraulic unit of Tractors

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Abstract: From the ancient age men had always tried to invent devices to augment human abilities and ultimately have reached this machine age. Now mankind is in search of more and more easy concept of transferring and transforming motion and power. Mechanized cultivation is very much essential for sufficient food production to feed the increasing population. So, agricultural machines are need based development. There are many tractors available in the market and research is going on to increase the efficiency and to overcome the shortcomings. The main part for cultivation is implement, which is generally mounted behind the tractor. There are different types of implements, which are widely used for ploughing. But movement of implement is very important for proper soil preparation and during transportation. Movement is actuated by the hydraulic thrust of a cylinder and performed through linkage system. Here slider crank mechanism has been used to transmit hydraulic thrust to the lifting of load (implement) via rotation of rock shaft, lifting arm, lifting rod, lower link and upper link etc. Link lengths including hydraulic cylinder diameter are optimized by applying Genetic Algorithm (G.A) so that pressure variation inside the cylinder is minimized during lifting of implement and thereby, smooth upward or downward motion of implement is possible. The best fitness value or objective function value of 1.39 was found and corresponding minimum pressure of 120.847 bars inside the cylinder was calculated.

Keywords: Linkage, Optimization, Tractor, Genetic algorithm, Mathematical modelling

1.   Introduction

From the ancient age men had always tried to invent devices to augment human abilities and ultimately have reached this machine age. Now mankind is in search of more and more easy concept of transferring and transforming motion and power. Mechanized cultivation is very much essential for sufficient food production to feed the increasing population. So, agricultural machines are need based development. There are many tractors available in the market and research is going on to increase the efficiency and to overcome the shortcomings. The main part for cultivation is implement, which is generally mounted behind the tractor. There are different types of implements, which are widely used for ploughing. But movement of implement is very important for proper soil preparation and during transportation. Movement is actuated by the hydraulic thrust of a cylinder and performed through linkage system. Cong Q et al designed a device for load–lifting performance of the lower link of the tractor based on the four-bar mechanism. The load test showed that the device could keep the loading force of the lower link stable during the lifting process [1].

GA is a population-based search procedure based on natural selection and inspired by Darwin's theory of evolution [2-5]. A set of potential solutions of a problem encoded in some manner is given as input to the GA. A fitness function has to be also provided based on which each candidate is quantitatively assessed. These candidates are actually solutions to the problem. GA improves them randomly. The favourable candidates are retained and permitted to breed. These digital children constitute new set of candidate solutions on which a second round of fitness evaluation is done. Inferior candidate solutions are deleted and efficient candidate solutions are preserved. These are again allowed to generate with random changes so that fitness of the population increase each round and ultimately leads to good solutions to the problem. This paper highlights the application of Genetic Algorithm (G.A) for optimization of linkage system shown in the fig. 1 so that smooth upward and downward movement of the implement (plough) is performed.

2.   Mathematical modelling

To optimize link lengths including hydraulic cylinder diameter so that pressure variation inside the cylinder is minimized during lifting of implement, the following twelve variables are to be considered: Hydraulic cylinder bore (d), Ram arm radius (R), Cylinder offset (E) from Fig. 2 (b), Connecting rod length (C), Stroke length (S), Total angular movement of Ram arm (θ), Position of lower link point (X0) from Fig. 3, Position of rock shaft centre (Y0) from Fig. 3, Lower link length (L0) from Fig. 3, Lifting rod length (L1) from Fig. 3, Lifting arm length (R1) from Fig. 3 and Distance of lifting rod attachment from lower link point on the lower link (R0) from Fig. 3.
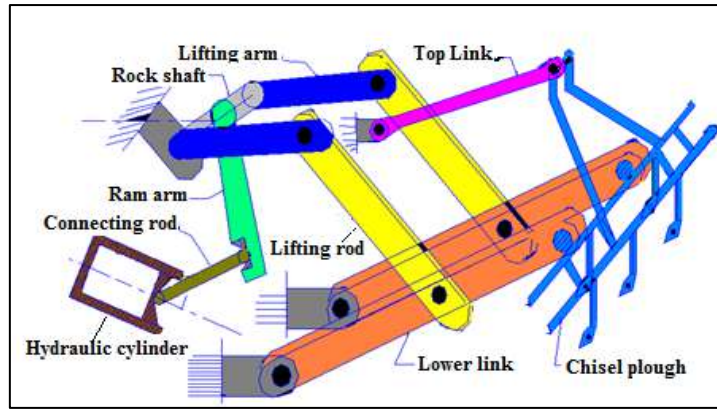
Fig. 1 Linkage system attached to tractor
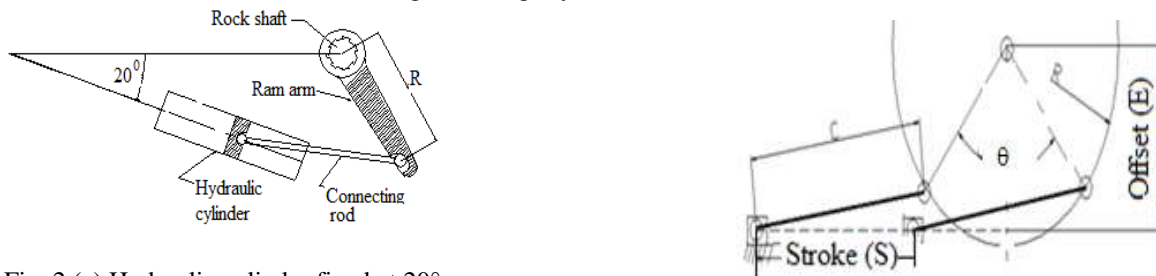
Fig. 2 (a) Hydraulic cylinder fixed at 20°
Fig. 2 (b) Showing C, S, R, E & θ
    to the horizontal rotates the rock shaft
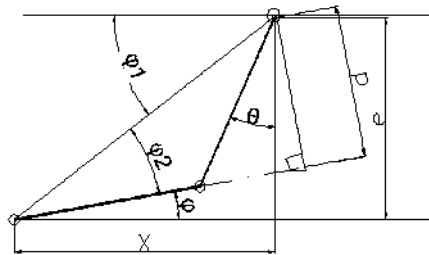
Fig. 2 (c) Different angular positions

From Fig. 1 and Fig. 2 (a)
Assuming maximum pressure, P = 160 bar
Ram arm radius, R = 73.1 mm

$$\text{Hydraulic thrust (F)} = \frac{\pi}{4} d^2 \times P \qquad \text{Eq. (1)}$$

From Fig. 2 (b) and Fig. 2 (c)

Cylinder offset (E) = 62.5 mm, Eccentricity per unit arm radius, $e = \dfrac{E}{R}$, Connecting rod length (C) = 134 mm, Connecting

rod length per unit arm radius, c = $\dfrac{C}{R}$, Stroke length (S) = 90 mm, Stroke length per unit arm radius, s = $\dfrac{S}{R}$

Anticlockwise angle of θ, ϕ are taken as +ve and clockwise –ve.

$$c \sin \phi = e - \cos \theta$$

Or $\sin \phi = \dfrac{e - \cos \theta}{c}$ ....Eq. (2)

$x = c \cos \phi - \sin \theta$ ....Eq. (3)

$$\tan\phi_1 = \frac{e}{x} \ldots\ldots\ldots\ldots\ldots\ldots\text{Eq. (4)}$$

$$\phi_2 = \phi_1 - \phi\ldots\ldots\ldots\ldots\ldots\ldots\text{Eq. (5)}$$

Perpendicular distance, p = $\sqrt{x^2 + e^2}\,\sin\phi_2$ .... Eq. (6)

Force in the connecting rod, Fc = $\dfrac{F}{\cos\phi}$ ...Eq. (7), where F= hydraulic thrust.

Torque, T = $F_c \times p \times R$

H_0 is the height of lower link point above ground level.

α_1 is the position angle of lifting arm with horizontal. Anticlockwise is +ve & clockwise is –ve. $R_x = R_1 \cos\alpha_1$
.........Eq. (8)

$$R_y = R_1 \sin\alpha_1 \ldots\ldots\ldots\text{Eq. (9)}$$

$$D_{xx} = R_x - X_0 \ldots\ldots\ldots\text{Eq. (10)}$$

$$D_{yy} = Y_0 + R_y \ldots\ldots\ldots\text{Eq. (11)}$$

j = distance between lower link point and centre point of joining lifting rod & lifting arm.

$$j = \sqrt{D_{xx}^2 + D_{yy}^2} \ldots\text{Eq. (12)}$$

$$\sin\gamma = \frac{D_{xx}}{j} \ldots\ldots\ldots\text{Eq. (13)}$$

$From\,the\,\triangle BDC, R_0^2 = j^2 + L_1^2 - 2jL_1\cos\psi\,[From\,the\,law\,of\,\cos ine\,of\,triangle].$

$$or\,\cos\psi = \frac{j^2 + L_1^2 - R_0^2}{2jL_1} \ldots\ldots\text{Eq. (14)}$$

$$\lambda = \psi - \gamma \ldots\ldots\ldots\ldots\qquad \text{Eq. (15)}$$

$In\,the\,\triangle ABE\,of\,\,fig.3, \lambda + \beta + \alpha_1 = 90^0$

$or\,\beta = 90^0 - \lambda - \alpha_1$

$But\,\alpha_1\,is - ve, hence\,\beta = 90^0 - \lambda + \alpha_1$

$Again\,in\,\triangle ABF\,\delta_1 + \beta = 90$

$or\,\delta_1 = 90 - \beta$

$or\,\delta_1 = \lambda - \alpha_1\ldots\ldots\ldots Eq.\,(16)$

Ly = Dyy- $L_1 \cos\lambda$ ....Eq. 17)

$$\sin\alpha_0 = \frac{L_y}{R_0} \ldots\ldots\ldots\text{Eq. (18)}$$

$$P_0 = j\sin\psi \ldots\ldots\ldots\text{Eq. (19)}$$

$$P_1 = R_1 \cos\delta_1 \ldots\ldots\text{Eq. (20)}$$

$$\cos\delta_0 = \frac{P_0}{R_0} \ldots\ldots\ldots\text{Eq. (21)}$$

$$F_L = \frac{T}{P_1} \ldots\ldots\text{Eq. (22), Where } F_L \text{ is the tensile force in the lifting rod and } P_1 \text{ is the perpendicular distance of the lifting rod}$$

from the rock shaft centre. Lifting capacity, **W** is calculated by the following procedure: Taking moment about the lower link point D, we get

$$W \times L_0 \cos\alpha_0 = F_L \times P_0$$

$$Or\ W = \frac{F_L \times P_0}{L_0 \cos \alpha_0} \quad \text{.........Eq. (23)}$$

Power Range, $H = H_0 + L_0 \sin \alpha_0$ ....Eq. (24)

Now with the above formulae we have calculated the lifting capacity at different power range. The lifting capacity is widely varying. The average capacity is W = 5462 N.

Form Eq. (23), Force in Lift Rod, $F_L = \dfrac{W \times L_0 \times \cos \alpha_0}{P_0}$

Torque, $T = F_L \times P_1$, Where P_1 is the perpendicular distance of Lift Rod from rock shaft center. Force in connecting rod,

$Fc = \dfrac{T}{pR}$, Where R is Ram arm radius and p is perpendicular distance of connecting rod per unit radius from rock shaft centre.

Hydraulic Thrust, $F = F_C \cos \phi = \dfrac{\pi \times d^2 \times P}{4}$, P is the pressure inside cylinder and d is diameter of cylinder.

$$Or\ P = \frac{4 \times F}{\pi \times 0.1 \times d^2} \quad \text{..........Eq. (25)} \text{ where P is in bar, d in mm \& F in N.}$$
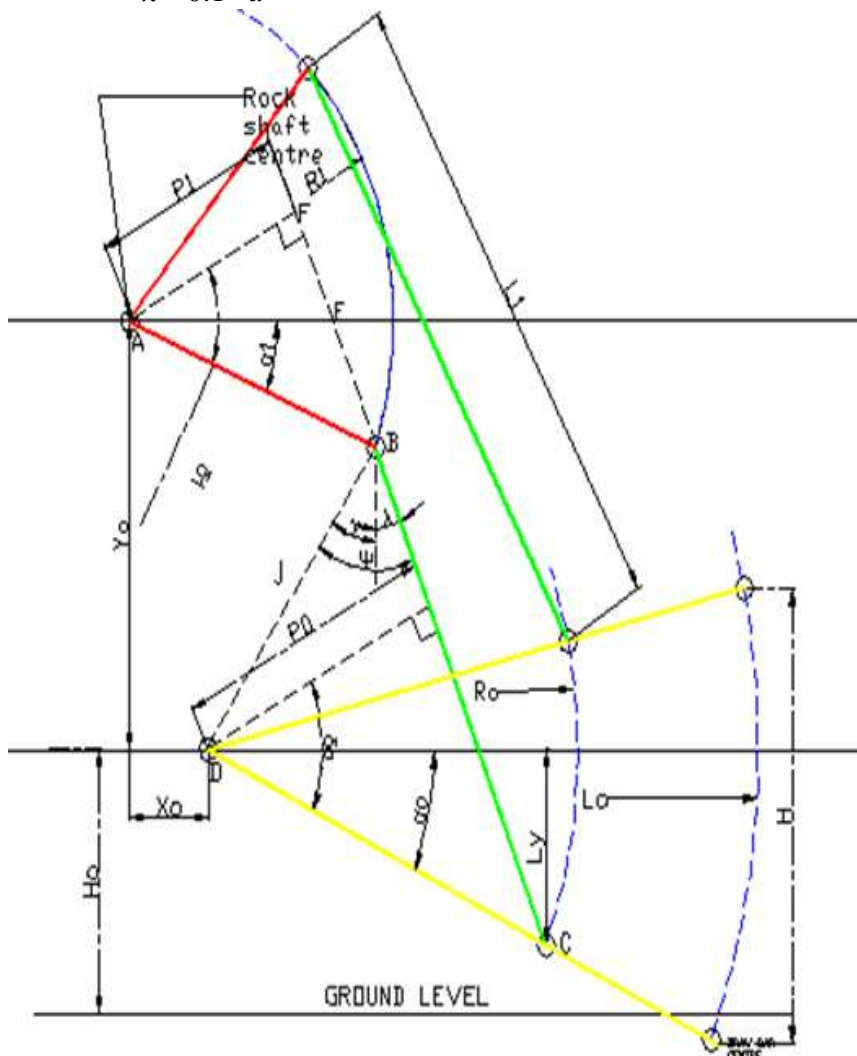

Fig. 3 Movement of linkages from ground level to topmost position

3   Running of GA with suitable parameters

The contributions of the above variables on the pressure variation are studied by detailed calculations and plotting graphs. Then trial and error method was applied manually for optimization and finally, genetic

algorithm was adopted for best optimization. After study of GA, the following GA parameters are selected for best optimization during running of the GA used for minimization of pressure variation.

Population size = 100 to 2000, Crossover probability = 0.6 to 0.99, Mutation probability = 0.005 to 0.015, Maximum no. of generations = 100, Chromosome length = 110, NO of runs = 1, field size = 10, Accuracy of fitness value = 0.00005, Tournament size for selection = 2 to 6, Random seed = 0.4 to 0.6,

Initial value of theta (θ) = - 25^0 and angle θ ranges from - 25^0 to 51^0. No of division of theta (76^0 is divided to 5 or 10 no of division). θ is increased at regular interval.

The following design constraints shown in Table -1 are used for the variables for optimization

Table- 1

Variable (mm)	Krishishakti (10 HP)	Range of variable in Krishishakti	Powertrack 40 HP model	Range of variable in Powertrack (40 HP)
d	50	40-----60	80	70------90
R	73.1	65------81	130	120-----150
E	62.5	57-------67	135	120-----150
C	134	127-----141	220	200------260
S	90	83------100	150	130----180
X0	110	95----120	60	60----130
Y0	460	440----490	490	490----550
L0	635	600----650	770	675----770
R1	250	225----275	280	250----300
L1	635	600----670	550	550---650
R0	400	400----550	340---500	500----550

Table -2

Variable	Optimum value in Krishishakti (mm)	Optimum value in powertrack (mm)
d	59.9609	90
R	65.0469	120
E	66.6188	140.381
C	140.945	260
S	92.3558	147.351
X0	95.9286	60.479
Y0	489.511	490
L0	600.635	675
L1	646.325	650
R0	404.545	500.929
R1	239.125	289.345

Table-3

GA Parameter set	Best fitness	Minimum pressure (bar)
Set 1	1.553077	132.413
Set 2	1.522280	126.383
Set 3	1.546956	126.263
Set 4	1.429121	123.494
Set 6	1.541898	116.986
Set 7	1.6894	119.522
Best set	1.391473	120.847

Fitness function: Pressure at definite interval of angle (no_div_theta) is calculated using variable values. From chromosome length, variable values are calculated as

$$X_i = X_i^L + \frac{(X_i^U - X_i^L)}{(2^n - 1)} \times (decoded\ value\ of\ string)$$

Then, sum_Pressure_difference = sum_Pressure_difference + fabs (Pressure [i]- Minimum pressure). Fitness function or objective function is to minimise (sum_Pressure_difference/ (no_div_theta-1)). The best fitness value or objective function value gradually decreases as it is minimization function. 7 sets of G .A parameters were used and .EXE file was run for 7 times and corresponding improved data for Krishishakti (10 HP) and Powertrack are shown in Table-2. The best fitness value or objective function value and corresponding minimum pressure is shown in Table-3. Optimized pressure variation inside the cylinder is shown in the fig. 4.
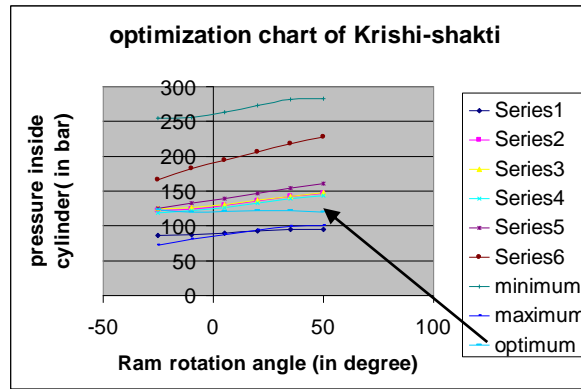
Fig. 4 Optimized pressure variation

4   Conclusions

While the mathematical model for the optimized linkage system was done for 10 H.P small tractor to improve the gradual and smooth movement of the implement but it is valid for any tractor. Only forces on the members will be changed depending on the implement weight or the no of bottoms used. Accordingly pressure will vary and G.A parameters will remain same. Ranges of linkages have to be changed slightly for design accommodation such as the diameter of the cylinder must be changed. Similarly locations of link points and hitch points have to be changed according to the IS 4468 (part 1): 1997. But the model is still valid.

This optimization is done without going into hydraulic valves operations or capacity utilizations of pump. So there is further scope for improvement in the gradual movement of the implement.

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Experimental analysis of multiple evaporator refrigeration system using R12, R134 & R22 refrigerants

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Abstract: Three evaporators having its own capillary for expansion in vapour compression refrigeration system have been considered for experimentation where, a single compressor having a single condenser is used. A hand operated valve is used for controlling mass flow rate. Refrigerant R-12, R134 & R-22 have been used to check the performance of Multiple VC system for different conditions, where it was found that performance of R22 is much better than R12 and R134. At present R22 is not used because of its chemical composition that can create problem for ozone layer in long term but replacement of R22 is available today with R400 series. By using this type of system one evaporator can be used as deep freezer, one evaporator as frost free and other can be used as normal refrigerator. A compressor of capacity of 1.0 Tonnes is used. The heavy condenser is used which is generally used in air conditioning system. The cooling capacity of each evaporator is regulated by its own input controller, while the compressor and discharge valves use single-input, single-output point. This appliance having three compartments each having common access door. The first evaporator is for first compartment operating at first pressure level, second evaporator is for second compartment operating at second pressure level and third evaporator for third compartment operating at third pressure level. By changing mass flow rate of each evaporator we can produce different temperature in each evaporator.

Keywords- Multiple evaporator V-C system, COP, refrigerant.

1 Introduction

Utility of refrigeration system is increasing day by day with global warming. In Asian countries, refrigeration system has more application for preserving food items. Multiple evaporative systems are based on vapour compression refrigeration system comprising of a compressor, condenser, expansion valve and a evaporator. The system used here is multiple evaporative systems which have some drawbacks like fluctuation of pressure. Some commercial refrigerating systems have one condensing unit connected to two or more evaporators. If the temperatures of evaporator are identical, the system uses only a low-side float to control the refrigerant. If two or more evaporating temperatures are desired (for example, a frozen foods temperature and a water-cooling temperature), a device must be used to keep one of the evaporators at a higher pressure. Lower the pressure, the lower the temperature. For this system, mass flow rate have to change for each evaporator by using its own valve. The vaporized refrigerant is returned to the compressor for being compressed to a high-pressure and high-temperature vapour. This vapor is cooled in the condenser, becoming a high-pressure liquid to be stored in the receiver until needed, but currently, receiver is not used. Filter-drier is installed on the liquid line. It keeps the refrigerant clean and dry. The system used here, have three evaporators with its individual expansion valve. The evaporator three in number are located in parallel. Suppose, the evaporator first operates at higher temperature than evaporator two followed by evaporator third. Therefore, proportionate quantity of refrigerant used by controlling mass flow rate maintaining each evaporator at different pressure. Multiple systems can be of type like having more than one compressor system or multi evaporator with single expansion valve or multi evaporator with individual expansion valve etc. There can be a cascade system for achieving very low temperature. A multi evaporator system will occupy less space compared to single system.

Reddy et al. [1] experimented using different eco-friendly refrigerants for analysis of V C system and discussed the effect of cooling coil temperature, degree of sub-cooling in condenser exit, the superheating in evaporator. Authors found that both cooling coil and condenser temperature have significant effect on COP.

Selladurai and Saravana kumar [2] performed experiments for comparing the performance parameter between R134a and R290/R600a mixture of hydrocarbon on a domestic refrigerator which is basically designed to work with R134a. It was found that R290/R600a hydrocarbon mixture give higher COP than R134a.

Kumar et al. [3] did first law energy and second law exergy analysis of V-C system vapour by the use of exergy-enthalpy diagram. The authors did energy analysis for finding the COP and exergy analysis for calculating various losses occuring in different parts of V-C cycle using R11 and R12 as refrigerants.

Mastani Joybari et al. [4] had performed experiments on domestic refrigerator that was manufactured for the use of R134a. The authors concluded that second law efficiency defect was highest in compressor than other part of system.

Bolaji et al. [5] performed a comparative analysis of different refrigerants i.e. R32, R152a and R134a in VC system and found that R32 has poor performance than R134a and R152a.

Yumrutas et al. [6] carried out exergy based analysis for investigation of the effect of condensing and evaporating temperature on VC cycle for finding COP and other losses. The authors found that minor temperature variation had less effect on exergy.

Kumbhar A. D. [7] conducted an experiment on multi evaporative system to by using three evaporators at - 3˚C, 2˚C, 7˚C. The test was done to find the COP by changing the condenser temperature from 37˚C to 42˚C with a step of 1˚C.

Silvia Minettoet et al [8] studied Experimental analysis of different methods for over-feeding multiple evaporators in refrigeration Systems. They used parallel evaporator for over feeding.

Kairouani et al. [9] used an ejector in a multi evaporator refrigeration system for increasing the performance. The ejector system increases the performance of VC system having more than two evaporators that were operated at different pressure and temperature.

F. Lontsi et al [10] developed a multi evaporator system combined with compression- ejection refrigeration system using eco-friendly refrigerants. The authors created low temperature for normal cooling and freezing temperature for storing food at very low temperature.

Jiyan et al [11] conducted an experiment on multi evaporator refrigeration system with VAR ejector. The authors used pressure regulating valve and VAR ejector to improve performance. Performance parameters were cooing capacity, compressor power consumption and ejector entrainment ratio. The results indicated that the efficiency of the multi evaporator system can be improved up to 12% by replacing the conventional pressure regulating valve with the variable area ratio ejector. This paper highlights the effect of COP by using multiple evaporative systems, one evaporator as deep freezer, one as frost free and other as simple domestic refrigerator. Three types of refrigerants such as R-12, R134 & R-22 are to be used to check the performance of multiple VC system for different conditions.

2   Design and selection of components

Compressor- The rated capacity of compressor is 3.5 kW i.e., 1.0 TR. These cooling capacities of compressor is divide into three cooling coils (evaporators) for experimental work in which lowest temperature cooling coil (Evaporator-I) is designed for 0.081 TR capacity, second cooling coil (Evaporator-II) is designed for 0.22 TR capacity and the high temperature cooling coil (Evaporator-III) is design for 0.5 TR capacity.

Condenser- Condenser is a device which is used for rejecting heat. Better heat rejection leads to better COP. Condenser load = Compressor capacity × heat rejection factor. An air-cooled fin type condenser having surface area 50 cm × 43 cm, 4 rows and 17 passes is selected for better heat rejection in condenser.
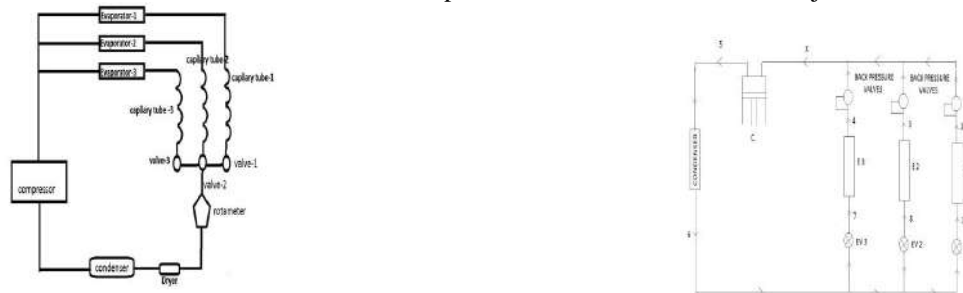
Fig-2. Modified multiple evaporative system.

Evaporator-The rated cooling capacity of compressor is 3.5 kW i.e., 1.0 TR. In order to have better cooling performance of multiple evaporator system, consider the actual cooling capacity given by 1 TR compressor is 0.8 TR. For getting lowest temperature (Evaporator-I) is designed for 0.08 TR capacity. Evaporator-I (lowest temperature evaporator) is used to store milk and dairy products. Evaporator-II (middle temperature) is used to store frozen foods etc. Evaporator-III (higher temperature) is used to store agriculture product. Evaporator load will be according to condenser and compressor capacity.

Fig-3 Actual diagram of test rig

T1 = Temperature after compressor.
P1 = Pressure after compressor.
T2 = Temperature after condenser.
P2,P3,P4=Pressure at T-point just before capillary coil.
P5,T3=Pressure and temperature after capillary coil for first evaporator.
P6,T4=pressure and temperature after capillary for second evaporator.
P7,T5 = pressure and temperature after capillary for third evaporator.
T6,T7,T8 =Temperature after evaporators for 1st , 2nd and 3rd evaporators.
P8,T9 = Pressure and temperature at inlet to compressor.
E_c = Energy consumed per second.
m' $_{(refrigerant)}$= Mass flow rate of refrigerant .

$$COP = \frac{refrigerating\,effect\,per\,sec}{Energy\,consumed\,by\,compressor\,per\,sec}$$

3.   Results and discussion

C.O.P of R-22 is much better than R-12 followed by R-134a i.e., higher pressure gas leads to better C.O.P in multiple evaporative system. R-134a is not suitable for multiple evaporative system. Maximum C.O.P of R-22 is 1.82 and its lowest is 0.86, similarly maximum C.O.P of R-12 is 1.5 and lowest is 0.81, and for R-134a maximum cop is 1.19 and minimum is 0.8 As the valve opening changes COP changes because of change in pressure in capillary coil Maximum mass flow rate for R-22, R-12, R-134a is 0.0476, 0.0371, and 0.031 respectively and corresponding maximum cop occurs
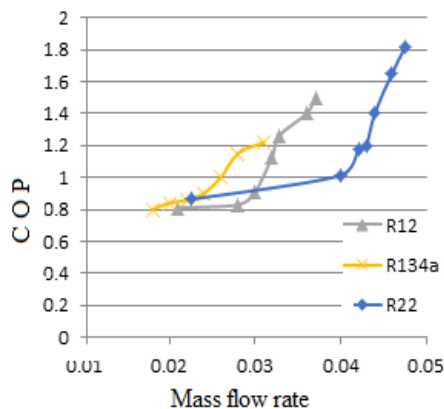
Fig. 4 Cop versus mass flow rate
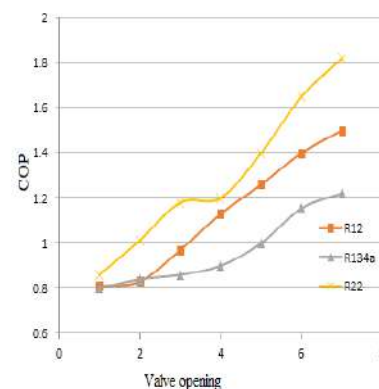
Fig. 5 COP of refrigerants vs its valve opening

4.   Conclusions

 i)   The arrangements of Multiple Evaporative systems show that COP will change if mass flow rate of refrigerant changes.
 ii)   By using multiple evaporative systems, one evaporator can be used as deep freezer, one as frost free and other as simple domestic refrigerator.
 iii) It requires lesser space for three systems by using one compressor and one condenser.
 iv)   This system minimizes the initial cost than buying of three different systems.
 v)   The arrangement of the multiple evaporative systems is most suitable for shopkeepers in terms of economy and compatibility.
 vi)   There is so much pressure fluctuation on changing mass flow rate which can be minimized by using back pressure valve and feedback control system.

For further study, COP can be maximized by changing the length, pitch and internal diameter of capillary coil. The material used in capillary coil is copper. For further study, material may be changed in order to get nearer to perfect adiabatic process. Binary ternary mixture can be used in place of R-134a, R-22 and R-12 to get a better COP. This concept can be applied for Air-conditioning i.e. multiple evaporator air conditionings.

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Synthesis of Transition Metal Doped Cadmium Sulphide Quantum Dots: An Innovative Development in Nanotechnology for Renewable and Sustainable Energy

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Abstract: Cadmium sulfide (CdS) quantum dots are focused on significant consideration owing to their application in optoelectronic devices such as high-efficiency solar cells, sensors, photodiodes, etc. The structural and optical features of such devices have a significant impact on their performance.

The controlled synthesis of CdS and nickel (Ni) doped cadmium sulfide ($Cd_{1-x}Ni_xS$) by the chemical co-precipitation method has been reported in this investigation. The presence of Ni in CdS is confirmed by Energy Dispersive X-Ray Analysis (EDAX). The XRD analysis was used to determine the crystalline structure, size, inter planar space, lattice constants, and volume of the unit cell. The average crystallite size was determined to be in the nanometer range and grew as nickel was added. FESEM and UV-Visible spectrometer were used to examine the microstructure and optical properties of the prepared samples. Cd1-xNixS quantum dots are beneficial for modifying the efficiency of optoelectronic devices as well as the development of unique nano materials with innovative features, as evidenced by the increased optical absorbance in the visible range of wavelength and the lowered bandgap caused by Ni doping.

Keywords: Transition metal, cadmium sulfide, quantum dots, Sustainable energy

1. INTRODUCTION

Compounds of chalcogenide materials such as cadmium sulphides(CdS), cadmium selenide(CdSe), cadmium tellurides(CdTe), zinc sulphide(ZnS), zinc selenide(ZnSe), zinc tellurides(ZnTe), lead sulphides(PbS) in nanoscale have attracted significant consideration in optoelectronics device application owing to their tunable bandgap. Among these cadmium sulfide (CdS) is one of the potentials and useful candidates with high transmitivity, low resistivity, good chemical stability, and wide bandgap of 2.42 eV at room temperature [1] and hence it is effectively applied in photoluminescent, photodetectors, sensors, biosensors, LASER, LED and as window materials in the high-efficiency solar cells[2].

The incorporation of transition metal (TM) ions such as Mn, Fe, Co, Ni, Cu, Zn, and others into CdS increased its electrical and optical characteristics, resulting in a wide range of technical applications in nanoelectronics and spin-based electronic devices [3].

In this study, Ni is used to dope CdS. Ni has an ionic radius of 0.072 nm, which is less than Cd^{2+}ionic's radius of 0.097 nm. So Ni may readily penetrate the CdS lattice and restore the Cd^{2+} ions, improving its structural, optical, and physical properties. This adjusts the bandgap of the CdS nanostructure without modifying its fundamental lattice structure and improves the surface to volume ratio of the material which is essential to progress the nanomaterial with desired qualities. [4].

The synthesis technique has a great influence on the properties of the nanoparticles. Varioussynthesis techniques like laser ablation, lithography, sputtering, molecular beam epitaxy, solvothermal, hydrothermal, sol-gel, vapor phase deposition, chemical bath deposition, chemical co-precipitation, etc were investigated for the preparation of nanoparticles. Among these techniques, the chemical co-precipitation method is preferred because of its simple method of preparation at a low cost and can be controlled by changing the deposition time, temperature, and impurity concentrations[5].

2. EXPERIMENTAL DETAILS

A. Synthesis CdS and Ni-doped CdS (CdS: Ni) quantum dots (QDs) were prepared by the chemical co precipitation method. Cadmium chloride monohydrate ($CdCl_2.1H_2O$), Nickel Sulphate hexa hydrate ($NiSO_4.6H_2O$), and Thiourea (CH_4N_2S) have been used as the source of Cd^{2+}, Ni^{2+}, and S^{2-} ions, respectively for the production of CdS and Ni-doped CdS without the need for further purification The whole chemical employed in this study was analytical grade (AR) and high purity (99% purity) commercially available.

To synthesis CdS quantum dots, 0.01M(20.13gm) of cadmium chloride and 0.1M(7.6gm) of Thiourea dissolving in 1000ml de-ionized water and to synthesis CdS with Ni 0.01M(20.13gm) of cadmium chloride, 0.1M(7.6gm)of Thiourea and Nickel Sulphate (13.14gm) dissolving in 1000ml de-ionized water prepared separately. Individual solutions were swirled with the magnetic stirrer to thoroughly dissolve the ingredients. By gradually adding a drop wise aqueous solution of sodium hydroxide(0.1M), the pH of the solution was maintained at 10. After some time the yellow and greenish-yellow colored colloidal solution was obtained for CdS and CdS: Ni solution respectively. The prepared solution was kept as it is for 24 hours. The precipitates that had accumulated at the bottom of the beakers were then filtered out and washed many times with de-ionized water to remove any remaining contaminants. The wet precipitates were collected and dried in a furnace at 90°C for 10 hours before being crushed into a fine powder. To remove moisture, all of the samples were heated in a Muffle furnace at 300°C for 2 hours. CdS quantum dots powder has a yellow tint, which changes to a light greenish color when Ni is added.

B. characterization

The structure of synthetic materials is determined via X-ray diffraction. This was done using a RigaKu Mini Flex 300/600 diffractometer using Cu-K radiation from 2 = 150 to 650 and a scan rate of 0.040/s. The microstructure was further studied by FESEM (ZEISS Sigma 500) at 20.00 kV and 250.00 kx. EDAX revealed the existence of constitutional components including Cd, Ni, and S on K and L lines. The optical absorption spectra were collected from 250 to 750 nm at room temperature using UV-VIS Spectrometer.

3. RESULT AND DISCUSSIONS

A. The crystallographic study by XRD
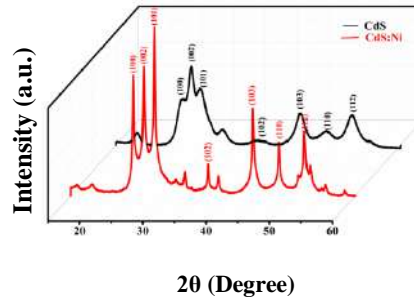

2θ (Degree)
Fig. 1 XRD pattern of CdS and Ni- CdS.

The XRD method was used to explore and assess the crystal structure, size, and strain of the materials. Figure 1 shows the XRD patterns of CdS and Ni-doped CdS nanocrystals. The diffraction peaks identified in CdS and Ni-doped CdS nanocrystals match the hexagonal phase of CdS (JCPDS card no.77-2306) and are in good accord with prior results [6]. The broad peaks seen further indicate that the processed samples include nanoparticles. The XRD spectra revealed no additional peaks, confirming the lack of any contaminants in the CdS lattice. According to Bragg's rule, a sharp and strong XRD peak is required for higher nano particle crystallinity[7]:

$$2d\sin\theta = n\lambda$$

The above equation is Bragg's equation where n denotes the diffraction order (n = 1), λ is the X-ray wavelength, and d represents the interplane spacing between planes with the provided Miller indices h, k, and l.The volume of the unit cell and the lattice constants 'a' corresponding to plane 100 > and 'c' corresponding to plane 002 > are determined by the following expressions[8]:

$a = \lambda/\sqrt{3}\sin\theta$, $c = \lambda/\sin\theta$ and the volume $V = \sqrt{3}a^2c/2$

The plane spacing d is associated with the lattice parameters (a and c) and the Miller indices in the Ni-doped CdS QD hexagonal crystal structure by the following formula. [8]:

$1/d_{hkl} = \{4(h^2+hk+l^2/a^2)+l^2/c^2\}/3$

The lattice constants (a and c), c/a ratio, and volume of the unit cell (hexagonal) are calculated and summarized in Table I. Similar values were reported for Ni-doped CdS [8].

TABLE I
LATTICE PARAMETERS

Samples	a(nm)	c(nm)	c/a	Volume(nm^3)
CdS	0.4052	0.6677	1.6476	0.0949
CdS:Ni	0.4124	0.6724	1.6302	0.0990

For the size and micro-strain assessment average of all the dominant intensities is chosen. The substitution of Ni into CdS lattice replaces the Cd^{2+} ions and they survive as interstitials in the CdS host lattice, causing additional defects in the system which is responsible for the change in XRD peak intensity and peak location. The Scherrer equation is used to calculate the average crystallite size of the prepared samples, which is written as :

$$D = k\lambda/\beta\cos\theta$$

here, k=0.94 and β denote the full-width at half maximum (FWHM), which was derived using Lorentzian fitting and the shape factor, respectively. The crystal size grows while the FWHM lowers after Ni-doping with CdS, indicating that the crystallinity level of Ni-incorporated CDs QD has improved. The following equation is used to determine the microstrain present in QD due to crystal defects and deformation [8]:

$$\varepsilon = \beta/4\tan\theta$$

The dislocation density, which is used to examine the deformation, irregularities, and crystal defects found in samples, may be computed using the following equation [8]:

$$\delta = 1/D^2$$

After Ni-doping, the decreased values of δ suggest a lower defect level in samples.Table II shows the variations in peak position (2), corresponding planes (hkl), FWHM (β), inter planer space (d), the average crystallite size (D), micro-strain (ε), and dislocation density (δ) of CdS and CdS: Ni nanostructures.

B. Microstructure and compositional studies

Figure 2 exhibit FESEM micrographs of CdS and Ni-CdS quantum dots. FESEM images of CdS with almost spherical particles closely packed with smooth surfaces. With a mean particle size of 14.23nm, the particles are non-uniformly dispersed and heavily aggregated. These nanoparticles are forming surface clusters. The increased surface energy of the produced nanoparticles may have caused particle aggregation.

FESEM micrograph of Ni-CdS, a bigger structure than CdS. Adding Ni causes lattice disorder and various defect-associated states. The grain's form changes little except in size. Nickel-doped CdS has a mean size of roughly 19.53nm.

An EDAX revealed the existence of constitutional components including Cd, Ni, and S on K and L lines. The distinct peaks demonstrate the existence of Cd, Ni, and S in the samples. Figure 3 and Table III show quantitative analysis of fundamental components such as Cd, Ni, and S in synthesized samples.

TABLE II

CRYSTAL SIZE, STRAIN, AND DISLOCATION DENSITY FOR DIFFERENT PHASES OF XRD

Sample	(hkl)	2θ (Deg)	β (Deg)	d_{hkl} (nm)	D (nm)	ε $\times 10^{-3}$	δ
CdS	(100)	25.35	1.230	0.0169	6.580	1.2075	0.660
	(002)	26.67	0.962	0.0177	8.391	0.9953	1.080
	(101)	28.32	0.973	0.0188	2.723	3.2520	0.114
	(102)	37.43	1.556	0.0247	5.049	2.3007	0.412
	(110)	44.13	1.608	0.0289	4.779	2.8457	0.386
	(103)	48.18	1.608	0.0314	4.708	3.1392	0.386
	(112)	52.31	1.862	0.0339	3.999	3.9902	0.288
CdS:Ni	(100)	24.90	0.404	0.0166	20.04	0.3893	6.123
	(002)	26.48	0.857	0.0176	9.422	0.8802	1.361
	(101)	28.26	0.581	0.0188	13.83	0.6387	2.957
	(102)	36.71	0.384	0.0242	20.45	0.5574	6.747
	(110)	43.83	0.518	0.0287	14.83	0.9110	3.712
	(103)	47.95	0.504	0.0313	15.01	0.9798	3.922
	(112)	52.01	1.004	0.0337	7.425	2.1378	0.991

Intensity (a.u.)

TABLE III
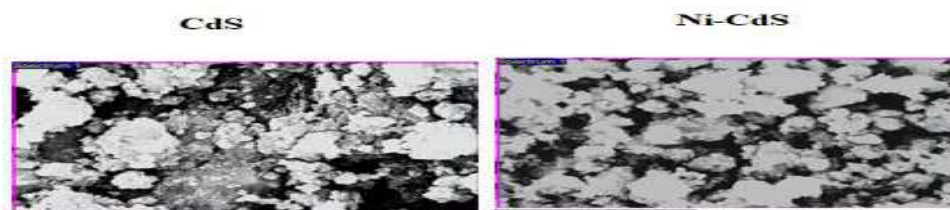
Fig. 2 FESEM images of CdS and Ni-CdS

ELEMENTAL COMPOSITION

Elements	CdS		CdS:Ni	
	Weight %	Atomic %	Weight %	Atomic %
S	16.16	40.33	10.80	27.16
Cd	83.84	59.67	75.71	54.31
Ni	-	-	13.49	18.53
Total	100.00	100.00	100.00	100.00

29

C. *Optical properties*

Optical absorption, transmittance, and bandgap of nanomaterials are important for optoelectronic device manufacture and applications.
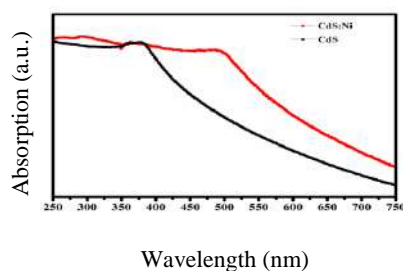

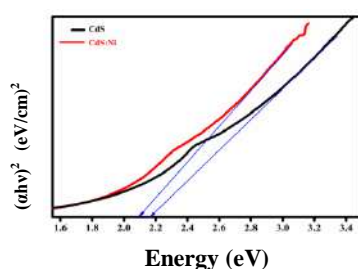**Fig. 4 Absorption spectra of CdS and Ni- CdS.**

Fig. 5 Tauc's plot between $(\alpha h\nu)^2$ versus energy (hν) of CdS and Ni-CdS.

Figure 4 shows the absorption spectra of CdS and Ni-doped CdS QDs from 250 to 750 nm. Ni-doped CdS QDs exhibit significant optical absorption below 490 nm. The absorbance decreases exponentially with wavelength. Ni creates a redshift to the absorption edge. The bandgap redshift verified appropriate Ni2+ inclusion inside the CdS lattice [9].

The UV absorbance below 500 nm is caused by electrons transitioning between the valence and conduction bands. The apparent absorption peak of about 490 nm at Ni added CdS is due to Ni interstitials in CdS lattice. These imperfections establish new inter-energy levels near the conduction band[4]. The bandgap of CdS and Ni-doped CdS nanostructures were measured via Tauc relation [10].

$$(\alpha h\nu)^n = K(h\nu - Eg)$$

Where α is the absorption coefficient, hν is the photon's energy, K is a constant[10] that depends on the effective masses associated with the bands, Eg is the materials' energy bandgap, and 'n' is 2 for the direct bandgap.

Figure 5 shows the extrapolating of the straight line of the plot of $(\alpha h\nu)^2$ versus (hν) is used to estimate the bandgap of the material.

The bandgap of CdS is 2.18 eV and is reduced to 2.10 eV (Eg = 0.08 eV) when Ni is doped into CdS. This is due to the strong interaction between 'p–d' hybridization in Ni and 'p' state of sulfide.

CONCLUSIONS

The chemical co-precipitation approach was used to successfully synthesize transition metal nickel doped in CdS quantum dots at room temperature. Un-doped and Tm-doped CdS QDs were studied for structural, morphological, and optical features. Undoped and Ni-doped CdS QDs had average crystallite diameters of 5.16nm and 14.43nm, respectively. After doping, the hexagonal crystal phase remained intact, although their diameters increased significantly.

Small lattice constants indicate high bond strength between atoms.it is also possible to control the size-dependent optical and structural properties of nanomaterials by changing various parameters such as deposition techniques, ambient temperature, and precursors used in the time of synthesis.

Optical study confirms the prepared nanomaterials have a wide bandgap(>2eV) and are reduced by nickel doping from 2.18eV to 2.10eV which are useful to modify the efficiency of optoelectronic, nanoelectronics, spin-based electronics, sensors, and memory devices. In the era of rapid energy consumption, this type of nanomaterials of wide bandgap and optical absorbance and emission in the visible range of wavelengths are also suitable for the production of sustainable energy

conversion and storage by using as window material in the solar cell which may consider the formation of new materials with innovative properties.

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Fuzzy Geometric Programming Approach in Water Pollution Control

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ABSTRACT: Mining and the related activities are responsible for large scale water pollution. The problem of water pollution control (WPC) may be treated as a multiple objective decision making problem. This paper deals with use of fuzzy geometric programming in water pollution control problem. A semi hypothetical case has been studied with regard to mining vis-a-vis water pollution.

Key word : Water pollution control, Fuzzy goals.

a. INTRODUCTION

The extent of water pollution caused by mining and allied industries depends upon the composition of mineral being mined including its processing, overburden characteristics, nature of the water body etc. These activities may cause large scale pollution. The level of total suspended solid (TSS) may be high, other parameters such as, coliform number may increase which indicate the bio-chemical degradation of water. The pollution due to organic discharge is also there. The treatment of water at present is limited to effluents from coke plants, washeries and water for domestic use, etc. In order to preserve aquatic life, it is important to have minimum levels of BOD.

In practice to solve the optimization problems, the techniques such as linear programming, nonlinear programming, goal programming, integer programming, geometric programming, fractional programming, dynamic programming are required. If either some/ all variables , any/ all constraints or any/ all objective functions in the optimization problem are imprecise then fuzzy mathematical programming approach plays a key role i.e. the need of fuzzy modeling arises when we try to deal with imprecise decision situations. In the problem of WPC some parameters are not precisely defined so in this paper the technique of geometric programming in fuzzy environment has been used to solve a typical water pollution control problem using min operator.

b. MATHEMATICAL DESCRIPTION OF THE PROBLEM

Let us consider a hypothetical situation of WPC where a small tributary to a main river having 'k' sources at the same number of different locations L_1, L_2 …….., L_k which are discharging b_1, b_2, ……..b_k kg of biological oxygen demand (BOD) /Unit. The flow in the river is v m^3/sec. The velocity of flow in the river is such that the travel time from L_1 location to L_2 location is t_1 units, from L_2 location to L_3 location is t_2 units, from L_3 location to L_4 location t_3, units, ……………….. from L_{k1} location L_k location is t_{k-1}, units. From L_k location to mouth of tributary is t_k unit. The rate of BOD exertion is 'r' mg/unit. To remove one kg of BOD at the above locations, costs are C_1, C_2, ………C_k units respectively. The degree of treatment at any location is about D%. The requirement as per the pure water quality standards is that the BOD in the river should not exceed 'd' mg/liter at any location. Since the rate of BOD execrtation is 'α'mg/units. So due to self purification f , fraction of water pollution remaining after 't' unit is described as $f = e^{-\alpha t}$ The values of 'f' are V_1, V_2, V_3, ………, V_K, corresponding to t_1, t_2, ……..,t_k respectively. At location L_1, b_1 unit of BOD are discharged into the flow. After a travel time of t_1 unit, BOD in the river at L_2 location due to discharge at location L_1 will have been reduced through self-purificationto b_1'. But at L_2 location, new discharge of b_2 kg will lead to concentration of b_2'. Similarly concentration at locations L_3, ……..,L_k may be determined. Let x_1 is the unknown fraction of BOD removed at L_1 location. Then (1-x_1) is the fraction BOD discharged in the stream, Similarly x_2, ………,x_k are defined. Let us assume that water quality standards require that the BOD in the river should not exceed 'q'mg/ltr. at any place.

A Linear programming model of the problem is given as:

Min

$$b_1 c_1 x_1 + b_2 c_2 x_2 + …….+ b_k c_k x_k$$

subject to

$$a_{11}(1 - x_1) \ \le q$$

$$a_{21}(1 - x_1) + a_{22}(1 - x_2) \le q$$

$$a_{31}(1 - x_1) + a_{32}(1 - x_2) + (a_{33}(1 - x_3) \le q$$

$$……………………………………………………..$$

$$a_{k1}(1 - x_1) + a_{k2}(1 - x_2) + …. + a_{kk}(1 - x_k) \le q$$

$$x_1 \le D, x_2 \le D, x_3 \le D, … … … … … … … x_k \le D$$

$$x_1 \ge 0, x_2 \ge 0, x_3 \ge 0, … … … … … … x_k \ge 0, ……….(2.1)$$

Where $a_{11}, a_{21}, a_{22}, ... a_{kk}$ are evaluated with help of discharging of BOD and its self purification at different locations. Model(2.1) is solved by linear programming algorithm.

2.1 SAMPLE PROBLEM

Assuming that small tributary to a main river having four different locations L_1, L_2, L_3& L_4 which are discharging 4000, 8000, 3500 & 3000 kg of biological oxygen demand (BOD)/day. The flow in the river is 1.16 m^3/sec. The velocity of flow in the river such that the travel time from L_1 location to L_2 location is 1 unit, from L_2 location L_3 location is about one days, from L_3 location to L_4 location is 1 unit and from L_4 location to mouth of the tributary is 1 unit. The rate of BOD exertion is 0.16 mg/unit. To remove one kg of BOD at the above locations costs are 6, 4, 5 and 2 units respectively. The degree of treatment at any location is about 90%. The requirement as per the water quality standards is that the BOD in the river should not exceed 30 mg per liter at any location.

The rate of BOD exceration is α=0.16 mg per unit. So due to self purification, f, fraction of water pollution remaining after 't' units is described as f=$e^{-\alpha t}$. The values of f are 0.85214, 0.78662, 0.72614 & 0.82530 corresponding to t=1, 1.5, 2& 1.2 units respectively. At L_1 location, 4000 kg of BOD are discharged into a flow of 1m^3/sec which leads to a BOD concentration of 40 mg/liter.

After a travel time of 1 unit, the BOD in the river at L_2 location due to discharge at L_1 location will have been reduced through self-purification to 40 x .85214 =34.0856 mg/liter. But at L_2 location, new discharge of 8000 kg will lead to concentration of 80 mg/liter. Similarly, concentrations at other L_3 locations may be determined. Let x_1 be the unknown fraction of BOD removed at L_1 location. Then (1-x_1) is the fraction of BOD discharged in the stream. Similarly x_2, x_3 & x_4 are defined. Here we may write an in equation for L_1 location as;
40 (1-x_1) $\leq$ 30   or $x_1 \geq 0.25$
Similarly for other three locations the in equations can be written as:
For location L_2, it is

$$34.0856\ x_1 + 80\ x_2\ \geq 84.0856$$

For location L_3, it is

$$29.0457\ x_1 +\ 68.172\ x_2 +\ 35\ x_3\ \geq 102.2177$$

For location L_4 it is

$$24.751 x_1 +\ 58.09209\ x_2 +\ 29.8249\ x_3 + 30\ x_4\ \geq 112.66799$$

The WPC cost will be C= 24000x_1 + 32000x_2 + 17500x_3 + 6000x_4. The maximum possible degree of treatment at each location is 90%.

The LP model is given as:

Determine x_1, x_2, x_3& x_4 that

Minimizes   24000x_1 + 32000x_2 + 17500x_3 + 6000x_4

subject to

$x_1 \geq 0.25$

34.0856x_1 + 80$x_2 \geq$ 84.0856
29.0457x_1 + 68.172x_2 + 35x_3 + $\geq$ 102.2177
24.751x_1 + 58.09209x_2 + 29.8249x_3 + 30$x_4 \geq$ 112.66799
$x_1 \leq$ .95
$x_2 \leq$ .95
$x_3 \leq$ .95
$x_4 \leq$ .95
$x_1 \geq 0$, $x_2 \geq 0$, $x_3 \geq 0$, $x_4 \geq 0$ …………………… (2.2)

The model (2.2) is solved by simplex method. The solution is as C
x_1= .354566, x_2 =.9, x_3= .873265, x_4=.852140, Min cost of WPC= 75525 units.

2.1.1 FUZZY MODEL OF THE PROBLEM

Determine x_1, x_2, x_3& x_4 that

Minimizes

Subject to   24000x_1 + 32000x_2 + 17500x_3 + 6000$x_4 \underset{\sim}{\geq}$ 6000

$x_1 \geq 0.25$

34.0856x_1 + 80$x_2 \geq$ 84.0856

29.0457x_1 + 68.172x_2 + 35$x_3 \geq$ 102.2177

33

$$24.751x_1 + 58.09209x_2 + 29.8249x_3 + 30x_4 \geq 112.66799$$

$$x_1 \underset{\sim}{\leq} .95$$

$$x_2 \underset{\sim}{\leq} .95$$

$$x_3 \underset{\sim}{\leq} .95$$

$$x_4 \underset{\sim}{\leq} .95$$

$$x_1 \geq 0, \quad x_2 \geq 0, \quad x_3 \geq 0, \quad x_4 \geq 0 \quad \dots\dots\dots\dots\dots (2.3)$$

Where, the symbol $\sim$ stands for fuzziness

The model (2.3) is solved by simplex technique. To solve, it is required to defuzzify each fuzzy goal using linear membership functions $\mu_1, \mu_2, \mu_3, \mu_4 \& \mu_5$ with help of tolerant limits

$$\mu_1 = (C - 60000)/2296$$
$$\mu_2 = (.9 - x_1)/.105$$
$$\mu_3 = (.9 - x_2)/.105$$
$$\mu_4 = (.9 - x_3)/.109$$
$$\mu_5 = (.9 - x_4)/.105$$

Let $\lambda = \min \{\mu_1, \mu_2, \mu_3, \mu_4, \mu_5\}$ i.e. λ is the min operator, which is the intersection of all the membership functions.

The crisp form for the above fuzzy model is obtained as

Max $\quad \mu_1{}^{1/5} +_+ \mu_2{}^{1/2} +_+ \mu_3{}^{.2} +_+ \mu_4{}^{.2} +_+ \mu_5{}^{.2}$

$$24000x_1 + 32000x_2 + 17500x_3 + 6000x_4 - 2296\lambda = 60000$$

subject to

$$x_1 \geq 0.25$$

$$34.0856x_1 + 80x_2 \geq 84.0856$$

$$29.0457x_1 + 68.172x_2 + 35x_3 \geq 102.2177$$

$$24.751x_1 + 58.09209x_2 + 29.8249x_3 + 30x_4 \geq 112.66799$$

$$x_1 + 0.05 \lambda = .95$$

$$x_2 + 0.05 \lambda = .95$$

$$x_3 + 0.05 \lambda = .95$$

$$x_4 + 0.05 \lambda = .95$$

$$\mu_1 \geq 0, \quad \mu_2 \geq 0, \quad \mu_3 \geq 0, \quad \mu_5 \geq 0, \mu_5 \geq 0 \quad \dots\dots\dots\dots\dots (2.4)$$

ANALYSIS: Numerical solution to the problem (2.4) has been obtained using LINDO software. The optimal solution is as ;

$\lambda = \max \{\mu_1, \mu_2, \mu_3, \mu_4, \mu_5$

$$X_1 = 0.95$$

$$X_5 = 0.95$$

$$X_3 = 0.95$$

$$X_4 = 0.95$$

$$X_5 = 0.95$$

& total WPC cost is 75525 units.

c. CONCLUSION

This paper is about solving a practical problem with pollution control of water using optimization technique in fuzzy environment known as fuzzy linear programming approach. This approach deals with min operator. It is observed that by allowing slight flexibility or fuzziness to different goals, the objective value is considerably minimized. There is ample scope for further generalization and diversifying the problem in keeping with real life situation and corresponding modifications in the mathematical model developed in this work.

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A PROSPECTIVE MARKETING STUDY ON PROBLEMS FACED BY WOMEN ENTREPRENEURS IN RURAL GOA: EMERGING NEEDS AND CHALLENGES

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Abstract

.A women entrepreneur is any woman or a group of women who begin, organize and operate a business enterprise for personal gain. As the concept of women entrepreneur is concerned, it came into force many years ago, today, problems faced by them due to rapid changes in the society and orthodox society culture, In this invited research paper we have focuses on the various problems faced by women entrepreneurs in Goa. The main objectives of this submitted paper are to analyse various problems faced by women entrepreneurs and to find out the association between a demographic profile and overall problems faced by them. The submitted research paper has been written on the primary data such as a questionnaire method is used and asked 104 respondents to collect data in order to complete the assigned research work. There are many variables or constraints being used in this research work such a sin dependent variables, dependent variables, and controlled variables related to personal, financial, human resources, manpower, natural resources of raw material, technological, infrastructure, administrative problems, and the techniques used in problems are descriptive Statistics, such as the Chi-square Test, Regression Analysis, etc. Finally, the findings of the study are shown a positive influence on the overall problems faced by the women entrepreneur in rural area sand there is no association between age, qualification, marital status, turn over and monthly income of the location of the women entrepreneurs in rural Goa. We are hope fulthis research will be an impact and motivate the young women entrepreneur for enhancing their entrepreneurial activities in near future and they will contribute a major role to economic development and sustainability is not only in the state of Goa but also in India

Key words:

Women Entrepreneurs (WE), Economic and Administrative Problem (EAAP), Business Enterprise (BE). Natural Resources (NR), Technological Infrastructure Development (TID)

1. Introduction

Women Entrepreneurs is defined as the women or a set of women who start, organize and run a business venture. A woman entrepreneur is hence a confident, innovative and pioneering woman desiring monetary independence individually and simultaneously creating employment opportunities for others(www.p/women-entrepreneurs-in-india/32337, 2020)

A huge number of women are venturing into entrepreneurship in one form or the other. The force to pursue entrepreneurship is due to the enormous passion or certain compulsions. Today, entrepreneurs play a fast and foremost role in the economic development of the nation.Entrepreneurs are wheels of economic development of the country. Women's skills, knowledge, talents, abilities and willingness to do something for themselves and their kids or family are some reasons for the women has becomes entrepreneurs. According to World Bank, investing in a women business rather than investing in a men's business will ensure economic development of the nation. The government is also taking some initiative to encourage the women to start with their businesses(Hidayat, 2018).Even though the women are encouraged to start with their own businesses the problems faced by the women are increasing rapidly. In a country like India the world still seems the male dominated one, which often leads to some major problems in running their business. Some of the women are illiterate or a fresh graduate with no past experience which has worsened their work more(Dhilon, 2017). According to the sixth census released by Ministry of statistics and programme implementation, women constitute around 14% of the total entrepreneurs' base in India i.e. 8.05 million out of 58.5 million entrepreneurs While some are accidental entrepreneurs due to lack of other work Opportunities, many others are driven by a specific mission or goal(survey, 2019).

1.1 Women Entrepreneurship in Goa

Famous for its beautiful beaches and pristine natural beauty, Goa is one of the India's biggest tourism spot. However there is more to this state then just sand, sun and waves. Goa is India's richest state with the highest GDP per capita and is also home to many successful women entrepreneurs. In Goa there are 810 women enterprises and 667 enterprises which are managed by women .Some well-known women entrepreneurs of Goa are Rina Barreto (Founder of Cheree Tree) , Ethel Da Costa (CEO of Geek Media), Siya Shaikh (Founder of Monomania Goa), Ashwini Aditya (Founder of Shree Foods), Maria Victor

(Founder of Make it happen), Pallavi Salgaoncar(Owner of Desserts N More), Rachana Deshpande (aR consulting Solutions) (www.p/women-entrepreneurs-in-india/32337, 2020).

In Goa there are lots of opportunities to start a business for the women, as they have creative mind, innovative ideas and multi-tasking capabilities which are better than those of men. Government of Goa is taking initiative to uplift the women entrepreneurs segment in Goa. The Goa Industrial Development Corporation (GIDC) was established by Government of Goa in 1996 with the aim of securing and assisting establishment of industrial areas and industrial estates in Goa (www.goaidc.com).

There are various institutions in Goa that facilitate the youth to start the business such as Centre of Incubation and Business Acceleration (CIBA), Forum for Innovation Incubation Research and Entrepreneurship (FIRE), Goa Chamber of Commerce & Industry (GCCI) and Goa Institute of Management (GIM)(www.startup.org, 2020).

Even though Goa is home to many women entrepreneurs, they have to face lot of challenges during establishing and operating the business especially those from rural areas. The challenges can be about anything from prejudice and discrimination, to lack of knowledge and education on how to make their dreams a reality(Sanzgiri, 2017).

2. Literature Review

A systematic literature survey has been conducted in order to find out the research gap and scope of the proposed study. The surveys of the literature are as follows:

Kannan.P & Aneeshta M (2020) The researchers have studied the prospects and challenges of rural women entrepreneurship development in Kozhikode district along with the problems faced by them in garment sector.

The primary data is collected from 150 women entrepreneurs through questionnaire & is analysed by using Percentage Analysis &Garret Ranking Test. The study concludes that the traditional mindset of the society is the main obstacles in entrepreneurship in Kerala.

Vembly Colaco & V. Basil Hans (2018). The objectives of the research were to analyse new dimensions of entrepreneurship theoretically & empirically & to examine prospects & challenges for strategic entrepreneurship in urban India. The study was conducted by using Secondary data. T – Test, mean & regression analysis were used to conduct the study. The findings of the study were if the women were given the opportunities they would have worked harder than man. Challenges faced are: equal rights, market size, access to childcare, technology transfer, etc.

Shyamala.J(2016) The research focuses on the problems & challenges faced by rural women entrepreneurs in India.

The findings of the study were that the factors motivating the women are need for additional income, not finding a right/ suitable job, getting self-actualisation etc .Problems faced are personal, social and business related problems.

Rodrigues Anthony (2016)

The main objective of the study is to focus and to divert the attention of talented women of the City towards the available opportunities to become a successful entrepreneur.

The study is based on both primary and secondary data. The primary data is collected by interviewing 200 ladies. The findings of the study were women are highly motivated and self -directed; they also exhibit a high internal locus of control & achievement. **Vasan.M (2016)**The objectives of the study are to identify the problems faced and to measure the role of women entrepreneurs in economic development. The study is based on the secondary data. The study concluded that the women entrepreneurs have to face lot of problems like lack of education, social barriers, legal formalities, high cost of production, male dominated society, etc and there are no major contributions towards economic development.

Rakesh Kumar Gautam, K. Mishra (2016)

The researchers analysed the issues & challenges faced by the rural women entrepreneurship in India. The study is purely based on secondary data. The findings were that the problems faced are lack of education, shortage of raw material, socio cultural barriers, absence of motivation, etc

Jayakumar.P & J. Kannan (2014)

This study focused on the challenges and opportunities for rural women entrepreneurs' .This paper are conceptual in nature. The findings of the study were that the challenges faced by women are financial problem, less risk bearing capacity, need of training and development, male dominated society.

Anitha D. Pharm & R. Shritaran (2013).The paper highlights on the problems being faced by women entrepreneurs in rural area and analyses the Motivational factors which encourage them. The primary data is collected from 90 respondents. The data is analysed using Chi Square Analysis. The findings of the study were that, the women are ready to face the challenge but the society is very much receptive, so is the family. Women are not into business for survival but to fulfil the inner urge of creativity. The problems faced are mode of business, training programmes.

Manjunatha.K(2013) This study examines the rural women entrepreneurial problems.

This paper is conceptual in nature. The findings of the study were that problems faced in rural areas are gender bias in formal institution, lack of financial assistance, imbalance between family & profession, failure of training & skills, absence of professional personality.

Kavita D. Chordiya (2013)

The researcher focused on the problems faced by women entrepreneurs in Malegaon taluka & nearby places. Primary data was collected by interviewing 100 women entrepreneurs. The study revealed that the main problem faced by women is dual role of home maker & lack of self- confidence.

3 Statement of Research Problem

Extensive review of literature was conducted by referring various articles published in research journals, bookswhich revealed the following.

    i.   Most of the articles referred related to study, are on the challenges & issues faced by women entrepreneurs in

India.

ii. There are studies which are undertaken by researchers on problems faced by women entrepreneurs in Goa but only few talukas (Ponda & Margoa) are taken into consideration while collecting the data.

iii. No study has been found on problems faced by Women Entrepreneurs in Rural Goa.

By keeping all the above factors in consideration the researcher has selected & titled the topic as "Problems faced by women entrepreneurs in rural Goa**."**

4. Objective of the Study

i. To study the association between respondent's age, educational qualification, marital status, monthly turnover & monthly income and location of the women entrepreneur in rural Goa.

ii. To study the influence of the personal, financial, human resource raw material, technological, infrastructural, administrative problems on overall problems faced by women entrepreneurs in rural Goa.

5 .Hypothesis of the Study:

H_o – Nullhypothesis (H_o) refers that there is no significant association in between respondent's age, educational qualification, .marital status, monthly turnover and income as related with the location of the women entrepreneurs in rural Goa

H_{o1} –This hypothesis indicates that there is no significant influence of the personal, social financial, human resource, raw materials, technological, and administrative problems faced by women entrepreneurs in rural Goa.

6. Research Methodology

The research methodology adopted for the present study on "various Problems related to women entrepreneur's faced by them in the location of rural Goa , {India} as follows :

6.1 Sources of Data

Primary Data: The researcher randomly circulated 100 Google forms consisting of useful questions to women entrepreneurs from rural Goa through researcher's personal contacts. Out of which 47 duly filled forms were received back. Besides this the researcher personally interviewed 57 women entrepreneurs from Ponda, Bicholim, Mapusa & Honda market who are from rural Goa.

Secondary Data: It is collected from various websites and research articles.

6.2 Analytical Tools

Data is analysed by using descriptive statistics, Chi Square test and regression analysis.

6.3 Sample of thestudy:

The sample consists of 104 women entrepreneurs from rural Goa operating in Ponda, Honda, Bicholim and Sanquelim market were selected randomly out of which 64 women entrepreneur are from North Goa and 40 are from South Goa district respective

7. Data analysis and Interpretation

7.1 Demographic Profile of the Respondent's

Table No. 1: Showing the demographic profile of the Respondents of Women Entrepreneurs

Total No. of respondents = 104

Total No. of respondents = 104			
Variable		**Frequency**	**Percept (%)**
Age	18 – 28	20	19.2
	28 – 38	23	22.1
	38 – 48	38	36.5
	48 & above	23	22.1
Educational Qualification	Below SSC	34	32.7
	SSC	15	14.4
	HSSC	27	26
	Graduate	22	21.2
	Post Graduate	6	5.8
Marital Status	Married	70	67.3
	Unmarried	26	25
	Divorced	2	1.9
	Widowed	6	5.8

From Table no. 1 we can state that out of 104 respondents 38% respondents from the age group of 38 – 48 which comprises of majority of sample & 19.2 % belong to the group of 18 – 28. Educational qualification shows that the 32.7 % of respondents belongs to the below SSC group which is the highest. On the other hand, very few respondents i.e. only 5.8 % have done Post Graduation. In case of Marital Status the majority of the women i.e. 70% of the total respondents are married whereas only 2% of the total women are divorced.

Table No. 2: Showing the monthly turnover of the Women Entrepreneur

Monthly Turnover (Rs.)	Frequency	Present
0 – 50,000	33	31.8
50,000 – 1,00,000	27	26
1,50,000 – 2,00,000	32	30.8
2,00,000 & above	12	11.5
Total	**104**	**100**

Source: **Compiled from the Primary Data of own source of researcher**

Semiotic Models of monthly turnover of Women Entrepreneur in pie chart and Bargraph:

In this section, from the Table No. 2, which is showing about the monthly turnover of the women entrepreneur's income and it is observed that majority of the women i.e. 31.8% of total respondents has the turnover of Rs. 0 – 50,000 per month & only few respondents 11.5% of 104 women has the turnover between Rs.2,00,000 & above per month. Where is others response in differently .Therefore, the researcher has compared with different women entrepreneur's monthly income and their economic status at present.

Monthly Turn Over of women Entrepreneur in Bar graph]

Frequency

- 0 – 50,000
- 50,000 – 1,00,000
- 1,50,000 – 2,00,000
- 2,00,000 & above
- Total

Table No 3: Showing the monthly Income of the women entrepreneurs

Monthly Income (Rs.)				Frequency	Per cent (%)
0 – 25,000				24	23.1
25,000 – 50,000				21	20.2
50,000 – 1,00,000				19	18.3
1,00,000 – 1,50,000				14	13.5
SLNo	Types of Business	Frequency	Percentage (%)	10	9.6
2,00,000 & above				16	15.4
Total				104	100

Source: Compiled from the Primary Data

From the Table no.3, it is observed that the majority of the women i.e.23.1 % of total respondents has the annual income of Rs.0 – 25,000 per month & only few respondents 9.6% of 104 women has the annual income between Rs.1,50,000 – 2,00,000 per month.

Table No 4: Showing the Types of Business carried out by Women

Source: Compiled from the Primary Data

From the Table no.4 it is seen that most of the women i.e. 15.4 % of the total respondents are engaged in the business of general store followed by 13.5% in tailoring & only few respondents i.e.2% are engaged in the business of fruits & vegetable processing.

7.2 Analysis of association between respondent's age, educational qualification, marital status, monthly turnover & annual turnover and the location of the women entrepreneurs in rural Goa.

Ho – There exists no significant association between respondent's age, educational qualification, marital status, monthly turnover & annual turnover and the location of the women entrepreneurs in Rural Goa

Again , for the purpose of testing the Hypothesis the researcher have used Chi- Square Test. Chi- Square Test is used to find the association of age, educational qualification, marital status, monthly turnover & monthly income as related to the location of the women entrepreneur sinrural Goa.

Table 5: Showing the association between the respondent's age, educational qualification, marital status, monthly turnover & annual turnover and the location of the women entrepreneurs in rural Goa

Demographic		District				Total		Chi. Squared Value
		North Goa		South Goa				
		No.	%	No.	%	No.	%	P Value
Age(years)	18 - 28	13	12.50%	7	6.70%	20	19.20%	3.259
	28 - 38	12	11.50%	11	10.60%	23	22.10%	
	38 - 48	27	26%	11	10.60%	38	36.50%	0.35
	48 & above	12	11.50%	11	10.60%	23	22.10%	
Educational Qualification	Below SSC	23	22.10%	11	10.60%	34	32.70%	3.322
	SSC	9	8.70%	6	5.80%	15	14.40%	
	HSSC	18	17.30%	9	8.70%	27	26%	
	Graduate	12	11.50%	10	9.60%	22	21.20%	0.51
	Post Graduate	2	1.90%	4	3.80%	5	5.80%	
Marital Status	Married	41	39.40%	29	27.90%	70	67.30%	1.09
	Unmarried	18	17.30%	8	7.70%	26	25%	
	Divorced	1	1%	1	1%	2	1.90%	0.78

	Widowed	4	3.80%	2	1.90%	6	5.80%	
Monthly Turnover(Rs)	0 – 50,000 .	22	21.40%	10	9.70%	32	31.10%	2.776
	50,000 – 1,00,000 .	17	16.50%	10	9.70%	27	26.20%	
	1,50,000 – 2,00,000 .	19	18.40%	13	12.60%	32	31.10%	0.428
	2,00,000 & above	5	4.90%	7	6.80%	12	11.70%	
Monthly Income(Rs)	0- 25,000 .	16	15.40%	8	7.70%	24	23.10%	5.931
	25,000 – 50,000 .	12	11.50%	9	8.70%	21	20.20%	
	50,000 – 1,00,000 .	12	11.50%	7	6.70%	19	18.30%	
	1,00,000 – 1,50,000 .	9	8.70%	5	4.80%	14	13.50%	0.313
	1, 50,000 – 2,00,000 .	3	2.90%	7	6.70%	10	9.60%	
	2,00,000 & above	12	11.50%	4	3.80%	16	15.40%	

Source: Compiled from Primary Data

Table No. 5 provides a detailed explanation of the values exhibited in the above table which is a result of cross tabulation of the different demographic factors of the entrepreneurs with their location.

As far as the age is concerned the p – value is greater than the 0.10 at 10 % level of Significance. Hence we fail to reject the Null Hypothesis and conclude that there is no significant difference between the entrepreneurs in North Goa & South Goa with reference to the age group. This means that there is no significant association between age &location of the women entrepreneurs. The Chi Squared value shows difference of 3.26 between observed & expected value. In case of the marital status the p – value is greater than 0.10 at 10 % level of significance. Hence we reject the Null Hypothesis and conclude that there is no significant difference between women entrepreneurs in South & North Goa with reference to the marital status, which means that there is no significant association between marital status & location of the women entrepreneurs. Educational qualification as a demographic factor has a p- value of 0.51 which is greater than 0.10 at 10% level of significance. Hence, we fail to reject the null hypothesis and conclude that there is no significant difference between educational qualifications of women entrepreneurs residing in south & north Goa, which concludes that there is no significant association between the educational qualification and location of the women entrepreneurs.

The monthly turnover as a demographic factor has the p – value more than 0.10 at 10% level of significance. Therefore we accept the Null Hypothesis which means there is no significant difference in monthly turnover of women in North & South Goa, which means that there is no significant association between the monthly turnover and the location of the women entrepreneurs. Also the p – value of monthly income is more than 0.10 at 10 % level of significance which concludes that there is no significant difference between the monthly incomes of the women entrepreneurs in North & South Goa. The Chi Squared value shows difference of 5.931 between observed & expected value.

7.3 Analysis of influence of personal, financial, raw material, human resource, infrastructural, technological & administrative problems on overall problems faced by the women entrepreneurs in rural Goa.

Ho –There is no significant influence of the personal, financial, human resource, raw material, technological, infrastructural & administrative problems on the overall problems faced by women entrepreneurs in Rural Goa.

For the purpose of testing the Hypothesis, the researcher has used regression analysis to see the influence of personal, financial, raw material, human resource, infrastructural technological and administrative on the overall problems faced by the women entrepreneurs in rural Goa. The variable used are:

Dependent – Overall Problem **Independent** –Personal, financial, raw material, human resource, infrastructural, technological & administrative problems

Table 6: Showing the influence of personal, financial, raw material, human resource, and infrastructural, technological & administrative problems on the overall problems faced by women entrepreneurs in rural Goa.

Factors	Adjusted R - Squared	Beta	Sig.
Personal Problems		.286	0.001
Financial Problem		.261	0.001
Raw Material Problem		.227	0.001
Human Resource Problem	0.73	.312	0.001
Infrastructural Problems		.284	0.001
Technological Problem		.299	0.001
Administrative Problem		.304	0.001

The Adjusted R – Squared is 0.73 which indicates that there is 73% of variation in overall problems which is explained by the personal, financial, raw material, human resource, infrastructural, technological & administrative problemsand remaining 27% is unexplained.

The significance value of personal, financial, raw material, human resource, and infrastructural, technical & administrative problem is 0.001 which is less than 0.10 at 10 % level of significance. Hence it can be said that there is a significant impact of these factors on the overall problems faced by the women entrepreneurs in rural Goa.

The Beta values of these factors are positive which means it shows the positive Prospective and influence of personal, financial, and economic development raw-material, and human resource, infrastructural, technical & administrative problem on the overall problems faced by the women entrepreneurs in rural Goa.

8. Findings

The study revealed that there is a positive influence of personal, financial ,human resource, raw materials ,and infrastructural, technological & administrative problems on overall problems faced by women entrepreneurs in rural Goa.The study also concluded that there is no association of the age, marital status, educational qualification, monthly turnover and monthly income with the location which means the scenario in both the districts i.e. south and north Goa is similar.

9. Conclusion

In conclusion from the above discussions, we may conclude that the contribution of women entrepreneurs in diverse entrepreneurial activities has empowered them in economic, social and cultural fields. The access in taking decisions on their own in household matters and business has made the women more self-confident than before. The rural women have become improved organizers. The women entrepreneurs require support of appropriate policies and systems to successfully face the problems. The Government of Goa has adopted few policies related to growth of the women entrepreneurship. However, there are problems of its implementation. The rural women entrepreneurs continue to be victims of denial as some facilities provided by the Government are not available in rural areas where as, they are available in urban areas. In spite of having to face many problems the women entrepreneurs have successfully managed their ventures. We are sure that support from family, Government and proper training will further empower them.

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A Fuzzy Quadratic Programming Approaching Model for Solid Waste Management

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ABSTRACT: In the era of technological development over the past three decades, there have been a multitude of factors contributing to the detriment of the environment. This paper deals with a Mathematical Model to bring out the features of system analysis with respect to the solid waste disposal management (SWDM) problem. Nature was able to digest the wastes created by companies as well as contributions from households, despite the fact that industrial expansion was not extraordinary. The SWDM problem is solved, using a fuzzy quadratic programming method.

Keywords- SWDM, membership function, fuzzy mathematical, programming technique, Lingo.

1. INTRODUCTION

Humans have been harnessing natural resources to maintain life and disposing of trash that are abandoned as worthless or undesired since ancient times. Because the population was tiny and there was plenty of space available at the start, trash disposal did not pose a serious concern.

However, waste management has become a difficult challenge for metropolitan populations as a result of rapid urbanisation and population growth (Cheng et al., 2009). These problems are exacerbated by fast socioeconomic growth, which is accompanied by rising pollutant emissions and diminishing resource availability. As landfill capacity declines, there is an increasing need for alternate waste treatment facilities such as incinerators, composting facilities, and recycling facilities. These are increasingly being included into waste management systems.

Probabilistic or potential uncertainties are typically connected with the quantity of waste disposal and the expenses associated with collections, transportations, waste treatment, and other aspects of solid waste management (SWM) modelling. Many writers [1,2,3,4,5,6,7,8,9,10] are familiar with the many mathematical models connected to (SWM) problem.

2. MATHEMATICAL DESCRIPTION

The major components for involved in SWM system are the following.
   a) Sources of waste generation
   b) Sorting, waste treatment and
   c) Disposal facilities

During many intervals, garbage flows from various nodes to certain facilities. Some of the total garbage created is sent straight from the sorting plant to the waste disposal facility, i.e. the landfill. The image depicts many sorts of expenditures, such as transportation costs associated with the waste and residue transfer procedure, as well as operating costs associated with waste treatment. During many intervals, garbage flows from various nodes to certain facilities. Some of the total garbage created is sent straight from the sorting plant to the waste disposal facility, i.e. the landfill. The image depicts many sorts of expenditures, such as transportation costs associated with the waste and residue transfer procedure, as well as operating costs associated with waste treatment.
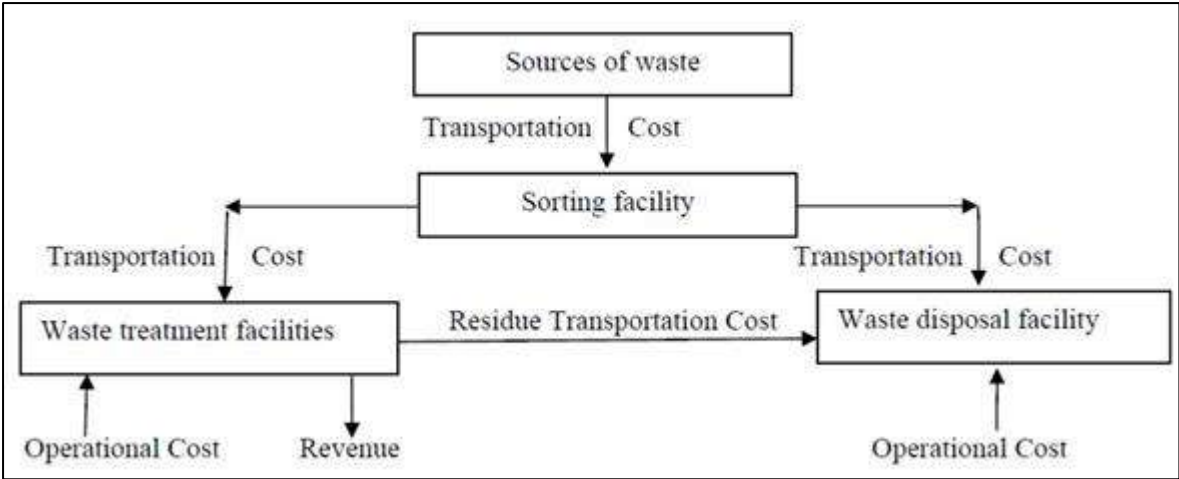
Fig.-1

3.   SAMPLE PROBOBLM

The problem considered to develop a regional disposal system for the solid of three   node (N_1) has population of 100000 and a production of 1800 tons of solid wastes per week node (N_2) with population of 75000 generates solid waste of 1400 tons per week node (N_3) has a population of 4500 and produces 800 tons per week of solid waste .The collection and hauling cost are per ton per week for nodes. Disposal alternatives such as incinerations recycling, refilling and dumping in river are available. There are three sanitary landfills.

3.1Mathematical Model:

The waste sources and numerous disposal options are the components of the systems. The problem's goal is to reduce the total cost as much as possible (transfer, transport and disposal). All solid wastes produced at three nodes (N1, N2, N3) will be disposed of here. With this goal, a linear programming model is created for the given issue. The decision variables, objective function, and restrictions are all used to turn the issue into a mathematical model. The fundamental choice variable is included in the model to Xij – quantity of solid waste transferred from node I to disposal location j (t/wk) represents the quantity of wastes that are sent to disposal sites (for simplicity, locations that are far from each node are not included). There are additionally two recycling plants (r) and one incineration facility (I) accessible from the three nodes.
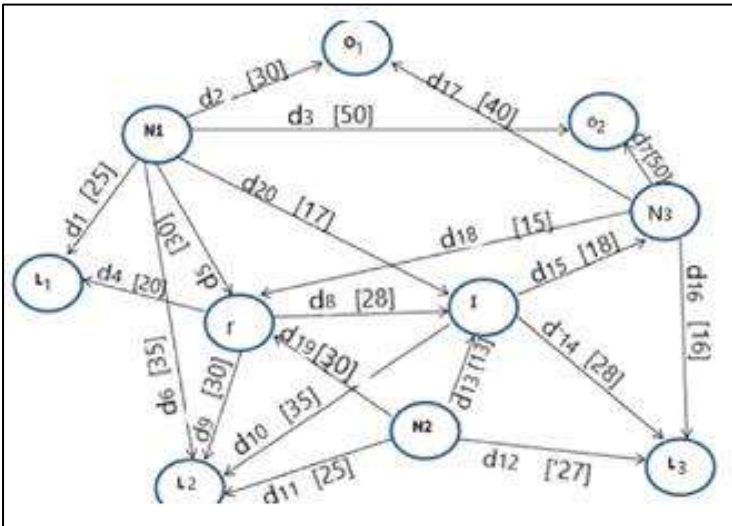

Fig.2

The location of each disposal site, as well as their distance from the other three sites and the material flow pattern, are depicted inside the rectangle. The leftover wastes after salvage, which amount to around 30% of

45

total trash, will be transferred to an incinerator facility or landfilling regions in the recycling process. The remaining burnt trash in front of the incinerator, which is considered 20% unburned waste, is to be disposed of via sanitary lean filling. In order for the incineration and recycling plants to operate economically, they must be loaded at least 400 t/week and 250 t/week, respectively. The operation's coastlines, as well as each disposal's capacity The transportation cost is considered to be Rs 5/t/km per week as an option.

The goal is to dispose of the three nodes' solid wastes for the least amount of money possible. This assumes that the disposal facilities will be operated by a regional or joint authority, with a cost-sharing arrangement that is acceptable to all three nodes.

Additional choice variables x64, x65, x67, x73, x74 are included in the model to reflect garbage returned from recycling and incineration operations. As a result, the model has a total of 20 (twenty) variables. Let C i represent the total expenses at nodes 1, 2, and 3, which are the recycling facility, incineration plant, landfill site, and river disposal regions.

$C_1 = 15(X_{11} + X_{12} + X_{17} + X_{14} + X_{15}) + 5(30X_{11} + 50X_{12} + 36X_{17} + 30X_{16} + 50X_{14} + 30X_{15})$
$C_2 = 13(X_{21} + X_{22} + X_{26} + X_{27} + X_{23}) + 5(15X_{22} + 40X_{21} + 30X_{26} + 18X_{27} + 43X_{23})$
$C_3 = 11(X_{33} + X_{34} + X_{36} + X_{37}) + 5(27X_{33} + 25X_{34} + 38X_{26} + 15X_{37})$.
$C_4 = 40(X_{16} + X_{26} + X_{36} + X_{64} + X_{65} + X_{67}) + 5(30X_{64} + 20X_{65} + 29X_{67})$
$C_5 = 80(X_{17} + X_{27} + X_{37} + X_{73} + X_{74} + X_{67}) + 5(28X_{73} + 35X_{74})$
$C_6 = 25(X_{14} + X_{15} + X_{23} + X_{33} + X_{34} + X_{64} + X_{65} + X_{73} + X_{74})$
$C_7 = 30(X_{11} + X_{12} + X_{21} + X_{22})$
Hence, d (x, y) sanitary distance between x and y

$d_1(N_1, L_1) = 25$	$d_2(N_1, O_1) = 30$
$d_3(N_1, O_2) = 50$	$d_4(L_1, r) = 20$
$d_5(N_1, r) = 30$	$d_6(N_1, L_2) = 35$
$d_7(N3, O_2) = 50$	$d_8(r, I) = 28$
$d_9(L_2, r) = 30$	$d_{10}(L_2, I) = 35$
$d_{11}(L_2, N_2) = 25$	$d_{12}(N2, L_3) = 27$
$d_{13}(I, N_2) = 13$	$d_{14}(I, L_3) = 28$
$d_{15}(N_3, I) = 18$	$d_{16}(L_3, N_3) = 16$
$d_{17}(N_3, O_1) = 40$	$d_{18}(N_3, r) = 15$
$d_{19}(N_2, r) = 35$	$d_{20}(N_1, I) = 17$

The total cost is $G(x) = \sum C_i$ $i = 1, 2, ...7$

And the objective function becomes
Minimize

$G(x) = 195X_{11} + 195X_{12} + 243X_{21} + 128X_{22} + 253X_{23} + 203X_{26} + 183X_{27} + 245X_{73} + 171X_{33} + 161X_{34} + 51X_{36} + 166X_{37} + 265X_{67} + 215X_{64} + 280X_{74} + 165X_{65} + 290X_{14} + 190X_{15} + 190X_{16} + 275X_{17}$.

…. …. ……………………………….. (2.0)

The model's restrictions include limitations on each disposal plant's capacity. Minimum load and return waste disposal restrictions for incineration and recycling operations. At each of the three nodes, as well as at each disposal site, mass balance must be met. Thus, the constraints are

F1(x)	; $X_{11} + X_{12} + X_{14} + X_{15} + X_{16} + X_{17}$	=	1800
F2(x)	; $X_{21} + X_{22} + X_{23} + X_{26} + X_{27}$	=	1400
F3(x)	; $X_{33} + X_{34} + X_{36} + X_{37}$	=	800
F4(x)	; $X_{11} + X_{21}$	≤	50
F5(x)	; $X_{12} + X_{22}$	≤	40
F6(x)	; $X_{23} + X_{33} + X_{73}$	≤	500
F7(x)	; $X_{14} + X_{34} + X_{64} + X_{74}$	≤	1000
F8(x)	; $X_{15} + X_{65}$	≤	800
F9(x)	; $X_{16} + X_{26} + X_{36}$	≤	800
F10(x)	; $X_{17} + X_{27} + X_{37}$	≤	1500

$$F11(x) \quad ; X_{16}+X_{26}+X_{36} \qquad\qquad \geq \qquad 250$$

$$F12(x); X_{17}+X_{27}+X_{37} \qquad\qquad \geq \qquad 400$$

$$X_{64}+ X_{65}+X_{67} - 0.3(X_{16}+X_{26}+X_{36}= 0$$

$$X_{73}+X_{74} - 0.2(X_{17}+X_{27}+X_{37}+X_{67}= 0$$

$$X_{ij} \geq 0 \quad \text{…………………………………. (2.1)}$$

Thus, the linear programming model (2.1) is the schedule by Lingo software the objective value of G(x)= 853650.0 and

x11=50.0000, x12=40.0000, x14=760.0000, x15=800.0000, x16=150.0000,

x17=0.00000, x21=0.000000, x22=0.000000,x23=0.000000,x26=0.000000,

x27=1400.000, x33=150.0000, x34=610.0000, x36=650.000,x37=0.000000,

x64=240.0000, x65=0.00000, x67=0.000000, x73=280.0000,x74=0.000000

Table-1 Cost and capacities solid Waste Disposal Alternative

	Site Method	Capacity(t/wk)	Operation Cost (Rs./t/wk)
1	River dumping	50	30
2	River dumping	40	30
3	Sanitary Landfill	500	25
4	Sanitary Landfill	1000	25
5	Sanitary Landfill	800	25
6	Recycling plant	800	40
7	Incineration plant	1500	80

These costs may vary from region to region. Total cost=Rs.2,12,500
The example problem has three nodes producing wastes, with three sanitary landfill settings and two damping locations alternated. One recycling facility and one incineration plant, built from the three nodes, leave the fig.2 depicted disposal alternate location. Fuzzy variable of model (2.1) particular is quite estimate to take the fuzzy model of (2.1) becomes cost G(x), $F_{1\,(X)}, F_{2\,(X)}\ and\ F_{3\,(X)}$ are not rigid practically these are fuzzy in nature. Determine X such that

$$G(X) \underset{\sim}{\leq} \quad 853650.0$$

$$F1(x) \; ; X_{11}+ X_{12}+ X_{14}+ X_{15}+X_{16}+X_{17} \qquad = \qquad 1800$$
$$F2(x) \; ; \quad X_{21}+ X_{22}+ X_{23}+ X_{26}+ X_{27} \qquad = \qquad 1400$$
$$F3(x) \quad ; X_{33}+ X_{34}+ X_{36}+ X_{37} \qquad\qquad = \qquad 800$$
$$F4(x) \quad ; X_{11}+X_{21} \qquad\qquad\qquad \leq \qquad 50$$
$$F5(x) \quad ; X_{12}+X_{22} \qquad\qquad\qquad \leq \qquad 40$$
$$F6(x) \quad ; X_{23}+X_{33}+X_{73} \qquad\qquad \leq \qquad 500$$
$$F7(x) \quad ; X_{14}+X_{34}+X_{64}+X_{74} \qquad \leq \qquad 1000$$
$$F8(x) \quad ; X_{15}+X_{65} \qquad\qquad\qquad \leq \qquad 800$$
$$F9(x) \quad ; X_{16}+X_{26}+X_{36} \qquad\qquad \leq \qquad 800$$
$$F10(x) \quad ; X_{17}+X_{27}+X_{37} \qquad\qquad \leq \qquad 1500$$
$$F11(x) \quad ; X_{16}+X_{26}+X_{36} \qquad\qquad \geq \qquad 250$$
$$F12(x) \quad ; X_{17}+X_{27}+X_{37} \qquad\qquad \geq \qquad 400$$
$$F13(x) \quad ; X_{64}+ X_{65}+X_{67} - 0.3(X_{16}+X_{26}+X_{36}) =0$$
$$F14(x) \quad ; X_{73}+X_{74} - 0.2(X_{17}+X_{27}+X_{37}+X_{67)} =0$$
$$X_{ij} \geq 0 \quad \text{…………………………………. (2.2)}$$

The fuzzy model (2.2) is not solved so then is need of defuzzification for the model (2.2). The concept of linear membership function is used for defuzzification.

For Four Fuzzy goals, we use Four Linear membership functions $\mu_{1(X)}, \mu_{2(X)}, \mu_{3(X)}$ and $\mu_{4(X)}$ with approximated tolerance limit as desired by decision maker as:

$$\mu_{1(x)} = \frac{900000 - G(x)}{853650}$$

$$\mu_{2(x)} = \frac{2000 - F1(x)}{200}$$

$$\mu_{3(x)} = \frac{1500 - F2(x)}{100}$$

$$\mu_{4(x)} = \frac{1000 - F3(x)}{200}$$

CRISP MODEL OF (2.2)

Determine X which Maximize:

$$\mu_1^2 + \mu_2^2 + \mu_3^2 + \mu_4^2$$

Such that:

$$\mu_{1(x)} = \frac{900000 - G(x)}{853650}$$

$$\mu_{2(x)} = \frac{2000 - F1(x)}{200}$$

$$\mu_{3(x)} = \frac{1500 - F2(x)}{100}$$

$$\mu_{4(x)} = \frac{1000 - F3(x)}{200}$$

F1(x) ; $X_{11} + X_{12} + X_{14} + X_{15} + X_{16} + X_{17}$	=	1800		
F2(x) ; $X_{21} + X_{22} + X_{23} + X_{26} + X_{27}$	=		1400	
F3(x) ; $X_{33} + X_{34} + X_{36} + X_{37}$	=		800	
F4(x) ; $X_{11} + X_{21}$	$\leq$		50	
F5(x) ; $X_{12} + X_{22}$	$\leq$		40	
F6(x) ; $X_{23} + X_{33} + X_{73}$		$\leq$		500
F7(x) ; $X_{14} + X_{34} + X_{64} + X_{74}$	$\leq$		1000	
F8(x) ; $X_{15} + X_{65}$	$\leq$		800	
F9(x) ; $X_{16} + X_{26} + X_{36}$		$\leq$		800
F10(x) ; $X_{17} + X_{27} + X_{37}$		$\leq$		1500
F11(x) ; $X_{16} + X_{26} + X_{36}$		$\geq$	250	
F12(x) ; $X_{17} + X_{27} + X_{37}$		$\geq$	400	
F13(x) ; $X_{64} + X_{65} + X_{67} - 0.3(X_{16} + X_{26} + X_{36}) = 0$				
F14(x) ; $X_{73} + X_{74} - 0.2(X_{17} + X_{27} + X_{37} + X_{67}) = 0$				

$X_{ij} \geq 0, \mu_{1(X)} \geq 0, \mu_{2(X)} \geq 0, \mu_{3(X)} \geq 0, \mu_{4(X)} \geq 0, \ldots\ldots\ldots..(2.3)$

The model (2.3) is solved by Lingo software. The solution is obtained as Objective Value= 3.000000 and $\mu_{1(X)} = 0.000000, \mu_{2(X)} = 1.000000$,

$$\mu_{3(X)} = 1.000000, \mu_{4(X)} = 1.000000,$$

x11=50.00000, x12=40.00000, x14=705.5876, x15=634.5500, x16=17.13354, x17=352.7289, x21=0.000000, x22=0.000000, x23=229.9190, x26=22.80991, x27=1144.271, x33=254.2292, x34=0.000000, x36=545.7708, x37=0.000000, x64=10.262400, x65=165.4500, x67=0.000000, x73=15.85183, x74=284.1482,

Solution of the Model:

The Fuzzy quadratic programming Lingo model solution has been discussed using computer programming. The minimal cost of solid waste removal for the three nodes is 853650, according to the solution. Only the incinerator and the sanitary landfill (disposal alternative 3) are not being used to their full capacity. The average per capital rate for waste disposal is Rs.853650/220000 = Rs.3.90

4. CONCLUSIONS

A multi-objective fuzzy quadratic programming model is discussed in this study for decision making in SWM under numerous uncertainties. The answer to a SWM problem is found using a mathematical model called a linear programming model. To summaries, this sort of model is a decision to build a strategy to acquire the best solution for any environmental management challenge.

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Routing Techniques in MANETs: A Review

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Abstract: MANETs are the fastest growing wireless networks due to their characteristics of self-configuration, self-administration and dynamic topology. Manets have limited resources (power, bandwidth) but they provide versatile applications in many areas as they do not require any extra infrastructure for their deployment and flexible in nature. Manets are used during the emergency and rescue, disaster situations, military operations and in various businesses, educational and individual scenarios where a group of peoples want to communicate as per their choice or demand. This paper presents the types of routing algorithms designed for providing commutation in Manets. The paper also compares them on the basis of different performance criteria. The factors influencing performance of Manets routing protocols is also described in the paper because the random node mobility and various other factors like network size and traffic intensity are very dynamic that results in unpredictable variations in the overall network performance.

Key Words: Proactive, Reactive, Hybrid, Routing in Manets, Performance, Comparison

I   Introduction

A mobile ad hoc network (MANET) is a group of mobile nodes that establish a temporary network without using any existing network infrastructure or centralised administration. The topology of the network is constantly changing due to the mobility of the nodes, as well as the continuous parting and joining of nodes. Routing protocols are required to manage data transmission. Routing is the basic operation for data communications. The procedure or set of rules defined for finding and selecting routes for data communication between any two hosts in an adhoc network is defined as routing algorithms. Routing mechanism in adhoc networks is completely different from wired or infrastructure based wireless networks due to their decentralized and dynamic topology. Adhoc network uses multi-hop routing mechanism to route packets from source node to destination node through one or many intermediatory nodes by selecting the best path or most efficient path. It is done by maintaining routing tables to store necessary information required for data forwarding. Therefore every node in adhoc network is capable of performing the tasks of router and hosts. Hence analysing the performance of the routing protocols becomes crucial to finding an efficient routing protocol. Researchers have conducted different performance evaluation of routing protocols through trial and error simulation experiments.

2   Classifications of Routing Techniques

MANET routing protocols have been designed for accurate, fast, reliable, scalable, stable, fairness, robust, QoS aware and energy efficient routing protocols for a high volume of dynamic network topology. Depending upon the routing strategy Manet routing protocols may be categorised as follows:
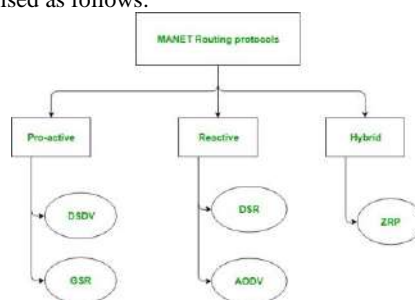

Figure 1: Types of Routing Protocols

1. TABLE DRIVEN/ PROACTIVE PROTOCOL every node in the Proactive Routing Protocol keeps information in the form of tables, which must be updated whenever the network changes. In finding a new route, there is no path discovery delay [16]. Routes are available when they are needed with proactive protocols. However, in large networks or networks with rapidly moving nodes and advanced control traffic, the control overhead of these protocols can be significant. Overhead introduced due to extra information required for fresh route maintenance. Large amount of time taken in distributing and recovering the link breakage information throughout the network.
 Some examples of Proactive Routing Protocols are:
        1. Destination Sequence Distance Vector (DSDV) [6]
        2. Global State Routing (GSR) [7]

3. Hierarchical State Routing (HSR) [8]

1.1 DSDV (Destination-Sequenced Distance Vector): It is a proactive routing protocol which is modification of traditional distance vector routing. Every mobile node maintains a routing table which lists all the available destinations, the metric and next hop to each destination and a sequence number generated by the destination node. The packets are transmitted between the nodes of an ad hoc network using routing table stored in each mobile node. Each node updates the routing table with advertisement periodically [17]. Each node in DSDV is required to maintain two tables. The routing table is one of them, and so it contains a complete list of all other nodes in the network's addresses. The other holds the data for each destination node's setting time. It is used to decide when an advertisement should be refreshed. The complexity in DSDV increases with the network size due to the overhead for maintaining and updating these tables.

1.2. GSR (Global State Routing): is also a routing protocol with a proactive/table-driven approach. It extends all the way the wired network's link state routing. Its routing algorithm is based on Dijkstra's. The link state routing protocol was not optimized for mobile ad-hoc networks because each node floods link state routing information directly into the entire network, likely to result in global flooding, that can cause control packet congestion.

As a result, the Global State Routing Protocol (GSR) was developed as a solution. The link state routing packets are not flooded into the network by global state routing. Each mobile node in GSR keeps a record of one list and three tables: adjacency list, topology table, next hop table, and distance table.

1.3 HSR (Hierarchical state routing): proposed in Scalable Routing Strategies for Ad Hoc Wireless Networks by Iwata et al. (1999), is a typical example of a hierarchical routing protocol. HSR maintains a hierarchical topology, where elected cluster heads at the lowest level become members of the next higher level. It increases the scalability of routing by increasing the robustness of routes in adhoc networks.

2. ON-DEMAND/REACTIVE PROTOCOL On demand routing techniques are also known as reactive routing protocols [3] [4]. When two nodes desire to communicate with each other, reactive protocols do not need to maintain a connection among all pairs of network nodes on a constant basis. Rather, a route from source to destination is established when two nodes want to communicate with each other. When a source node wants to send data packets to a destination node, it first checks its route database to see whether there is a route available. If no valid route are identified, it implements a route discovery method to find a path to the target, which means route discovery is now on-demand. The route is valid as long as the connection is not disrupted. Reactive protocols tend to decrease the control traffic messages overhead at the cost of increased latency in discover a new routes. In reactive protocols there is no need of distribution of information. It consumes bandwidth when the data is transferred from source to destination [18]. The main benefit of reactive routing systems is that they have a reduced routing overhead over proactive routing protocols [1]. The introduction of route acquisition latency is a downside of reactive routing technology [1]. When a source node demands a route, there is some downtime while the route is identified. In proactive routing protocols, on either hand, routes often are available as soon as they are needed, and there is no delay in starting the data session. Large time taken for finding efficient route due to high latency introduced by many request and reply packets within the network. There can be congestion in the network due to excessive flooding of request packets.
Some examples of Reactive Routing Protocols are:

             1. Dynamic Source Routing (DSR) [9]
             2. Ad hoc On-demand Distance Vector Routing (AODV) [10]
             3. Temporary Ordered Routing Protocol (TORA) [11]

2.1. DSR (Dynamic Source Routing): it is based on source routing method means the node itself has entire route to the destination. Every node maintains a cache along with its freshness (age) information to store recently discovered paths. If the desired route is not available in the cache or the entry in cache is expired (because of long time idle), the sender broadcasts a RREQ (route request) packet to all of its neighbours for discovery of path to the destination. Sender also appends its address within the packet. RREP (route reply) packet is send back to the source when destination is reached and the route got established. It does not require routing table because the complete route is stored within the data packet itself. But due to this DSR is not scalable to large networks because it increases the processing resources significantly.

2.2. AODV (Ad-hoc On-Demand Distance Vector Routing): AODV establishes a route to a destination only on demand. It is based on Distance Vector routing method and uses next hop as metric. It works in two phase i.e. route discovery and route maintenance. Route discovery phase uses RREQ packet to be forwarded to neighbouring nodes for discovery of desired route and RREP packet that establishes the route between source and destination. Route maintenance phase uses RERR packet when something wrong happens within the communication to make aware the source node about the fault. AODV is capable of unicast, broadcast and multicast routing [19]. AODV avoids the counting to infinity problem by using destination sequence numbers [10].

2.3. TORA (Temporary Ordered Routing Protocol): determines the direction of links between two nodes by using arbitrary height parameter. QUERY, UPDATE and CLEAR packets are used to establish path from source to destination. QUERY packet initiates the route discovery which completed by the broadcast of UPDATE packet by the node having information about destination. All other nodes in the path update their height information regarding the destination node. CLEAR packet clears all data when no route from source to destination is found. TORA has multiple routes from source to destination that helps when any link or node fails. TORA require the synchronization between nodes for effective route discovery.

3. HYBRID ROUTING PROTOCOL The reactive and proactive routing strategies are combination of a hybrid routing protocol. It is recommended that proactive routing protocols' control complexity be minimized, and also the latency caused by route discovery in reactive routing methods. Dependency over active nodes in the network. Dependency over traffic volume gradient for demands. Example of Hybrid Routing Protocol is:

             1. Zone Routing Protocol (ZRP) [12]

3.1 ZRP (Zone Routing Protocol): It is a hybrid routing protocol that divides the network into zones. ZRP provides a hierarchical architecture where each node has to maintain additional topological information requiring extra memory [12].

3   Factors affecting the performance

Random node mobility, in combination with other variables like as network size and traffic intensity, can cause unforeseen changes in overall network performance. The overall performance of any protocol operating on an ad hoc network is influenced by a number of factors. Node mobility, for example, may result in link failures, which will have a detrimental influence on routing and service support quality. Network scalability will be influenced by network size, control overhead, and traffic volume. These considerations will aid in the selection of design options and trade-off. Assume, for example, that node mobility has a bigger impact on average control overhead than any other element. As a result, implementing algorithms that adjust to node mobility would be the most beneficial.

- Network Overhead: This parameter refers to number of control packets generated by routing protocols. Due to shared wireless media, additional control packets may easily lead to congestion or collision in MANET. Packet lost is one the results of congestion and collision. Therefore, high packet overhead increases packet lost and the number of retransmitted packets. This will easily wastes nodes energy and networks resources.
- Processing Time: routing protocols needs time to calculate route from source to destination. Due to MANET's dynamic topology and internal or external interruptions there is strong possibility of route's breakage between two different nodes because of their frequent mobility. Therefore, routing approaches must have as low as possible processing time in order to increase MANET flexibility and avoid rerouting process.
- Energy Consumption: In MANET nodes have limited energy supply. Therefore, optimizing energy consumption is highly challengeable in MANET. High energy consumption reduces nodes and network's lifetime.
- Throughput: This metric represents the total number of bits forwarded to higher layers per second. It is measured in bps. It can also be defined as the total amount of data a receiver actually receives from sender divided by the time taken by the receiver to obtain the last packet.
- Media Access Delay: The time a node takes to access media for starting the packet transmission is called as media access delay. The delay is recorded for each packet when it is sent to the physical layer for the first time.
- Packet Delivery Ratio: The ratio between the amount of incoming data packets and actually received data packets.
- Path optimality: This metric can be defined as the difference between the path actually taken and the best possible path for a packet to reach its destination.

4   Comparison of Various Routing Techniques

In ad hoc networks nodes network topology cannot be identified in advance but have to be discovered. Each node learns about nodes nearby and constructs a map with the paths to reach them. The routing protocol discovers the new routes while keeping track of the validity of old ones. Various protocols are available and chosen depending on circumstances. The table given here compares the three types of routing protocols based on different dimensions.

Table 1 : Features of Manet Routing Protocols [17]

Dimension Used for Comparison	Proactive	Reactive	Hybrid
Structure of Network	Flat or Hierarchical	Flat	Hierarchical
Network Scalability	Suitable for small networks; Upto 100 nodes	Suitable for Medium size networks; 1000 to 10000	Suitable for Large size networks; > 10000
Routing Updates	Periodic and whenever topology changes	No routing updates as route calculation is done when demand arises	Required periodic updates within hierarchy/zone
Storage Requirements	Large amount of storage is needed to store routing data in routing table	Smaller than proactive to store routes	Depends on the size of zones inside networks
Extra Overhead	High	Low	Medium
Availability of Routing Information	Always available; stored in tables	Available when required	Combination of both
Latency	Information for routing already available in routing tables. So, low latency value	Route Request Packets being flooded throughout the network. So, high latency value	Less than reactive but more than proactive
Handling Mobility of nodes	Using Periodic Updates of Routing Table	Route Repair and Maintenance Procedure	Combination of both
Delay Introduced	Low as routes calculated before needed	High due to on-demand routes calculations	Within zone Low but Outside zone equivalent to reactive routing protocol

5   Conclusion

Routing is an essential component of communication protocols in MANET. The design of the protocols are driven by specific goals and requirements based on respective assumptions about the network properties. In this survey we discussed the three types of routing protocols. The proactive protocols, such as Destination Sequenced Distance Vector (DSDV), periodically disseminate routing information among all the hosts in the network, so that every host has the up to date information for all possible routes. In contrast, reactive routing protocols, such as Ad-Hoc On-Demand Distance Vector Protocol (AODV) and Dynamic Source Routing (DSR), query a route when there is a real need for it. It may be concluded that reactive routing algorithms are better than proactive in manets due to their dynamic nature. AODV and DSR are the most widely used manet routing protocols. The hybrid routing techniques combines the best features of both the proactive and reactive routing. However there can be different scenarios in which different routing protocol is suitable depending upon the requirements and factors influencing as discussed in the paper.

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TEXTILE EDUCATION 4.0

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ABSTRACT: Textile materials are interactive materials between humans and environment. The new industrial revolution, supported by industry 4.0 and textile education 4.0 has provided a fast developing platform for growth and reinvention of opportunities in advanced functional textiles.

It has been found by research that conventional textiles, fibre, materials and manpower cannot meet the aspirations of modern society. Advanced and smart functional textile materials are the only solution to fill this gap. To generate and produce these, industry 4.0 equipment have been developed. Likewise, to train the required human resources education 4.0 is being put into practice by the means of augmented reality, virtual reality, 3D printing, IIoT and other core technologies. Industry 4.0 has been adopted by world's largest industry viz. textile industry.

The research as under has been conducted on a number of stakeholders from academia as well as industrial work-force. This research paper aims to study education 4.0 and its modalities which create human resource for industry 4.0. in general and for textile in particular. This research has built a model and formula for it. This model consists of all elements that are present during the teaching-learning process. It is a guidelines structure that will empower teachers.

KEYWORDS: Education 4.0, Smart textiles, augmented reality, IIOT

1. INTRODUCTION

Textile industry is catching the fourth industrial revolution 4.0 at its own pace. It is one of the largest industries of manufacturing sector. With the advent of advanced functional textile materials, it is important to perceive the growth in terms of novelty and productivity. The main challenge in achieving smart industrial goals is the availability of suitable and efficient human resources.

2. INDUSTRY 4.0 SMART FACTORY TECHNOLOGY

For this research, survey of more than 150 stakeholders was conducted from industry, academia, skill & training providers and students. Their valuable feedback helped to formulate a model for future textile engineering faculty members in respect of education 4.0. This is based on the requirements of industry 4.0

3. METHODOLOGY

Kiosk surveys – (Touch SLren tech)

Kiosk survey methods were adopted for this with help of computer service providers. The survey was conducted through computer at GGSESTC location with following questionnaire: -

How you rate Education system 4.0:

Q.1 In which areas should we improve?

a) Core subject knowledge with Virtual Class room management

b) Creativity

c) Mentoring

d) Social and emotional Manager

e) Problem solving

f) Strong analytical skills & E-skills

Feedback from various stakeholders was received and recorded. The preliminary data is uploaded to a database (SQL server).

This allows SQL queries to be run on the database on the high level questions. Adaptations to the Vibelog tool for the kiosk study. The data is analysed with collinear factor analysis method.

4. RESULTS AND DISCUSSION:

After detailed study and analysis of processed data

MODEL

$$\text{TFQI } 4.0 = \frac{f(a * V \sqrt{b * v * c * I * e * G * f * Y * g * O})}{h * R}$$

Whereas –

TFQI = Textile Faculty Quality Index 4.0

1) V= Virtual classroom management skills with core subject knowledge
2) I = Improved creativity & analytical meta cognitive skills
3) B = business mentorship and social skills
4) G = green technologies
5) Y = yacht concept & skills
6) O = online knowledge transparency AR/VR/ULL/3D/E skills
7) R = reluctance to change
   a to h are constants

Fig 1

5. CONCLUSION

There are multiple strategies based on the above discussion that must be adopted to improve the quality of teachers to meet the demands of textile industry 4.0. They are providing information and communication assistance and service in the form of time given, opportunities created and authority and responsibility taken.

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Study on the influence of thin film thermocouple design on its operational performance

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Abstract. Thin film thermocouple is developed to measure rapid surface temperature changes. It has low cost, excellent spatial resolution and fast response as compared to wire thermocouple. Here, we will evaluate the performance of thin film thermocouple with regard to its response time. To start with, thin film thermocouples are built using anodic vacuum arc deposition technique. Then, thermocouple is calibrated. Later, an experimental setup is prepared in which focused sun rays are used to heat the junction so as to get the required response time in the Digital storage oscilloscope. Response time is obtained for a number of TFTC. Tolensky interferometric technique is used to determine the thickness of a number of TFTCs. At last, the performance is shown by plotting the graph between response time and film thickness. Thin film thermocouples provide a intrusive means of measuring surface temperature in a hostile, high temperature environments.

Keywords: Tolensky interferometric technique, TFTCs, anodic vacuum arc deposition technique

1   Introduction

The concept of thin film thermocouples (TFTs) was first reported in the 1930's by Harris et al. [1]. Various combinations of thermocouple elements have been studied and analyzed in Marshall et al. [1].TFT have been used for various surface temperature measurements by Bullis et al. [2], Assanis et al. [3], Debey et al. [4], Tian et al. [5] and Laugier [6], due to their inherent advantages over wire-bead type thermocouples.

 The use of thin films for surface temperature measurement provides the advantage that they can be fabricated on surfaces where placement of a beaded thermocouple may interfere with the functioning of the object, e.g., aerodynamic structures where the surface roughness is of extreme importance and cannot be compromised.

TFT has extremely small thermal inertia when compared to conventional beaded thermocouples, resulting in fast thermal response, as reported by Chu et al. [7]. The small thermal inertia also causes minimal interference of the surface temperature distribution, as reported by Chu et al. [8]. Thus, TFT provide more accurate measurement of surface temperatures than beaded thermocouples according 5 to Bullis et al. [2].

The thin film thermocouple is an extremely thin temperature sensor with a maximum thickness of 60 μm, incorporating a protective film patterned directly on the polyimide film by vacuum deposition technology. This thermocouple can easily measure the temperatures of areas with minimal surface irregularities and the narrowest. It is also able to perform multipoint measurement within a single element using an independent layout design and detailed patterning enabled through the selection of a photolithography etching method. The schematic diagram of various design of thin film thermocouple is shown below
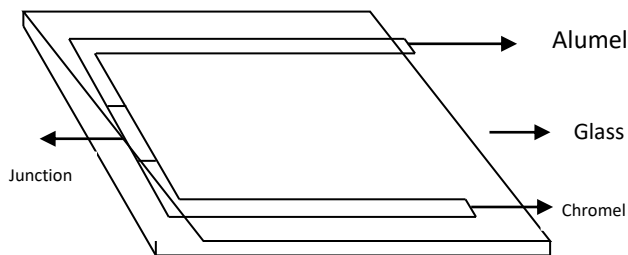

Fig1: Single junction thin film thermocouple

2.   RESEARCH METHODOLOGY

2.1 Fabrication of Thin film thermocouple

The glass plate (called substrate) is cleaned in ultrasonic bath with Acetone. Teflon is used as a mask. Mask is placed at one side and substrate is loaded inside Anodic vacuum arc deposition system. After coating at one side, this mask is lifted off and put over other side and reloaded into the deposition system. In this way, a thin film thermocouple is fabricated.

Alumel (Ni95⁄Mn2⁄Al2⁄Si1) and chromel (Ni90⁄Cr10) (i.e. *K*-type thermocouple) are selected as materials which is to be coated on substrates like as Glass ,Mica and metal alloy due to their relatively large difference in

Seebeck coefficients and a wide operating temperature range. Theoretically, *K*-type thermocouples can function up to 1250 ∘C with a thermal sensitivity of approximately 41 μV $^{\circ}C^{-1}$.

Fig. 2

2.1.1 Anodic vacuum arc deposition unit

The vacuum arc plasma sources and the substrate holders must be mounted in a vacuum deposition chamber. The coating chamber is a cylindrical vessel. The chamber consists of two view ports fitted with toughened glass to monitor the operation. The chamber is fitted with four ports for fixing the cathode and 3 numbers of anodes each oriented at 90^0 apart in four quadrants. Anode consists of two parts. One part is graphite crucible of 50 mm length in which tungsten boat/ basket is placed and this is supported by water cooled stainless steel support. Anode can be moved to and fro by means of linear shaft seal. Cathode is made up of stainless steel 40 mm in diameter disc with 6 mm tapped hole at the front to support the circular graphite plate. Cathode is shielded with a stainless steel shield to prevent the micro-particles produced at the cathode-spots from reaching the substrate. However,a substrate holder is desired which also provides for controlling the substrate temperature, allowing for substrate bias, shielding of unwanted surfaces from deposition, moving the substrate to provide uniform coatings over large areas, multiple substrates.
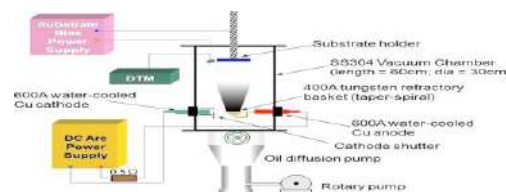

Fig 3 Schematic diagram of AVA Deposition unit

2.2 Final experimental setup

Here, input is given to the thermocouple amplifier which shows the amplified voltage signal in the digital storage oscilloscope. Focused light rays fall to the junction of the thin film thermocouple and the response of the thermal sensor was recorded simultaneously by a digital oscilloscope.
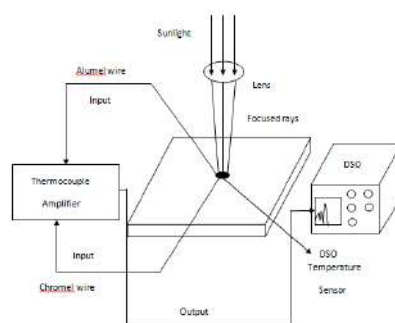

Fig 4 Experimental setup for response time measurement

2.2.1 FABRICATION OF DUAL RAIL REGULATED POWER SUPPLY:

It provides dual rail supply which means there are two equal supply voltages one positive and one negative. It is capable of supplying up to +/-12v dc at up to 1 amp. It consists of a Centre tapped transformer, Diodes, Electrolytic Capacitor, Three Terminal Voltage Regulator, Resistors and Light emitting diodes [43]. This circuit is used to deliver power supply to the Thermocouple amplifier which will be discussed later. With the proper use of transformer we can easily build a dual rail regulated power supply.
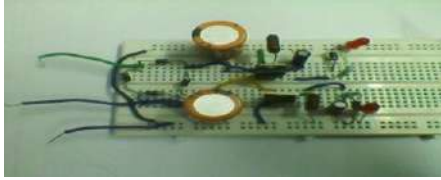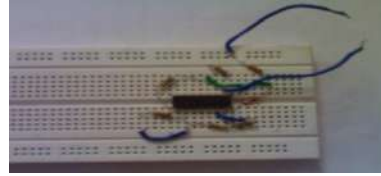
Fig. 5

Fig. 6 Instrumentation Amplifier

2.2.2 Fabrication of Instrumentation Amplifier

An instrumentation amplifier is a differential op-amp circuit providing high input impedances with ease of gain adjustment through the variation of a single resistor. Any instrumentation amplifier has high input impedance

$$V_{3-4} = (V_2 - V_1) \left(1 + \frac{2R}{\text{—}}\right)$$

and very low output impedance. These amplifiers usually have a gain in a range between 1 and 1000. This intimidating circuit is constructed from a buffered differential amplifier stage with three new resistors linking the two buffer circuits together.

2.3 THIN FILM THICKNESS MEASUREMENT

In thin films, as the film thickness is usually in the range of a wave length of visible light, we find various types of optical interference phenomena which is fruitful for the accurate determination of film thickness. Here, we discuss about multiple beam interferometric technique namely fizeau fringe of equal thickness (also called as Tolansky technique) for the measurement of film thickness.

$$t = (d/\text{fringe spacing}) . \frac{\lambda}{2}$$

3. RESULTS

Now we will discuss the effect of size on the dynamic response of thin film thermocouples. Sensors with different sizes and different film thickness are fabricated.

3.1 CALIBRATION OF THIN FILM THERMOCOUPPLE

To calibrate thermocouple junctions, each thin film thermocouple pad was bonded to its corresponding compensation wire with silver paste.. The soldering iron was used to heat the junction of thin film thermocouple. Thermometer was used to record the temperature of the junctions. A multimeter measured the thermoelectric voltage generated by the thermocouple
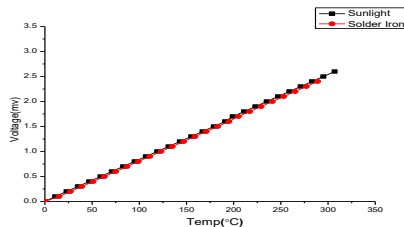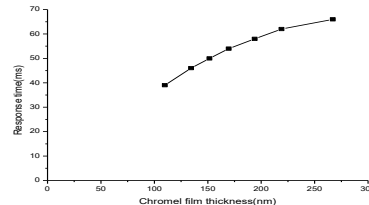

Fig. 7

Fig. 8

Calibration of the thermocouple was done by increasing substrate temperature from room temperature to 290 $°C$ in increments of 12 $°C$. At each setting the surface temperature was allowed to reach the steady state and the voltage generated by the thermocouple recorded. The results indicate that the TFTC has a nearly linear relationship between temperature and thermoelectric output voltage at the experimented temperature range. In other case, focussed heating beam was used to heat the thermocouple junction. Here, again TFTC has a linear graph between temperature and thermoelectric voltage. The difference is that temperature increases a little rapidly than in case of solder iron and voltage increases as well.

3.2 Performance of thin film thermocouple

Here, film thickness varies from 109.8nm to 267nm.and response time varies from 39ms to 67ms.From the graph it is seen that the response time of thin film thermocouple fabricated on glass becomes shorter as the film thickness decreases. It means the response time is directly related to thickness of the sensor. A TFTC with shorter film thickness responds more quickly as compared to TFTC of having larger thickness.

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THE EFFECT OF WELDING PARAMETERS IN MICRO PLASMA ARC WELDING OF STAINLESS STEEL 304 THIN SHEETS

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Abstract: These days welding of thin plate is prominent due to its importance in various field such as aerospace, medical science and industrial application etc., where welding of thin structure is required. Stainless steel is most widely used due to its corrosive resistance with high strength and ductility. Micro Plasma Arc Welding (MPAW) is one of the effective welding processes, for these structures, therefore optimum parameter for effective welding needs to be studied. In this work specimens for welding are prepared from stainless steel (SS 304) having sheet thickness of 0.5mm and welding is carried out using MPAW. The effects of welding parameters such as welding speed, and base current on the weld properties are considered.

Mechanical properties are evaluated by carrying out tensile test , hardness test and microstructure. These tests are carried out on different specimens which are obtained by micro plasma arc welding by varying the welding parameters for different specimen. The results obtained from the test are analyzed and optimum values of the welding parameter are determined.

Keywords: MPAW, stainless steel 304, mechanical properties

1. Introduction

The effect of process parameter in micro plasma arc welding (MPAW) is on stainless steel thin sheet has greater influence on mechanical properties and good quality of welding. At the different input parameter such that welding speed, base current, peak current, nozzle distance etc. are varied their quality of welding and mechanical properties. To determine these optimum input process parameter visual inspection is used. Heat input is also important process parameter for welding thin sheets because in fusion welding process material is joined by melting of metals .In other arc welding process high heat produce than material melt throughout, burn throughout, greater tolerance are obtained. So micro plasma arc welding is good welding of thin sheet but it has high equipment cost compared to GTAW.

In the pulse current MPAW select the pulse frequency and optimize the base current, peak current welding speed and nozzle distance to maintain the arc and also material is melt at the peak current so narrower heat affected zone (HAZ) is obtained , greater to heat sink lower heat input is required and reduce residual stress are obtained.

From the literature review (Kondapali Siva Prasad et.al, Kaung-hung Tseng et.al, F.Karimzadeh et.al, Mohandas et.al.) it is under stood that maximum of work is reported the effect of welding speed, base current ,peak current, standoff distance, pulse frequency, gas flow rate are considered. Hence ultimate tensile strength, hardness values are obtained at the optimum process parameter. But here optimum values of the process parameter are obtained at visual inspection and varied base current, welding speed and standoff distance to obtained for the good quality of welding and then ultimate tensile strength and hardness values are obtained.

2. Experimental procedure

Prior welding work piece was cut by shearing machine having dimension 100 mm x150mmx 0.5 mm. Cut samples were then cleaned by polishing paper and acetone such that no impurities were present on the welding edge. After edge preparation work piece was hold tight in the fixture in such a way that nozzle tip was able to move exactly on top of the butt line between the work pieces. Various welding conditions used in experiment. Different process parameter was adjusted to carry out the study of effect process parameters. Table 1 shows various welding conditions used for experiments.

TABLE- 1Welding condition

Power source	Micro plasma machine (model: MP 50)
Polarity	DCEN
Electrode	Tungsten
Plasma gas	Argon
Shielding gas	Argon
Copper nozzle diameter	1.2mm
Torch position	Vertical
Operation type	Semi automatic
Mode of operation	Pulse

Following two important process parameters were varied during micro plasma arc welding of SS sheets. The other process parameters listed in Table 2 were kept constant.

Following process parameters were varied.

a. Welding speed

b. Base current

TABLE-2 Following process parameter remains constant

Plasma gas	0.9 LPM
Shielding gas	3.25 LPM
Sec pre flow	4 sec
Sec up slope	4 sec
Sec dn slope	3 sec
Sec post flow	6 sec
Pulse time	40 m sec
Standoff distance	2.5mm
Pulse	40

frequency	pulse/sec

3.   Optimization of process parameter for micro plasma arc welding of ss304 sheets of 0.5mm thickness

Variation in travel speed for determining optimum speed for sound of successful welding. As shown in the figure A,B,C,D,E. samples were found with defects increase in travel speed. Hence optimum values of travel speed was found to be for different current and other input parameter remain constant. Following graph are plotted of defect specimen for obtaining optimum welding speed at each current.
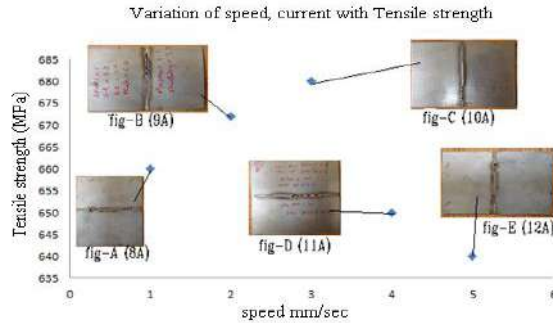
Fig-1. Defective specimen for optimizing welding speed

TABLE-3 Optimum speed for each current.

Current	8Amp	9Amp	10Amp	11Amp	12Amp
speed	3mm/sec	4mm/sec	5mm/sec	6mm/sec	7mm/sec

Experiment with different average current and speed were carried out. Average current was varied from 8 A to 12 A with the interval of 1 A. Welding speed of 3 mm/sec to 7 mm/sec with interval of 1 mm/sec. Fig 4.1 shows the photo graph of welding samples carried out process parameters (a) 8 A & 3 mm/sec (b) 9 A & 4 mm/sec (c) 10 A & 5 mm/sec (d) 11 A & 6 mm/sec (e) 12 A & 7mm/sec of current & travel speed .

For determining optimum speed at various current values visual inspection of weld bead was considered. Welding at various travel speed & various current values were carried out for obtaining successful defect free welds. The various type of defect and their respective tensile strength Vs travel speed is presented in pictorial from in fig 4.1. thus optimum values of process parameters are determined fo MPAW of ss 304 sheets & summarised in table 3. In fig -1 fig E & D shows spatter , burring during MPAW to high values of currents 11 & 12 A & low travel speed. Fig. A,B& D shows incomplete fusion & burning of sample due to low values of speed at different current values of 8,9,10,11,12 A respectively.
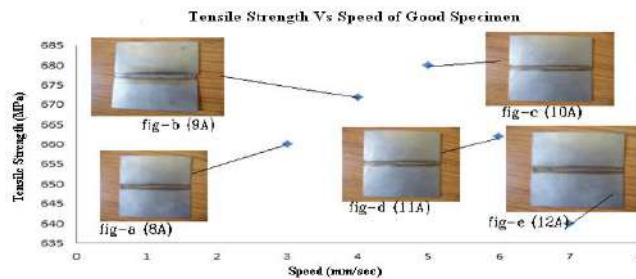

Fig-2 Good specimen for optimizing welding speed

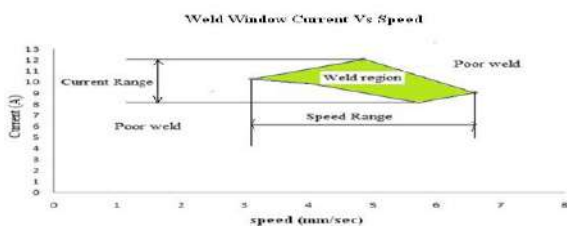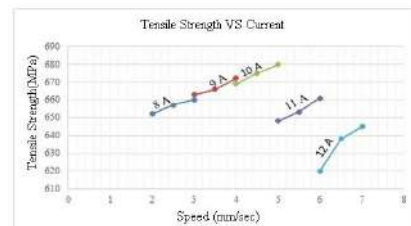Fig:-3 Weld window   Fig-4 Tensile strength VS speed

For optimizing the speed at each average current first we tried a particular speed for welding than we get poor weld and this specimen are tested to obtained strength of welding than we increased welding speed and get better welding and this sample is also tested And get better tensile strength than previous welded sample and then again increase welding speed and get poor weld. So this type of experiment is repeated for each current and current range and speed are finalized. Fig 3 and 4 shown speed range, current range at a particular input parameter.

4. Mechanical Testing of Welds

4.1 Tensile Testing of weld

After many experiments at different process parameter specimen are prepared for different testing. For tensile testing specimen were cut by Co_2 laser cutting machine (ORION-3015) as per ASTM D-1708 specification. Tensile test were carried out in 5 KN computer controlled micro test machine (model no-MT 10081), so that specimen undergoes deformation. Fig.5 shows photograph of samples prepared for tensile testing.

Fig-5 Specimen for tensile test

Fig-6 Dimension of specimen for tensile test

3 set of samples were prepared for each set of process parameters for tensile testing. Three samples were tested for tensile testing and results are plotted in graph shown in figure 7
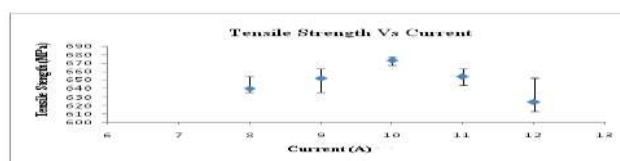

Fig-7 Current Vs Ultimate tensile stress

It is found from the graph above that samples welded at 9 and 10 A current show better tensile strength as compared to others. At lower value of current the heat generated was not sufficient to weld the samples and create defect weld. Weld defects are anticipated and will be confirmed with metallographic study. At higher values of current 11 and 12 A the excess current amplitude is leading to spatter of weld pool and again reducing the strength of the weld. The optimum value of current is found to be 10 A. After tensile and hardness test it is found that maximum tensile strength is concluded at average current 10 A (650 MPa) at input parameter and maximum hardness value at average current 8 A (268 HV) at input parameter.

4.2 Hardness Test

After Micro plasma arc welding at different process parameter 3 specimens at each parameter are prepared and hardness is measured at five different points on specimen and average hardness value is measured. . Vickers hardness testing is carried out with 300 kgf load for getting the indentation.
Following points are considered at the specimen. -2, -1, 0 , 1, 2 are indicating only different points on the specimen.

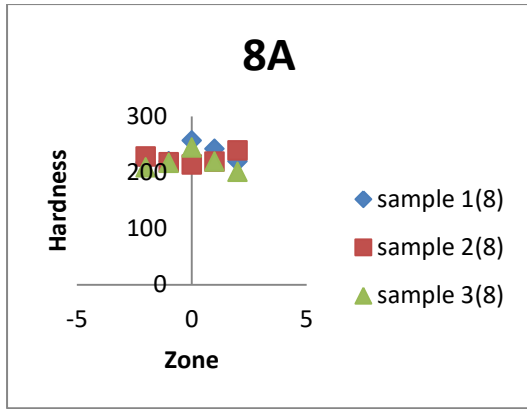| Base material Zone (-2)	HAZ (-1)	Weld Zone (0)	HAZ (1)	Base material Zone (2)

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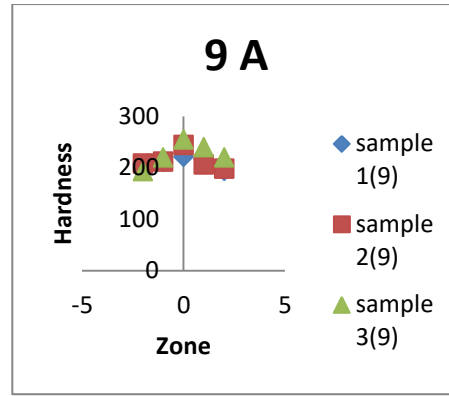Fig 8-Hardness values at 8A of three sample at different zone

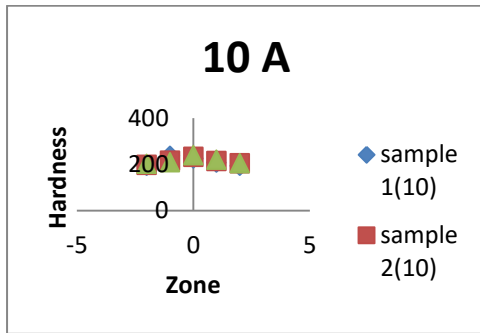Fig -9 Hardness values at 9A of three sample at different zone

Fig-10 Hardness values at 10A of three sample at different zone
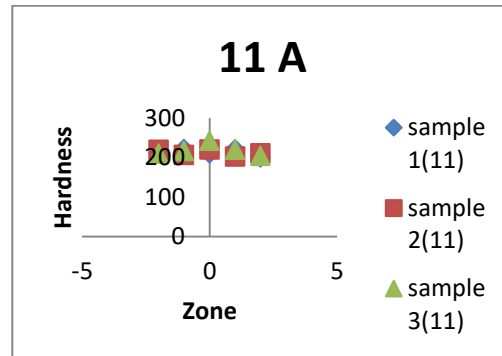

Fig-11 Hardness values at 11A of three sample at different zone
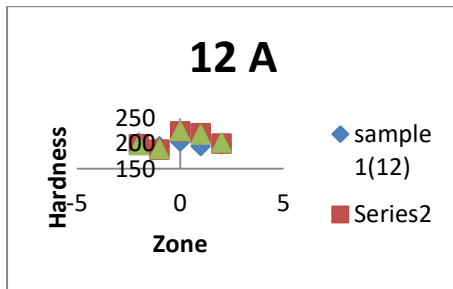
Fig-12 Hardness values at 12A of three sample at different zone

TABLE 4 Average surface hardness at different process parameter and at different points.

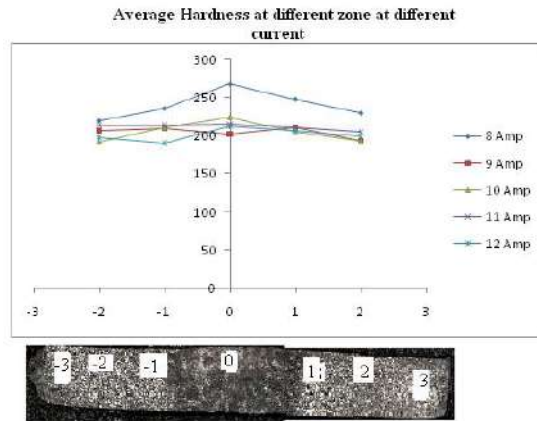| Average current	Base metal	HAZ	Weld Zone	HAZ	Base metal
8 Amp	220	236	268	248	230
9 Amp	207	210	202	216	194
10 Amp	192	211	225	206	193
11 Amp	214	213	215	210	205
12 Amp	198	191	213	207	200

Fig-13 Hardness values at different currents

4.3 Microstructure

For grain size inspection specimen is cut in transverse direction of 20 mm length such that welding region remain center of the specimen and mounted this sample by phenolic powder. Specimen are mounted by Hydraulic press machine. The samples are polished by using polish paper having (320, 400, 600, 800,1000,and 1200) grade. These sample are further polished by aluminum oxide and velvet cloth in a polishing machine. These polished sample are etched by using 100ml water , 100 ml hydrochloric acid and 10ml HNO_3.

Micrograph are taken using optical microscope (Carl zeiss 10001208) at 100x magnification. The micrograph of parent metal zone and weld fusion zone shown in fig:-14 below.
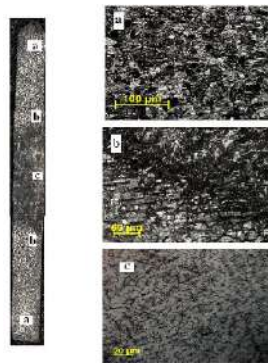

Fig-14 Microstructure at different zone

5   Results and discussion

After tensile and hardness test it is found that maximum ultimate tensile strength is concluded at average current 10 Amp (650 MPa) at input parameter and maximum hardness value at average current 8 amp (268 HV) at input parameter. And microstructure is refinement than base zone HAZ.

It is found the weld bead increases with current up to a certain limit after which burn out of the material occurs. Tensile testing and Vickers micro hardness testing and micro structure are conducted to estimate the best quality weld under the stimulated region. The ultimate tensile strength is found to be comparable to the base metal. But with increase in current more brittle components are formed. Thus proper shielding device has to be provided to protect the molten zone to prevent formation of the brittle components. Hardness is increased due to martensitic transformation taking place during welding. In micro plasma (pulse) arc welding process work piece is remain at high temperature for melting at a very short period of time so solidification rate is high. And also hardness is increased due to refinement of grain structure.

6.   Conclusion

(1) Optimum values of welding current , travel speed at constant parameter such as plasma gas , pre flow gas , secondary flow gas nozzle tip distance ,nozzle diameter are determine based on tensile strength.
(2) Optimum values of travel speed is determined to be 5 mm/sec & optimum values of current is determined to be 10 A based on Tensile testing of samples at various values of current and speed
(3) Variation in Hardness values is found at HAZ, FZ & base zone for all MPAW samples welded at different process parameters. Maximum values of HV are found at FZ at 8A. Reduce HV are obtained at 9 , 10-11,12 A. Thus Optimum current based on Hardness can concluded to be 9 A.
(4) MPAW samples at 10 A shows maximum Tensile strength and good ductility.
(5) Fig 4.15 shows the microstructure of base zone , HAZ , and welded zone. This is a single- phase austenitic microstructure with equiaxiad grain.

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Development of a Novel Model for sqaring numbers ending with 5, 25 & 75

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ABSTRACT: The paper is proposed by use the technique of Ancient Indian for the design of high-speed Vedic Multiplier. Vedic Mathematics is used to improve the performance. Vedic Mathematics is the system of mathematics in which a unique technique to calculation mathematical problems based on 16 Sutras. In this paper we have discussed the planning of Vedic method for multiplication which beat a difference in the actual process of multiplication. It entitles similar generation of intermediatory products, eliminating unwanted multiplication steps with zeros and climb to higher bit levels using Karatsuba algorithm with the closeness to different data. Minimum calculations for multiplication, division of all types of numbers, either small or large we will use Urdhva Tiryakbhyam Sutra (Algorithm) and this is most important formula for Vedic mathematics.

In this paper new shortcut technique for the squaring of natural numbers ending with 5, 25 and 75 has been developed. These techniques are easily applicable to the numbers involving two digits, three digits and some extent four digits.

KEYWORDS: Vedic mathematics, urdhva triyakbhyam sutra, Karatsuba algorithm.

1. INTRODUCTION

Indian Ancient system of mathematics gives the Vedic Mathematics in which some important rules to solving a problem on based on arithmetic, algebraic, geometric and trigonometric. Vedic mathematics is based on 16 Vedic sutra, in which the formula is describe step by step or logic involved while solving mathematical problems to solve by the ordinary method which was read in primary classes. Vedic mathematics was initially rediscovered from Indian scriptures between the years 1911 to 1918 and fully developed in 1957 by Jagadguru Sri Bharathi Krishna Thirthaji Maharaja, a scholar of Sanskrit, Mathematics and philosophy [10].

The students preparing for competitive examinations such as Bank Probationary officers' exam, IBPS exams, FDA, NDA, SDA, UDC, LDC, Bank Clerks, Railway exams in India finds very difficult to solve aptitude and reasoning problems in less time of competitive exams. In Vedic mathematics mainly 16 sutra which is used to solve some basic mathematical operations such as multiplication of 5-digit numbers, multiplication of number near to base, square, square root, cube, cube root, calendar problem, division and subtraction. Vedic mathematical formula is used to calculate competitive examinations aptitude & reasoning problem and help to decrease the load of solving aptitude & reasoning problems and the students can able to solve more or more mathematical problems in short time of Competitive exams.

In this paper Vedic mathematics sutra is to upgrade the calculations of basic mathematical operations on aptitude and reasoning. The basic mathematical operations include square root, cube root, multiplication of 4-digit numbers, multiplication of numbers near to base, subtraction using the rule all from nine and last from ten. Students applying Vedic methods for calculating mathematical problems must note time taken before and after adopting Vedic methods. This paper finds that Vedic mathematical sutra importantly upgrade the calculations speed of mathematical and reasoning operations.

2 VEDIC MATHEMATICS TECHNIQUES USED IN THIS PAPER

A **r – digits number** N is written in the power of 10 as

$$N = 10^{r-1}X_{r-1} + 10^{r-2}X_{r-2} + \cdots + 100X_2 + 10X_1 + X_0$$

Where $X_i (i = 0, 1, 2, \ldots, r-1)$ are (+) ve integer and $X_{r-1} \neq 0$

We have, $X_0 = 5 \Rightarrow N = 10N_1 + 5$ … (1.1)

$10X_1 + X_0 = 25 \Rightarrow N = 10^2N_2 + 25$ … (1.2)

$10X_1 + X_0 = 75 \Rightarrow N = 10^2N_2 + 75$ … (1.3)

Where $N_1 = 10^{r-2}X_{r-1} + 10^{r-3}X_{r-2} + \cdots + \cdots + \cdots X_1$ … (1.4)

And $N_2 = 10^{r-3}X_{r-1} + 10^{r-4}X_{r-2} + \cdots + \cdots + \cdots X_2$ … (1.5)

SQUARING THE NUMBER ENDING WITH 5:

We have from (1.1)

$$N^2 = (10N_1 + 5)^2$$

$$= 100N_1{}^2 + 100N_1 + 25$$

$$= 10^2N_1(N_1 + 1) + 25 \quad \text{… (2.1)}$$

ILLUSTRATIONS:

When $N = 65 \Rightarrow N_1 = 6$

From (2.1) $\Rightarrow$ $65^2 = 10^2 \times 6 \times 7 + 25 = 4225$

$85^2 = 10^2 \times 8 \times 9 + 25 = 7225$

$95^2 = 10^2 \times 9 \times 10 + 25 = 9025$

$115^2 = 10^2 \times 11 \times 12 + 25 = 13225$

SQUARING THE NUMBER ENDING WITH 25:

From (1.2) we have,

$$N^2 = (10^2N_2 + 25)^2$$

$$= 10^4N_2^2 + 5000N_2 + 25^2$$

$$= 10^4N_2^2 + \frac{10^4}{2}N_2 + 25^2$$

$$= 10^4N_2(N_2 + \frac{1}{2}) + 25^2 \quad \text{… (3.1)}$$

ILLUSTRATIONS:

When $N = 125 \Rightarrow N_2 = 1$

$$\Rightarrow 125^2 = 10^4 \times 1 \times 1.5 + 25^2$$

When $N = 725 \Rightarrow N_2 = 7$

$$= 15625$$

$$\Rightarrow 725^2 = 10^4 \times 7 \times 7.5 + 25^2$$

$$= 525625$$

When $N = 825 \Rightarrow N_2 = 8$

$$\Rightarrow 825^2 = 10^4 \times 8 \times 8.5 + 25^2$$

$$= 680625$$

SQUARING THE NUMBER ENDING WITH 75:

From (1.3) we have,

$$N^2 = (10^2 N_2 + 75)^2$$

$$= 10^4 N_2^2 + 15000 N_2 + 75^2$$

$$= 10^4 N_2^2 + 10^4 \frac{15}{10} N_2 + 75^2$$

$$= 10^4 N_2 (N_2 + \frac{3}{2}) + 75^2 \quad \dots (4.1)$$

ILLUSTRATIONS:

When $N = 275 \Rightarrow N_2 = 2$

$$\Rightarrow 275^2 = 10^4 \times 2 \times 3.5 + 75^2$$

$$= 10^4 \times 7 + 5625$$

$$= 75625$$

When $N = 775 \Rightarrow N_2 = 7$

$$\Rightarrow 775^2 = 10^4 \times 7 \times 8.5 + 75^2$$

$$= 10^4 \times 59.5 + 5625$$

$$= 595000 + 5625$$

$$= 600625$$

When $N = 1275 \Rightarrow N_2 = 12$

$$\Rightarrow 1275^2 = 10^4 \times 12 \times 13.5 + 75^2$$

$$= 10^4 \times 162 + 75^2$$

$$= 1620000 + 5625$$

$$= 1625625$$

When $N = 2275 \Rightarrow N_2 = 22$

$$\Rightarrow 2275^2 = 10^4 \times 22 \times 23.5 + 75^2$$

$$= 10^4 \times 517 + 75^2$$

$$= 5170000 + 5625$$

$$= 5175625$$

3. CONCLUSION:

Indian Ancient system of mathematics gives the Vedic Mathematics in which 16 formulae and sub formulae which is originally referred in Sanskrit as sutras. A person requires continuous practices and a very good interest by the order to become expert in Vedic mathematics techniques. In this paper we found that reduce the time required for completing some basic mathematical calculations by the use of Vedic mathematics techniques. The Vedic mathematics techniques can reduce the burden and overhead of students in competitive examinations while solving quantitative aptitude and reasoning problems. It is considered as one of the short cut methods for solving basic mathematical operations.

In this paper, a set of mathematical operations are considered, the paper statistical proved that Vedic mathematics techniques significantly reduce the time duration while solving some basic mathematical problems. The students found that in difficulty to solve mathematical problems at the time of competitive examinations at least one minute can be saved by the use of Vedic mathematics techniques for solving problems of basic mathematical operations. We shall want this paper play an energetic and encouraging bit part for research work of Vedic mathematics and techniques to enhance the speed of calculations at the time of any competitive examinations.

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E-BANKING AUTHENTICATION USING IDENTITY-BASED RSA TECHNIQUE IN CONJUNCTION WITH ONE TIME ID

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Abstract: Electronic banking is a banking in which funds are transferred electronically. The main research concern of encryption in public key cryptography is RSA (Rivest, Shamir, Adleman). RSA is a public key asymmetric cryptosystem algorithm which is used to encryption and decryption. RSA has conquer the weaknessof symmetric algorithm i.e. authenticity and confidentiality.In this paper, we present an Encryption algorithm based on RSA techniques to calculate point. This point is used for Encryption and Decryption with the help of Public and Private key, which is given. The designing strategy of point not only to make the security and efficiency but also reduces the size of keys.

Keywords- Public Key Cryptography, RSA (Rivest, Shamir, Adleman), OLTP, One-time ID generation,

1.   Introduction

E-Banking: Electronic banking is the process by which a customer works in banking transactions electronically without visiting the bank. Electronic banking, also refer to electronic funds transfer (EFT),to transfer funds directly from one account to another by the use of electronic.
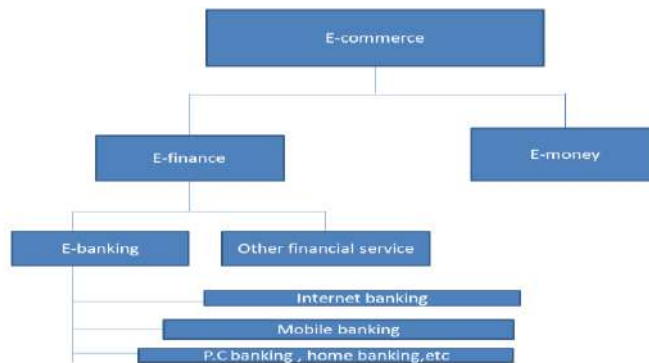
➢   **Advantages of Internet Banking**
- It is easy to create, open and operate.
- It is very convenient and easily pay your bills
- It is available 24x7
- Internet banking is fast and efficient

➢   **Disadvantages of internet banking**
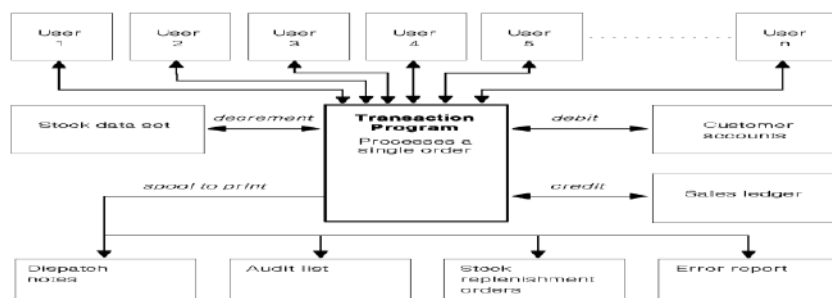- Internet connection must.
- It is not possible to use it if the bank's server is down.

Online Transaction Processing (OLTP)

➢   Online Transaction Processing (OLTP) applications are the client/server applications in which itgive online users direct access to data.

➢   It is units of work, called transactions. It might request a bank balance; another might update the balance.

Batch processing: In a batch processing system, an application program processes a batch of items or records. The batch of records has been collected over a period, and is usually pre-sorted for sequential processing at a predetermined time. Important qualities are rapid response, low cost per transaction and access/update of shared information with integrity.
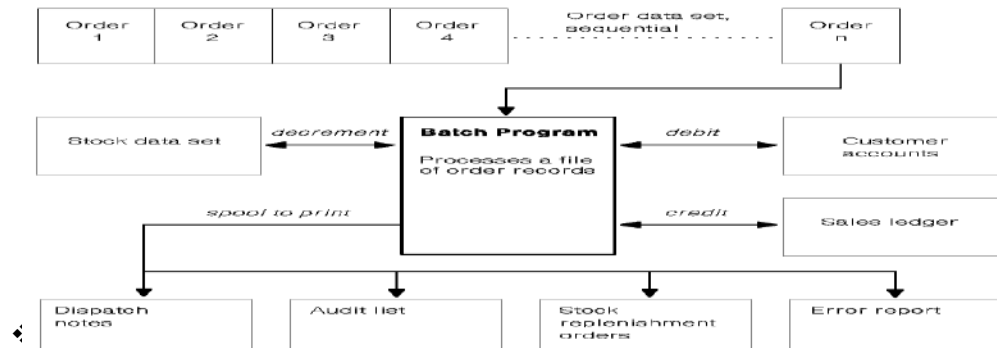
- Online processing

  - High availability

Type of Transaction
1.   Offline transaction
2.   Online transaction

❖   Online Transaction
- Internet banking
- Mobile banking
- Electronic Funds Transfer (EFT)
- Credit card
- Online reservation system

2.   The Mathematical Overview
Existing security approach used in online transaction

RSA Algorithm:

1.   Choose two different random prime numbers : p,q
2.   Compute n = p:q
3.   Compute Ø(n)= (p-1)(q-1) (Euler'stotient function)
4.   Choose an integer e, such that $1 < e < Ø(n)$ and gcd(e,f(n)) = 1
5.   Compute $d = e^{-1} \mod [Ø(n)]$
6.   Public encryption key : (e,n)
7.   Keep secret private decryption key : (d,n)

Encryption:

Obtain public key of recipient (e,n)
compute: $c = m^e \mod n$
Decryption:
Uses his private key (d,n)
Computes: $m = c^d \mod n$

Example of RSA:

1.   Choose p = 3 and q = 11
2.   n = p * q = 3 * 11 = 33
3. $\varphi(n)$ = (p - 1) * (q - 1) = 2 * 10 = 20
4.   Choose e such that $1 < e < \varphi(n)$ and e and n are co-prime. Let e = 7
5.   Compute a value for d such that (d * e) % $\varphi(n)$ = 1. One solution is d = 3 [(3 * 7) % 20 = 1]
6.   Public key: (e, n) => (7, 33)

7. Private key: (d, n) => (3, 33)
8. The encryption of $m = 2$: $c = 2^7 \% 33 = 29$
9. The decryption of $c = 29$: $m = 29^3 \% 33 = 2$

One-time ID generation

1. **Communication channel between each client and a CA server is reliable.**
2. **Online communication between the client and the bank does not have to beprotected**

Step for One-time ID generation

Step 1: Firstly the client sends a message to the CA containing the client's identity (ID).

Step 2: The client's identity is checked by the CA server. Only according to the sorted data if this identity is valid, the CA takes care of all key setup. It generates a distinct set$(p_i,\ q_i,\ d_i,\ d_i^{sem})$for each client i. by the RSA suppose the public key Ek_i Computed as

$Ek_{i=}(n_i,e_i)$ --1

  wheren_i, Is the product of two large randomly chosen prime p_i,$q$and the public exponent e_i and the output of $F(ID_i)$. Where F is mapping function .

$e_i \leftarrow F(ID_i)$--2

$PK_i=(n_i,\ d_i)$

$d_i * e_i = 1(mod(\emptyset(n_i)\ )$-- 3

$\emptyset(n_i)\ =(\ p_i-1)(\ q_i-1)$

Now di split into two part   one for sem and another for bank

$d_i= d_i^{sem}+ d_i^{bank}mod(\emptyset(n_i))$

$PK_{bank,i} \leftarrow (d_i^{bank},n_i)$ ---4

$PK_{sem\ ,i} \leftarrow (\ d_i^{sem},n_i)$

Step 3:CA can generate list of client identity and store in encrypted database . This id use to create each client one time ID for jth session (OIDj)

$(OID)j=H\ (ID_i,K_{client})$

K_{client} is random key generate for client

Step 4: CA issue the client public key certificate public key Eki. Pulse the token $(OIDi,j,\ K_{client})$ for each session.

Step 5: After receiving the token from CA, the client sends a request to the bank by launching a message m that includes the client one-time ID encrypted with the received public key along with K_{client} that is used to verify the client.

m <- (OID)I,j , K_{client}

Step 6:SEM checks that the client is not revoked by comparing both of $k_{client}^{bank}$and k^{CA}_{client} client getting from bank and CA respectively. If so, it signs the requested message with its private key to produce a partial signature $PS_{sem,i}=m^{disem}mod\ m_i$ and replies with it to the bank. If the client is revoked, the SEM gives an error.

Step 7: The bank receives $PS_{sem,i}$that is the token enabling signature generation and computes
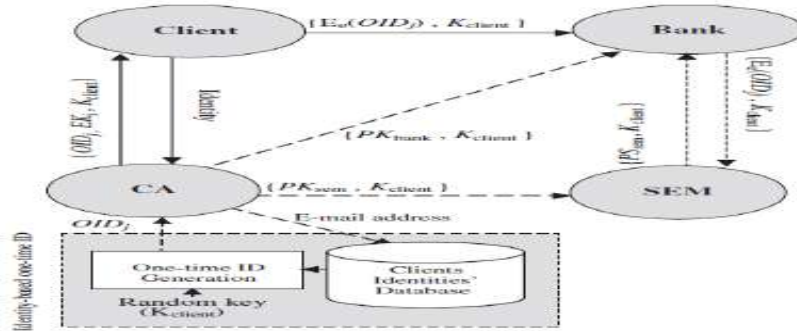
SEM: Security Mediator, CA: Certification Authority

Security Provide on m-Banking
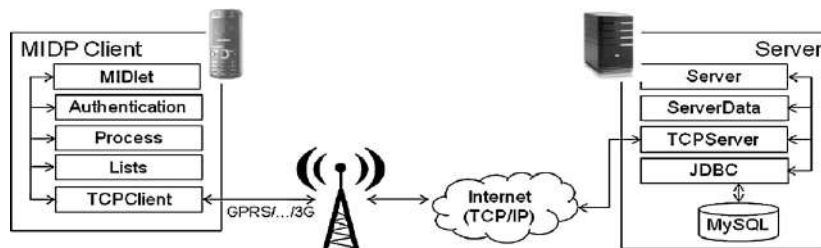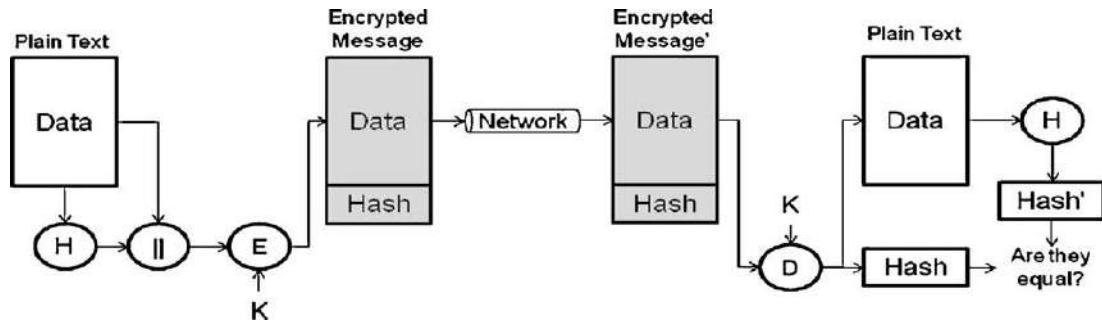
My Proposed scheme:
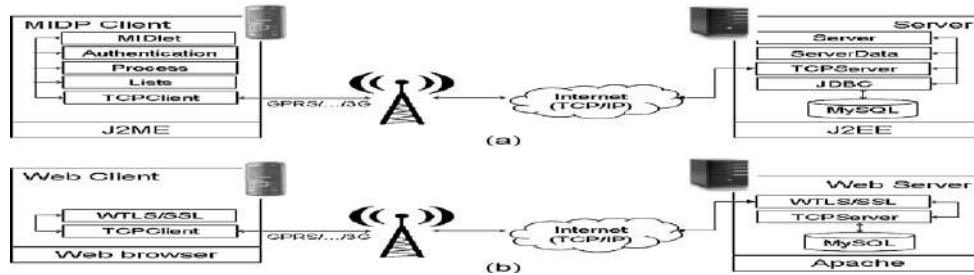
Calculated delay between clients and the CA (unit: μs)

Method of Encryption Key Size (bit)	Message Size(byte)	Average Latency(μs)
512	100	4.13
1024	195	5.32
2048	281	8.19

3   Conclusion

Now a day Banking Transaction over the internet has become a common feature. But how secure this all transactions. Using a new model cryptography technique RSA is a solution to his secure transaction and main advantage of this paper using one time-ID for each transaction. In that transaction ID using only once. This model to evaluate the performance metric average latency based on parameter key size and message size. Using RSA algorithm we achieve low average latency compare to other algorithms.

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Improvement of Cement's Strength using Marble Dust

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Abstract: Many environmental problems are caused due to industrial waste. Hence it required a special attention for the reuse of this waste material . Marble Dust Powder (MDP) is a new composite material that will help the cement industry to maximise material efficiency, provide cost savings, and construct structures that are robust, long-lasting, and environmentally friendly.MDP is by product obtained during the quarrying process from the parent marble rock, which contains of more than 50%. The potential use of MDP can be an ideal choice for substituting in a cementations binder as the reactivity efficiency increase due to the presence of limeIn this study, waste MDP with a diameter of 90 microns was utilised to investigate the characteristics of hardened cement. The influence of varying percent replacements of MDP on compressive strength, initial and final setting tests was also observed. The influence of MDP in cement on strength is shown in this experimental investigation. Three cement mixture containing 5% ,10%, & 15% MDP as cement by weight basis has been prepared Water/cement ratio as per consistency test (0.35) was kept constant, in all the cement mixes. Compressive strength has been obtained at 3, 7 and 28 days and Initial Setting time obtains 30 min and Final setting time 10 hours.

Keywords: Marble Dust Powder, Cement, Compressive Strength, Final setting time, Percentage of Water

1.   Introduction

Marble Dust Powder is **a** metamorphic rock composed of recrystallized carbonate minerals, most commonly calcite or dolomite. Marble may be foliated. Geologists use the term "marble" to refer to metamorphosed limestone; however, stonemasons use the term more broadly to encompass un-metamorphosed limestone. Marble dust, a solid waste material generated from the marble processing can be used either as a filler material in cement or fine aggregates while preparing concrete. Marble powder can be added to concrete as an additive to boost the concrete's strength. Marble dust is most commonly used in painting to make traditional rabbit skin glue gesso, which is a surface preparation for paintings. In addition to using marble dust to make a painting preparation, you can also mix it straight into your paints to create fascinating textures and give them more body. Brilliant white, marble dust for making grounds. Free-flowing, dry ground marble with a regulated particle size derived from natural calcite deposits. This marble powder may be used to build grounds as well as to give texture and body to paint. Concrete is the most widely used and flexible building material, and it is often used to resist compressive forces. Cement use and manufacture cause far more environmental issues and is also quite costly. Marble Dust helps the concrete industry to make a profit, save money on materials, and build structures that are sturdy, long-lasting, and low-impact on the environment. Marble Dust can be a good alternative for replacing cementitious binder for enhanced efficiency due to the presence of lime. Industries create garbage, which causes environmental issues. As a result, the need of reusing this waste material must be emphasised, and it is predicted that several million tonnes of Marble dust are created globally during quarrying. As a result, marble powder has emerged as a viable alternative material for improving the hardening qualities of concrete. Marble is a metamorphic rock that forms after a pure limestone undergoes metamorphosis. Marble dust has significant calcium oxide content, with more than 50% of it being calcium oxide. Marble dust, a by-product of marble cutting, sawing, and shaping, was studied from a physical and chemical standpoint in order to use it as a binding material in concrete and mortar manufacturing. To minimise negative environmental consequences, the cement content in concrete is concentrated and replaced by marble dust, which lowers the cost and increases the strength and durability of cement. Cement was used to substitute marble dust in percentages of 0%, 5%, 10%, and 15%.

Engineering properties of marble dust

Marble is a metamorphic rock composed of recrystallized calcite ($CaCO_3$) or dolomite ($CaMg(CO_3)_2$), while limestone or dolomite processed and taking a polish during cutting and polishing in the marble factories, a product composed of the marble dust mixed with water referred as marble waste slurry is generated. Usually, marble dust is obtained when the waste water is separated from marble dust by chemically processing the marble waste slurry.

Fig. 1. Marble Powder

Fig. 2. Stock of Marble Dust

Marble is made by transforming pure limestone into marble. Marble has been utilised for decorative purposes in monuments and historical buildings since ancient times. Tons of garbage have been produced by India's industries. When such contaminants are mixed with soil and water, the soil's porosity and permeability are reduced, as well as the soil's fertility. In addition, if it comes into contact with water, it pollutes it and renders it unsafe for human consumption.

So it is necessary to use the waste in functional manner.

Advantages of Marble Powder

• Marble powder can be used as filler in concrete and paving products, reducing the total void content.

• Marble powder can be used as an additive in concrete to boost the strength of the material.

• By using this marble powder to make other items, we may lessen pollution in the environment.

• Countertops, building stones, sculptures, floors, and a variety of other objects are made from marble dust mixed with concrete, cement, or synthetic resins.

• Marble dust is often used as a paint primer and filler for canvas paintings.

• It's a component in the production of white cement. Marble dust powder is obtained in dry form as an industrial by-product directly from deposits of marble factories. The composition of the marble sludge powder was recorded using the instrument (Thermo Scientific Into XL2 Series XRF Analyzer). The specific gravity depends on the nature of the rock it is processed. Marble dust powder has a specific gravity of 2.57.The physical properties are tabulated as in Table 2. The water absorption values were obtained by IS238686 (Part III-1963) test method and was found to be 2%. Quarry Rock Dust The quarry rock dust was obtained from local crushers and was used without any processing. The specific gravity of quarry rock dust was 2.56. Water absorption was 7% (Table 1).

TABLE 1: Physical Properties of Sand, Marble dust powder and Quarry rock dust.

Table no:- 01

Property	Marble sludge powder	Quarry rock dust	Natural sand	Test methods
Specific gravity	2.57	2.56	2.82	IS :2386 ,PART 3
Water absorption	2%	7%	3.4	IS:2386,PART3
Bulk density(kg/m3)	1135	1824	1385	Density Bottle

2. **Properties of Portland Cement:** Some key parameters that control the quality of cement are :
- Fineness of cement
- Soundness
- Consistency
- Strength
- Setting time
- Specific gravity (Relative density)

Fineness of Cement

Fineness of cement's refers to its particle size. Hydration rate of cement is depending upon this particle size. So, the fineness of cement is very important.

Soundness of Cement

The capacity of cement to not shrink when hardened is referred to as soundness. Excessive free lime and magnesia produce delayed expansion in good grade cement, which causes it to lose volume after setting.

Consistency of Cement

Consistency is the ability of cement paste to flow.

It is measured by Vicat Test.

In the Vicat Test, a regular consistency cement paste is used in the Vicat Apparatus. The plunger of the equipment is lowered till it touches the cement's top surface. Depending on the consistency of the cement, the

plunger will penetrate it to a particular depth. When the plunger penetrates 10 ± 1 mm into cement, it is said to have a normal consistency.

Compressive Strength

It's the most often used strength test. A 50 mm test specimen is taken and subjected to a compressive stress until it breaks. The loading procedure should last between 20 and 80 seconds.

Flexural strength

It refers the measure of tensile strength in bending. A 40 x 40 x 160 mm (loaded at its center point until failure) cement mortar beam is used for perform this test.

Setting Time of Cement

After mixing of water with the cement, it causes sets and hardens. There are various factors such as cement-water ratio, fineness of cement, chemical content, and admixtures , which affect the setting time of Cement .Cement used in construction purposes should have required initial setting time i.e. not too low   as well as final setting time i.e. not too high. Hence, two setting times required to measured:

- **Initial set:** The time at which cement starts hardens and completely loses its plasticity (typically occurs within 30-45 minutes)
- **Final set:** The time at which cement became hard and completely loses its plasticity .(occurs below 10 hours)

Specific Gravity (Relative Density)

Portland cement has a specific gravity of 3.15, but other types of cement (for example, portland-blast-furnace-slag and portland-pozzolan cement) may have specific gravities of about 2.90.

Chemical Properties of Cement:-

Following are the important chemical properties of cements. From which we can easily relate the contribution of MDP during this project work.

1. **Tricalcium aluminate (C_3A):**

   Tricalcium aluminate (C_3A) contributes less than 10 % of the total composition and is the main constituents of Portland cemen. It strongly react with water lead to a rapid setting, called flash set. Gypsum is added to reduce the hydration of C_3A. Cement with low levels of tricalcium aluminate is used, or slag is added to the cement or to the concrete mix to make it sulphate resistance.To suppress the formation of ettringite, slag contributes sufficient aluminium to cement.

   Type I cement: contains up to 3.5% SO_3 (in cement having more than 8% C_3A)

   Type II cement: contains up to 3% SO_3 (in cement having less than 8% C_3A)

2. **Tricalcium silicate (C_3S)**

   C_3S causes rapid hydration as well as hardening and is responsible for the cement's early strength gain an initial setting.

3. **Dicalcium silicate (C_2S)**

   As opposed to tricalcium silicate, which helps early strength gain, dicalcium silicate in cement helps the strength gain after one week.

4. **Ferrite (C_4AF)**

   Ferrite is a fluxine agent that reduces the melting temperature of raw materials in the oven from 3,000°F to 2,600°F. Although it hydrates quickly, it does not contribute much to the cement's strength.

5. **Magnesia (MgO)**

   In dry treatment facilities, magnesia is used as a raw element in the Portland cement manufacturing process. A large amount of magnesia in the cement can make it unsound and expand, but a small amount can make it stronger. CO2 emissions are also reduced when MgO-based cement is manufactured. The MgO concentration of all cement is capped at 6%.

6. **Sulphur trioxide**

   Sulfur trioxide in excess can cause cement to fail.

7. **Iron oxide/ Ferric oxide**

   Iron oxide, also known as ferric oxide, is primarily responsible for the colour of cement, in addition to giving strength and hardness.

8. **Alkalis**

   The alkali content of cement is determined by the quantities of potassium oxide (K2O) and sodium oxide (Na2O). Large levels of alkali in cement might make it difficult to control the setting time of the cement. Low alkali cement can cause discolouration in concrete when used with calcium chloride. In slag-lime cement, ground granulated blast furnace slag is not hydraulic on its own, but it is "activated" by the addition of alkalis.There is a 0.60 percent total alkali content limit that can be computed using the equation Na2O + 0.658 K2O..

9. **Free lime**

   Free lime, which can be found in cement, can cause it to expand.

10. **Silica fumes**

   Silica fume is used to increase a range of qualities in cement concrete, including compressive strength, abrasion resistance, and bond strength. Although the use of silica fume extends the setting time, it can provide extraordinarily high strength. As a result, Portland cement with a silica fume content of 5-20% is typically used in high-strength Portland cement projects.

11. **Alumina**

   because alumina is chemically robust, cement with a high alumina content may tolerate freezing temperatures. It also speeds up the setting time while weakening the cement

3. Experimental methodology and Investigations

Cement: - The entire experimental investigation employed Portland Slag Cement that complied with BIS (IS: 455-1989). The physical properties of cement are detailed in the table. Portland slag cement, made by Dalmia cement, was used for the MDP and the associated convectional concrete in the test.

(i). Standard consistency test

Penetration between 5 to 7 mm from bottom of mould

Cement wt. in each sample = 300 gm

Table no 02

Sl. No.	% Water	Wt. of water added in gm	Plunger Reading		
			Initial	Final	Diff.
1.	28	84	11	46	35
2.	32	96	11	39	28
3	34	102	11	16	5

Result:- The Std. Consistency of cement = 34 %

(ii) Fineness of cement

Wt. of pan = 205gm,

Wt. of Pan + Cement=305 gm,

Wt of cement = 100 gm,

Wt of retained on 90 micron sieve = 4 gm

% Wt retained =4*100/100 = 4%

(iii) Cement Specific Gravity

Wt. of bottle w_1= 108 gm

Wt. of bottle + cement (w_2) =158 gm.

Wt. of bottle +kerosene + cement w_3=1018 gm.

Wt. of bottle +kerosene w_4=988 gm.

Specific gravity of kerosene S = 0.79 g/cc

$$\text{Specific Gravity of cement (G)} = \frac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4) \, X \, 0.79}$$

$$G = \frac{158 - 108}{\{(158 - 108) - (1018 - 988)\} X \, 0.79} = 3.16 \text{ g/cc}$$

(iv) Physical property of cement

Table 03

Sl. No	Property	Test Method	Result	Standard Limit
1.	Normal Consistency	Vicat Apparatus	34%	25 % to 35%
2.	Fineness of cement	Sieve Test on Sieve no 90 Micron	4% Retain	< 10%
3.	Specific Gravity	Density bottle	3.16 g/cc	3.1 to 3.16 g/cc

(i). Standard consistency test:

Table no:- 04

Sl. No.	% Water	Wt. of water added in gm	Plunger Reading		
			Initial	Final	Diff.
1.	28	84	10	45	35

| 2. | 32 | 96 | 10 | 38 | 28 |
| 3 | 34 | 102 | 11 | 17 | 6 |

(ii) Fineness of cement

Wt. of pan = 205gm,

Wt. of Pan + Cement + MDP =305 gm,

Wt of cement + MDP = 100 gm,

Wt of retained on 90 micron sieve = 5 gm

% Wt retained =5*100/100 =5%

(iii) Cement Specific Gravity & MDP

Wt. of bottle w_1= 108 gm

Wt. of bottle + cement+ MDP, (w_2) =158 gm.

Wt. of bottle +kerosene + cement + MDP, (w_3) = 1017 gm.

Wt. of bottle +kerosene w_4=988 gm.

Specific gravity of kerosene S = 0.79 g/cc

$$\text{Specific Gravity of cement and MDP } (G)= \frac{W_2-W_1}{(W_2-W_1)-(W_3-W_4)\,X\,0.79}$$

$G= \frac{158-108}{\{(158-108)-(1017-988)\}X\,0.79}$ = 3.014 g/cc

- **When we added 10 % Mable dust :-**

(i). Standard consistency test:

Table no:- 05

Sl. No.	% Water	Wt. of water added in gm	Plunger Reading		
			Initial	Final	Diff.
1.	28	84	10	45	35
2.	32	96	10	38	28
3	34	102	11	16	5

(ii) Fineness of cement

Wt. of pan = 205gm,

Wt. of Pan + Cement + MDP =305 gm,

Wt of cement + MDP = 100 gm,

Wt of retained on 90 micron sieve = 7 gm

% Wt retained =7*100/100 =7%

(iii) Specific Gravity of Cement & MDP

Wt. of bottle w_1= 108 gm

Wt. of bottle + cement+ MDP, (w_2) =158 gm.

Wt. of bottle +kerosene + cement + MDP, (w_3) = 1017 gm.

Wt. of bottle +kerosene w_4=988 gm.

Specific gravity of kerosene S = 0.79 g/cc

$$\text{Specific Gravity of cement and MDP } (G)= \frac{W_2-W_1}{(W_2-W_1)-(W_3-W_4)\,X\,0.79}$$

$G= \frac{158-108}{\{(158-108)-(1017-988)\}X\,0.79}$ =3.014 g/cc

- **When we added 15 % Mable dust :-**

(i). Standard consistency test:

Table no:- 06

Sl. No.	% Water	Wt. of water added in gm	Plunger Reading		
			Initial	Final	Diff.
1.	28	84	10	45	35
2.	32	96	10	38	28

3	34	102	11	15	4

(ii) Fineness of cement

Wt. of pan = 205gm,

Wt. of Pan + Cement + MDP =305 gm,

Wt of cement + MDP = 100 gm,

Wt of retained on 90 micron sieve = 8 gm

% Wt retained =8*100/100 =8%

(iii) Specific Gravity of Cement & MDP

Wt. of bottle w_1= 108 gm

Wt. of bottle + cement+ MDP, (w_2) =158 gm.

Wt. of bottle +kerosene + cement + MDP, (w_3) = 1016 gm.

Wt. of bottle +kerosene w_4=988 gm.

Specific gravity of kerosene S = 0.79 g/cc

$$\text{Specific Gravity of cement and MDP } (G) = \frac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4)\, X\, 0.79}$$

$$G = \frac{158 - 108}{\{(158 - 108) - (1016 - 988)\} X\, 0.79} = 2.877 \text{ g/cc}$$
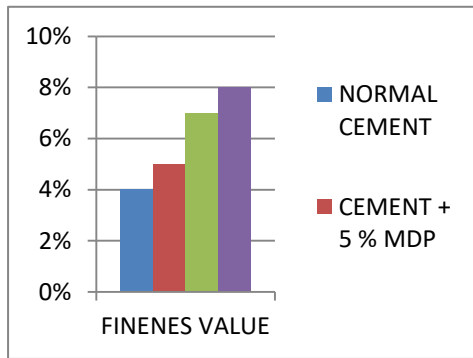

Fig 3. Comparison chart of Normal Consistency Cement and MDP
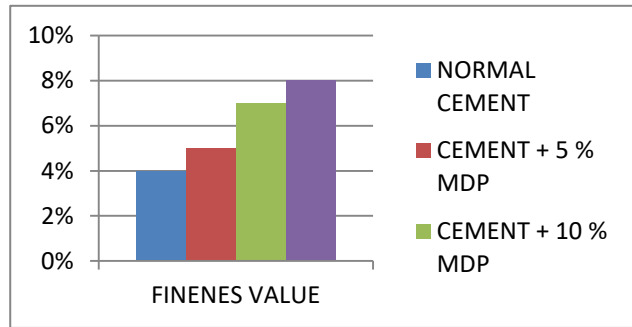
Fig 4. Comparison chart of Fineness value of cement Test of and MDP mixing conditions
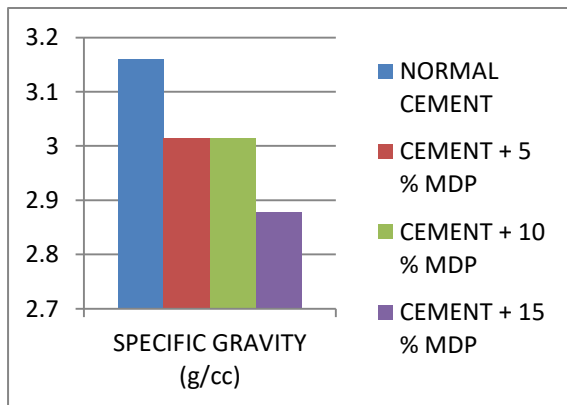
Fig. 5 Comparison chart of Specific Gravity of cement in normal and MDP mixing Condition

Fig. 6 Comparison chart of Compressive strength in 3 days of cement in normal and MDP mixing Condition

Compressive Strength of Cement

Table-07

Sr. No	Age of Cube	Condition of Cement & MDP	Cross Sectional Area (mm^2)	Load (KN)	Compressive Strength (N/mm2)	Remarks
1		Normal Cement		115	23	
2		Cement +5 % MDP		126	25.3	

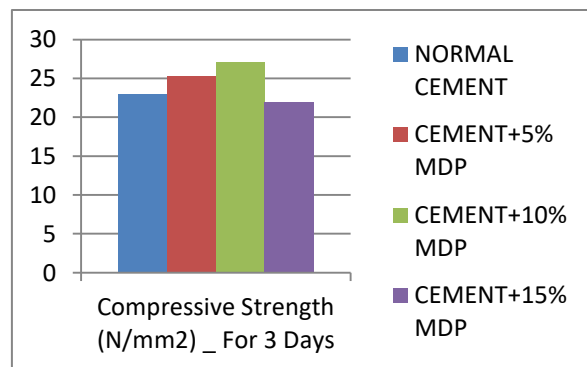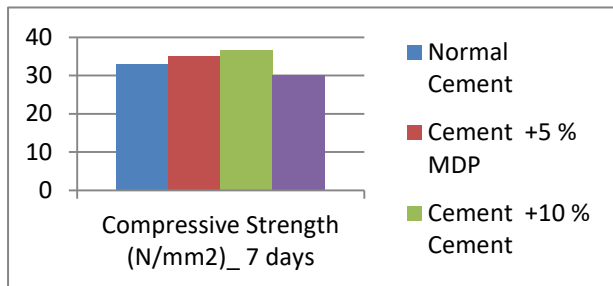| 3	3 Days	Cement +10 % MDP		134	27	
4		Cement +15 % MDP		109	22	
5		Normal Cement		164	33	
6	7 Days	Cement +5 % MDP	70.6 X 70.6	174	35	
7		Cement +10 % MDP		182	36.5	
8		Cement +15 % MDP		149	30	
9		Normal Cement		214	43	
10		Cement +5 % MDP		219	44	
11	28 Days	Cement +10 % MDP	70.6 X 70.6	233	46.7	
12		Cement +15 % MDP		199	40	

Fig. 7 Comparison chart of Compressive strength in 7 days of cement in normal and MDP mixing Condition
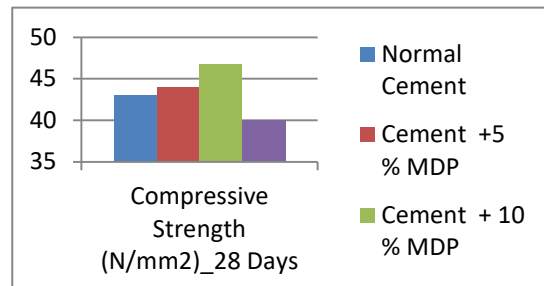

Fig. 8 Comparison chart of Compressive strength in 28 days of cement in normal and MDP mixing Condition

3. Conclusion

The use of MDP in cement improved the strength of the material. The following conclusions were reached after conducting research on the test results.

a) When MDP replaces 10% of the cement in a cement mix, the compressive strength of the cement mix increases, but as the amount of MDP grows, the compressive strength of the cement mix decreases.

b) It was shown that MDP may be utilised as a cement replacement material, and that replacing 10% of the cement with MDP results in an exceptional strength result when compared to regular cement.

c) Because the cost of cement decreases as a result of the usage of these waste materials, the construction sector may develop sustainably.

d) MDP could be a better partial substitute for cement in order to conserve the environment.

e) With respect to each testing day, all of the samples demonstrated an improvement in compressive strength.

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Effective Communication Skills: A Core Employability Skill for Technical Students

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Abstract: This paper aims to highlight the importance of Effective Communication Skills among engineering graduates in their academic and professional life. With globalisation an urge for English language and communication skills has been evolved. Technical students and professionals need effective communication skills for academic success as well as for career growth. Needs for effective communication is large and considered as the biggest factor in selection procedure. Professionals also need to have effective communication for achieving organisational and personal goals like promotions, projects etc. Effective communication skills can be acquired through reading and listening standard materials and continuous practice.

Key words: Effective Communication, professionalism, employability skill, career growth.

1. Introduction

Globalisation and IT revolutions have evolved the huge opportunities for peoples from different countries to come together and work under single umbrella. MNCs are providing various job opportunities and on the other hand it offers extreme career growth. Today we can see the youngest persons as CEOs of companies. This is because of tremendous opportunities made available; here age is not a barrier. To work in MNCs and with MNCs, communication skills become essential. India itself is a land of diverse culture and different languages. To serve the purpose of communication, especially at work place English is lingua franca. S. M. Jyothirmayee, et al, rightly says: "English is an important tool for today's international communication. With its global spread, English has gained the status of an international language."[1] At present global engineers must posses cross cultural and cross boundaries competencies. To match with the working environment and enhance the working culture, a common language is required; and English is fruitfully serving the purpose. Sunitha rightly says, "The development of Information Technology and global business give more scope for the use of communicating/functional English."[2] Thus, it can provide ample opportunities if engineering graduates learn to utilise English language and communication skills effectively. Researchers like Shikha Seetha repeatedly stress on technical students learning communication skills: "Communication skill is essential for an Engineer who aspires to carry out his professional practice in the global arena."[3] Effective Communication skills seem as the core skills that the employers are looking in its employees hiring from technical fields.

2. Need of Effective Communication Skills for Technical Students

First of all let us understand what is Effective Communication? "Effective Communication is about making our communication worthwhile and achieving the desired results."[4] Therefore, it can be said that effective communication is essential and a prior demand of the time to achieve a successful professional and personal life. Students especially in the technical institutions need strong communication skills as most of their books, journals and other materials are easily, and in a good numbers, available in English language. Technical students need effective communication during:

i. Their throughout academic life- day to day classes to understand the concepts appropriately; to make notes from varieties of books, journals, reading materials available in english; to ask queries and doubts; and similarly to answer if they are asked questions.
ii. Their viva voce, and internal and external exams.
iii. Their participation in Tech Fest and other quiz or completion organised by their own college or other colleges.
iv. Their participation in group discussion, presentation and even in interviews.
v. Their professional life- to prove themselves at work place, to convince colleagues and clients, for promotions and career growth.

As discussed above, it is quite clear that technical students really need effective communication skills. Now a day it is important not only for having hikes and promotions, but just for survival also, at work place, effective communication is a desired skill. Sunitha rightly says: "Professional students need to develop simple and effective communication skills. Particularly engineering students necessitate formulating two types of skills; they are core skills and communication skill (verbal and nonverbal) to discharge their duties further at workplace."[5] It is evident that students with effective communication skills rule over those having no or less communicative skills.

3. Present Scenario of 'Communication Level' among Technical

Students: It has been seen that students in most of the regional technical colleges and some even at the apex technical colleges are unable to make an effective communication. Consequently, they become frustrated and unhappy, as due to ineffective communication they are unable to meet their own goals and fail to get a desired result. This continues at work place also if they are making ineffective communication. They are unable to meet their goals, and often goals of individuals are connected with organisational goals, or the goals of people with whom individuals are surrounded. "The national employability report for engineering graduates published recently by Aspiring Minds, a company that tests job seekers' employability, revealed that around 60 percent of engineering graduates fails to get jobs because they lack the required levelling of English."[6] Thus, it can be claimed that effective communication skills is a major and core employability skills, especially for technical students, failing to which students may suffer a lot. Effective communication skills seems equally, and some times more important among other employability skills. "A recent survey suggests that differences in communication skills are strong predicators of an individual's success whether in society or at work."[7]

4.   Strategies to Learn Effective Communication

The famous industrialist Mr. Henry Ford once said, "If you always do what you've always done, you'll always get what you've always got." Students struggling to acquire effective communication skills need to change their learning methodologies and approach. Engineering communication Skills basically demands to work on several features of communication to make it effective. Selection of appropriate vocabulary, correct grammar, punctuation, pause, intonation and tone all comes under the consideration when preparing oneself for making effective communication. English Language Teaching faculties in higher technical education suggest that each student is different and thus, needs a different approach to make students learn and acquire competence in communication skills. Role of teachers here, thus, become prime and crucial. On the other hand, from students' end, their interest, hard work and continuous practice is required.

Effective communication skills stand on four pillars known as- Listening, Speaking, Reading and Writing. The purpose of teaching and learning of communicative class is to make these four pillars strong. Following are some strategies by implementing these one can develop Effective Communication Skills:

i.   ***Reading story books and other standard reading materials:*** Good story books and motivational books and journals can generate or develop one's interest and keep it throughout the completion of book. Once the reader develop interest it becomes little easier to go through the whole books and learn new vocabulary and sentence structure. Technical students should utilise new learned vocabulary, idioms and phrases while writing and speaking, so that they can remember and their learning becomes outcome based.

   For Examples: Panchatantra Story Books in English (for beginners), Wings of Fire (by Dr. A.P. J. Abdul Kalam & Arun Tiwari), The Power of Subconscious Mind (by Joseph Murphy), You Can Win (by Shiv Khera), etc.

ii.   ***Listening & Watching English programmes, News channels:*** By listening and watching motivational videos, news, music, movies, sports commentary, etc. in English can work positively for building as well as making improvement in English and communication skills. Watching and listening together can enhance vocabulary, grammar, intonation and pronunciation.

   For Examples: Channels- BBC English Learning, Discovery, National Geographic Channel, etc. These referred channels use standard vocabulary, simple sentences and speak slowly so that the viewers and learners can easily understand.

iii.   ***Use of Language Laboratory:*** "Language laboratory provides the flexibility of self learning for students and practical teaching facility for teachers."[8]

   Technology can be used to learn effective communication skills. Language Laboratory and software have lots of listening and reading materials which can be used to improve communication skills. Also, learners can write and record their speech in language laboratory which helps technical students to analyse and assess their performance. With these records students can compare their previous and present performance that brings into notice whether students' performance are improving, deteriorating, or just consistent. Language Laboratory can enhance all four pillars of effective communication and improve vocabulary, grammar, intonation and pronunciation.

iv.   ***Face to face conversation:*** By using the above three strategies students can prepare the platform and heap vocabulary, learn sentence structures, idioms & phrases, etc. Once technical students learn and gain confidence, they should start face to face conversation with faculty, class fellows, etc. Faculty members can arrange such activities to promote face to face conversation, initially for five to ten minutes.

v.   ***Group Discussion & Presentation:*** Technical students if able to make face to face interaction for more than ten minute, even with minimal errors, they can be introduced with group discussion and presentation skills. These activities should start with general topics reaching to technical. The

instructor or faculty members can enhance the duration of these activities depending upon the needs.

5.   Conclusion

Effective communication skills are essential employability skills for Technical students, avoiding which technical students may suffer throughout their academic and professional life. On the other hand it is a skill; and skills are meant to be learnt and mastered. If technical students lack it, through continuous practice and following the above said strategies they can learn it. Effective communication skills can surely provide broad platform and ample opportunities to technical students as students and as professionals, and finally contributing to their career growth.

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BOOK REVIEW OF BLASPHEMY BY TEHMINA DURRANI

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Abstract: "My Feudal Lord" in 1991, "Blasphemy" is the second major work by Tehmina Durrani; first published in 1998. The novel is a disturbing and agonizing tale of physical and sexual abuse, domestic violence, gender disparity, deterioration of moral and social values, misrepresentation of Islamic ideology, hypocrisy of so called "revered men of God", exploitation of the weak and the disappearance of humanity and loss of empathy. The novel exposes the desperate condition of women and their sufferings in Pakistan.

Keywords: Blasphemy, Tehmina Durrani, Exploitation; Misrepresentation, Deterioration, Dehumanization, Loss of empathy

BOOK REVIEW:

Blasphemy is a fictional text Tehmina Durrani with a backdrop in the South Pakistan. It narrates the story of sexual exploitation under the garb of religion and marriage as an institution. Tehmina Durrani, through raw and powerful literary expression suggests that how capitalism, patriarchy and the religion triply marginalized women in the society.

Heer is the central character of the text that experience rough time by getting pushed into an unwanted marriage with a religious prophet, Pir Sain. The author suggests how mother plays a powerful role in the Asian communities in determining the fate of their daughters. She presents a sarcastic overview of religious places, like, mosques and the religious ambassadors to be morally corrupt. Therefore, as the defining characteristic of the Pakistani women's writing, who often leave an impressive mark on raising issues of women's sexuality and the exploitation conducted by men, Durrani in her novel, Blasphemy lays bare attack on male supremacy, through widow-hood of Heer's mother.

Tehmina Durani's *Blasphemy* is one of the instrumental texts in voicing how women at the domestic front experience violence. The violence stated by the author isn't only subjected by men rather women also play an instrumental role in harassing the other women counterpart. The novel starts with two blasphemies. The first blasphemy is about Heer's father death that turned her life in the topsy turvy way. Another blasphemy is about her husband's death. The novel starts with a flash back those deals with present moment in the character's life. It deals with her husband death that was practically murder than death. Death of a man in an Asian community is curse in the family. Therefore, being orphan too was curse for the daughter of Pir Sain. People called the daughter of Pir Sain and Heer as orphan and death was considered as most dramatic event of life.

The religious fanaticism took over the personal disability of being rich. Blasphemy as a text lay bare on the issues related to the institution of the marriage and establishing women as instrument subjected to the torturing unit. Providing the background of the Heer as person, she is introduced as thirty-eight years old with six children, three sons and three daughters out of which one was still born and the other died as young man. The character is married to Pir Sain, a religious prophet. The author brings the metaphor of Cheel, the hawk to reveal the character of Pir Sain. The conflict between the emotions of the author and the emotions of the family members were very awkward. She saw the emotions of identifying the catastrophic situation of her daughter.

In chapter 2, stepping out, the author again venture into plight of stepping out from the conventional set up. Heer loved Ranjha. However, she wasn't allowed to marry the person of her choice. The paranoia of the existence strolled over her personal life. The first catastrophic situation faced by Heer was her father's death. As per the conventional norms, dying of husband leaves a woman helpless and subjected to a various kind of torture in the society. Therefore, Heer's mother always wanted her to marry a rich man so that she indirectly recoils back in the society.

In the beginning chapters the author states how the religious forces also subject violence and control the patriarchal system of Pakistan. The issues related to the ideological intrusion, historical occurrences and the zamindari system revolved around the women exploitation. The objectification of women in the text is quite evident through the cultural dichotomies that limit their well-being and also prohibit them from building the sound public image. The ideological reconstruction of the image is harmed by the preconception of the wives and the mother, who are preconceived as life-giver, caring, devoted and the faithful. In the light of argument made, the Blasphemy is the expression of the patriarchal supremacy, and this supremacy was propagated by the mother who continuously advices her newlywed daughter, "uphold your father's honour by showing good

breeding. Always remain subservient to your husbands will (1998, p.31). Durani is a feminist and also has been victim of the male aggression at the personal level.

Thus, Blasphemy through this semi-autobiographical novel, the author comments how the traditional upbringing of women is supposed to be soft, caring, polite and also docile from beginning to the end of her life. Through Heer, Durrani suggests how mothers who are supposed to protect their daughters suggest their daughters to submit themselves. Also, the author constructs the minor women character to create a framework how women were tortured by the women as they were instructed to follow the sexual prescriptions. Therefore, two-fold institutionalization of the mother as the birth mother and the mother-in-law is quite detrimental at the multiple levels. The mother teaches the preaching of the sexual conduct and the mother-in-law enforces that. However, men on the contrary are free to cross the threshold of religious preaching as per their needs and desires. Men like Pir Sain, Heer's husband, act within self-framed boundaries that is socially approved and the religiously sanctioned.

The novel brings out the staunch criticism against the marital rape that is again defended against the appropriate performance of the masculinity. However, for women, marriage shopping is all about buying from the two important brands which are purity and chastity. Heer as a young beautiful woman was subjected to the oppression and was forcefully pushed into the marriage. Her mother visited a religious prophet and requests him to find a suitable match for her daughter. Heer's mother visited the spiritual guides because traditionally these spiritual guides are the supreme and can bless with the best around. Therefore, her mother, despite being a woman allowed Pir, the saint to gaze at her daughter's body. Ultimately Pir Sain comes in with the recommendation that the "she not will not be burden for you. Her beauty is a rare asset" (1998, p.24). Ignoring such hint, she decides her fate of marrying a lecherous man. Her mother is overjoyed by such marriage proposal as it would extend the status of hers in front of the extended family. Marrying daughter in the upper class and the rich family would ease the suffering. The author here brings in here how fear breeds the superstition.

Interestingly, the protagonist learns about the nature of her husband at the first meeting after the wedding. Heer says, "He had commenced our wedding night with an animal haste for hunger and ended it satiated" (1998, p.39). She further describes an institution of the marriage as contract that has claimed her life. She has elaborated it as "the preparation, the rituals, the ceremony and the slaughter". These sentences speak volume about to the violence and the act of rape situated and approved within an institution of the marriage. The nightmare associated with the marriage and its atrocities and sex without consent is a critical issue in the marriage premises. Later her marriage turns into the night mare when she was subjected to the regular beating and the rape on the daily basis. Moreover, Heer was instructed to remain in isolation with rest of the world. She also comes to know that she is under observation by another woman called "Cheel", who is metaphorically eagle-eyed and nothing could escape from her. Cheel was also Pir Sain's trustee and confidant. Later Heer is introduced by the character Gori, a white woman from the European country who was journalist and visited pir to interview him. Gori promised pir to publish the comments of men and nothing about women. Also, she documented that Pir Sain is highly spiritual and the appreciated the devotion of the devotees associated to him. Durrani also sarcastically comments on the religious forgery associated with British raj in order to determine the power the religious head and subsequently the way people were indoctrinated by powerful demonstration of such religious head. Also, there were multiple controlling units such as langar outside the shrine that attracted poor to the shrine. The governance system of the Pir Sain respected all other pirs and at the same time, they respected him. Here there was another controlling unit such as to continue the perennial supremacy of the pir, all pirs were in perfect harmony so as it establishes control over the men and the resources together. Since, the power was exercised through the rich people, people who wanted to occupy the corridor of the power and position in the society.

Besides this, lust for women and sexual frustration was quite common among pirs. Initially, Heer assumed that she was raped for the first time in the institution of the marriage. Later, she understands that it was unending phenomena and also as directed by the mother-in-law, Amma Sain, Heer's first duty was to look after the sexual appetite of her husband. Durrani, sketches the character, Pir Sain as extremely pervert who even notices the puberty of her daughters. Such, insecurity prevailed deep in the Heer's mind and to protect her daughters, she started supplying young girls to her husband. To demonstrate this kind of incestuous act, Heer says "Diya and Munni were growing up and I was leading the widow's lamb for slaughter instead of slaughtering my own lambs (1998, p.127). The recurring act of supplying the girls and the never-ending desire of Pir Sain led to plan for the next sex and discuss the pleasure of the last one. Sex infested his brain and also, he forced his own wife to have sex with his clients and make video tapes of hers. Raising voice against such sexual crime was a sheer atrocity. Here in the novel, the religion is used as a cloak to hide the sexual perversion. Purdah was again the tool to hide the identity of the women. Heer's although was pushed in the illegitimate sex,

yet her identity was concealed as she calls herself as faceless and nameless woman. Throughout the novel, one sees that Pir Sain, misuse his name. Moreover, women were not allowed to read a translation of Quran. Citing the conversation, her daughter finds it curious to learn why the translation of Quran can't be read. She was always snubbed by the elder and gave up the idea of the reading the Holy text. Guppi, the daughter of Heer was told by her mother that it's a dangerous text as it ideologically exposed the exploiter around and enabled the revolution.

Knowledge in the conservative community proves to be dangerous, as such; Heer was gifted with the higher intellectual level as compared to other women of her age. Guppi too wasn't involved too much into the domestic affair intentionally. Heer knew the distinction the true Islam and the one that was being practiced around her to construct the social-hegemony. Pir Sain as the religious head almost carried the fake and shaky concepts of Islam which doesn't exist.

Heer was often sent to guest house, once she met her lover Ranjha, with whom she fell in love before her marriage. This led to the embarrassment because Ranjha might be not socially well off yet she may have been loved and respected. Finally, after getting tired and depressed, Heer visits the shrine to offer prayer for her miseries and as a miracle, probably; she meets a robed figure who promises to her to deal with Pir Sain. The novel reaches its climax when Heer finds out that the robed person is Cheel, who eventually murders Pir Sain. On the interrogation because Cheel did not kill Pir Sain earlier, she reported that "you were not ready bibiji". Later, Heer understands how sexual oppression is a tool to control class and power. Heer finally reveals the actual situation about the death pir sain but she was considered as the blasphemer of the shrine and the Holy Man.

The patriarchy is deeply ingrained in the structure of the system. Although Heer got rid of her husband, yet the authority did not trickle down to her rather than got transferred to her son. This led to more trouble for because in order save the shrine from the humiliation done by her mother, she declares her dead and asks her to leave the haveli forever. After a year, when she gets married to Ranjha, she chooses to visit her own fake grave and prays to Allah that "Oh Allah bless this soul for exposing the decadence of shrine worship. Bless her for bringing is closer to you. Heer as a woman who was beyond her traditional identity suggested that her attempt to fight against the chaos, moral corruption and the disintegration in the society. Elucidating, the male patriarchs, the author suggests how Islam was considered to be an instrument of the personal power and to control the several units in the society. Also, the text focuses on the essentialist notion of the power where the women occupy the gendered space where women cannot exercise free will and also keeps the male dominance at the legitimate position. Through the central character Heer, the author tries to show people women are exploited at the different layers of the society. At the first place, she was tortured, battered, abused and victimized and at the other layers she doesn't exercise any unit of the freedom.

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Reduction of stress wave amplitudes using very soft clay dampers

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ABSTRACT: Since long people are trying to develop some device so that the buildings are safe against ground vibrations particularly due to earthquakes. Several options like installation of dampers or isolators, bracings, jackets at nodal points, etc have been tried. In the present study an attempt has been made to use very soft clay dampers for reduction of vibration amplitudes. Two main disadvantages of very soft clay namely, consolidation and amplification of stress waves were arrested. The high compressibility was restricted by confining the soft clay with a geo-membrane. The ends of the geo-membrane were properly glued and placed below a footing so that no leakage of water took place and the soft consistency was preserved. The amplification of the stress waves was reduced by keeping the thickness of the clay layer to a minimum. A series of experiments were conducted on prototype models created in the field. The acceleration and displacement response of the prototype model with clay damper and without clay damper were measured. It was observed that introduction of clay damper considerably reduces the acceleration amplitude at the foundation level, tie beam level and first floor beam level. Also the displacement amplitude at the tie beam level and first floor beam level are reduced considerably due to clay damper.

1.   INTRODUCTION

Almost all people are afraid of the devastating consequence of an earthquake. Hence, people always try to make their building earthquake resistant. Although nothing can be saved against the fury of a large magnitude earthquake; but buildings can be made less vulnerable to damage against small magnitude earthquake. One of the old practices is to bypass the ground shaking by putting base isolators. The base isolation may be provided with natural rubber bearings (Kelly, 1997), high damping rubber bearings including lead plugs (Skinner et al., 1980), lead rubber bearings (Kelly and Hodder, 1982), friction- pendulum system (Mokha et al., 1991), Teflon bearings (Constantinou et al., 1990), laminated neoprene bridge bearing (Ghobarah and Ali, 1988), etc. Although some of these isolators prove to be very effective, a large scale application is not seen in India. One of the reasons may be the high cost of the isolators and the other may be the unwillingness of people to accept any non-conventional technique. Maintenance of the isolators in good condition is also expensive. Thus, there is a need for developing some simple and inexpensive systems that can offer the advantages of isolation to a large extent. One of the solutions is to adopt a construction material which is having high damping ratio. Out of many available naturally occurring materials, inorganic clay in the form of very soft consistency usually offers a high damping ratio. Thus very soft clay may be used as a damper provided the two main demerits of it, namely, high compressibility and amplification of stress wave magnitudes can be effectively removed.

In order to minimize the compressibility care must be taken to stop squeezing of water from the clay layer. This can be achieved by wrapping the soft clay with two or three layers of geomembrane. The evaporation loss may not be effective in those areas where ground water table remains high throughout the year. Examples of these areas in India are coastal areas, south Bengal, Tripura, southern part of Assam, plain lands of Manipur etc. Again the ends of geomembrane wrappers are to be properly sealed and kept below a surcharge load like a footing. A high strength geomembrane is required so that tearing does not occur. The second consideration is to maintain a minimum depth of soft clay so that amplification does not occur. Thus experiments were carried out with 100 mm thick softy clay wrapped in a geomembrane sheet and placed below the footings of a prototype building frame. Comparison of results between the structure resting over clay damper and a structure resting over ground has shown that the acceleration amplitude can be reduced by 40 to 50% of the normal value with the help of clay dampers. Hence, if properly designed the soft clay may be effectively used to reduce the vibration amplitude of stress waves.

SMALL SCALE FIELD TEST

Small scale field tests were proposed to observe the effectiveness of the clay dampers. Four pits of size 1.2 m × 1.2 m × 1.5 m depth were constructed as shown in Figure 1. The pit P1 was used for a normal footing resting on ground. The remaining two pits namely P2 and P3 were used for footings resting over clay dampers. The size of each footing was kept as 1.0 m × 1.0 m x 0.15 m. In the pit P2 the clay damper consisted of two 100mm thick cells, each of size. 1.2 m x 1.2 m. This damper was designated as type1. In the pit P3 the clay damper consisted of a bottom layer of

three cell of each of size 1.2 m × 0.4 m ×0.1 m and a top layer of single cell of size 1.2 m x 1.2 m x 0.10 m thick. This damper was designated as type2. In a preliminary study, it was observed that more than two layers of

geocells are not effective (Singha and Dey 2009). The fourth pit P4 was kept open and was used as a source of vibration by dropping a 65 kg hammer from 4.80 m height.
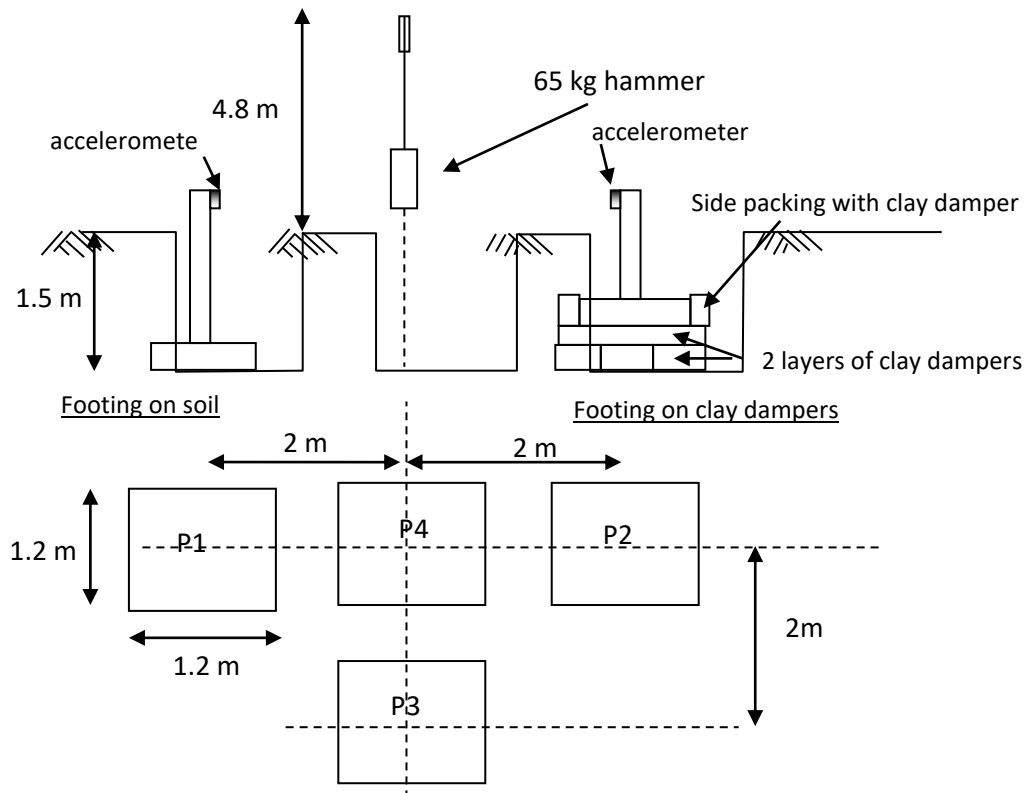

Figure 1. Small scale field test set up

2.1 *Preparation of clay damper*

The clay lumps were grinded thoroughly and was mixed with water so that the water content near to the liquid limit (water content was kept as 43%). The soft clay was wrapped with two layers of geomembranes to form a cell, henceforth termed as clay damper. Two layers of clay dampers were placed one above the other. Figures 2 to 4 show the preparation of a clay dampers. The tearing strength of the geomembrane was kept as 1 kg/cm^2 considering bursting of the cell under an expected vertical load of 100 kN. Wrapping of the

geomembrane with sufficient overlapping was made. Care was taken to put the overlapping zone below the proposed footing to avoid leakage of the soft clay through the open end. The open ends of the geomembrane were pasted with sticky tapes as shown in

Figure 2. Mixing clay with water

Figure 3. Three cells of clay dampers

Figure 4. Single cell of clay damper

Figure 4. Construction of footing over the clay damper is shown in figure 5

Figure 5. Construction of footing over the clay damper

2.2 *Measurement of vibrations*

Accelerations of footings resting on clay dampers and without clay damper were measured with the help of accelerometer, type 4507 (B&K make) with software Pulse Lab shop version 10.1. The responses of the vibration were recorded with the help of FFT analyzer. The accelerometer can pick up acceleration of a vibration perpendicular to its base plane. Thus, it was possible to measure the acceleration of either horizontal or vertical vibration with a simple orientation of the accelerometer. Due to non-availability, two acceleration pickups could be used at a time hence a number of combinations were adopted, namely,

- Combination I :   accelerometers on footing without damper and on footing over damper type 1,
- Combination II :   accelerometers on footing without damper and on footing over damper type 2, and
- Combination III :   accelerometers on footings over damper type 1 and damper type 2.

Figures 6 and 7 show the variation of horizontal acceleration against time for a combination of damper arrangement. Table 1 summarizes the results of all the experiments. A reduction factor is defined as a ratio between the maximum acceleration of the footing resting on clay damper to the maximum acceleration of the footing without clay damper.
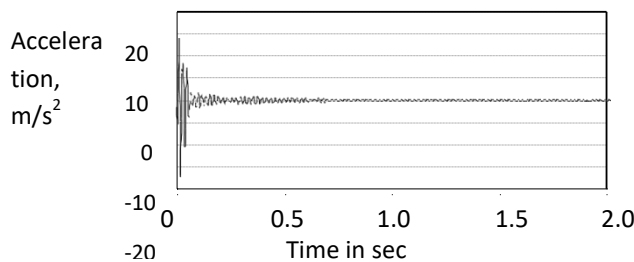

Figure 6 Variation of horizontal acceleration against time for normal footing for test combination I
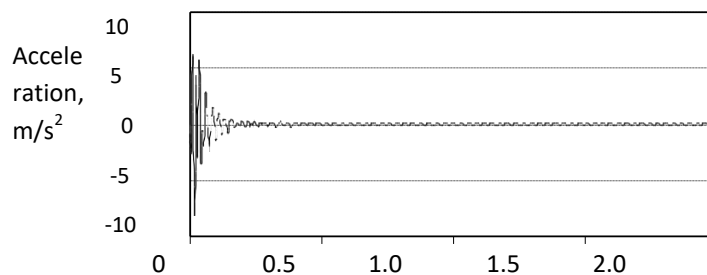

Figure 7 Variation of horizontal acceleration against time for footing with clay damper type 1 for test ombination I.

It was observed that the clay damper type 1 reduces the peak acceleration by almost 50%. It was also observed that the clay damper type 2 reduces the peak acceleration by 60%. Thus clay damper type 2 reduces the peak acceleration amplitude by 20% in comparison to the reduction of amplitude by damper type 1. It was therefore decided to carry out a prototype field test with a building frame resting over clay dampers type 2.

3.   FIELD TEST

Once the laboratory model studies became successful, it was decided to carry out prototype field tests to verify the rest results in the field. It was proposed to study the effect of the clay dampers on single and two storeyed RCC frame structures. For all the cases, the depth of foundation was kept as 1.0 m. Following steps were taken to construct the field model.

3.1 *Test Lay-out*

In the initial stage only two single storey RCC frame structures of size 3m x 3m and height2.40 m were proposed to be constructed. One single storey RCC structure was constructed on normal soil and the other structure over clay dampers. The size of the foundation was kept as 0.9 m x 0.9 m. The damper consisted of two layers each 100 mm thick. The bottom layer consisted of three cells of size 0.90 m x 0.30 m x 0.1 m thick and the top layer of one cell of size 0.9 m x 0.9 m x 0.1 m thick. This combination had been proved to be very effective (Singha and Dey 2009). The outline of the cell was first made with a wooden shuttering, two layers of geomembrane were placed over the shuttering and then very soft clay with water content 43% was placed over the cell. The free ends of the geomembranes were then overlapped through 200 mm and pasted with two layers of sticky tape and were placed below the footing. In order to separate the footing from the surrounding soil, four side cells were put for each footing. Different stages of construction of the building frames are shown in Figure 8. One trench of width 0.75 m and depth 1.2 m was constructed in between the two structures. Two steel plates were placed vertically on the two sides of the trench. A tripod stand was erected and a weight of 200 kg was suspended from the stand. Vibration was imparted to the soil by striking the steel plate with the 200 kg hammer in the horizontal direction. The height of the weight is so adjusted that the hammer hits the steel plate at a depth of 1.0 m i.e. at the depth of the foundation. The vibration was measured with the help of accelerometers 4507 (B&K make) with software Pulse Lab shop version 10.1. Four accelerometers were put, one on the footing, one at the tie beam, another on the roof beam and the last one on the ground in front of the footing. The responses of vibration were recorded with the help of FFT analyzer. The detailed test lay-out is shown in Figure 9.

TABLE 1 Test Results

Obs. No	Horizontal peak acceleration (m/sec^2)		Reduction factor
	Without damper	With damper: type 1	
1	2.26	0.826	0.37
2	17.5	8.16	0.47
3	17.3	8.62	0.50
4	16.7	7.78	0.47
	Without damper	With damper: type 2	
5	13.7	4.7	0.34
6	12.7	5.23	0.41
7	16.1	5.45	0.34
	With damper: type 1	With damper: type 2	
8	7.49	6.26	
9	8.09	6.19	
10	7.93	6.48	
11	7.9	6.2	
	Vertical peak acceleration (m/sec^2)		
	Without damper	With damper: type 1	
12	8.25	6.15	0.75
13	8.81	5.55	0.63
	With damper: type 1	With damper: type 2	
14	5.33	2.68	0.50
15	5.62	2.43	0.43
16	5.42	2.51	0.46
17	5.5	2.42	0.44

Column 1 represents observation number.

3.2 *Experimental Results*

Accelerations of the ground and the structure due to vibration were measured by putting accelerometers on the ground and on the footings placed on the ground and over the clay dampers. The acceleration time histories of the ground and the structures with and without the clay damper are shown in Figures 10 and 11. Table 2 shows a comparison of peak horizontal accelerations obtained from the accelerometers.

Construction of foundation

Construction of roof

Construction of trench

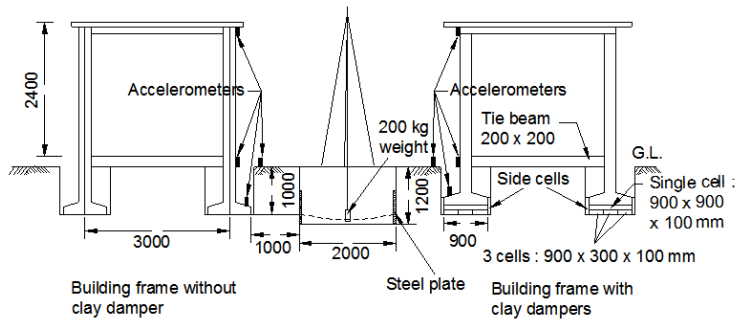Figure 8   Different stages of construction
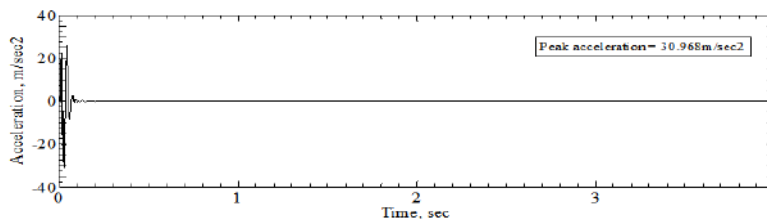

Figure 9 Test lay-out

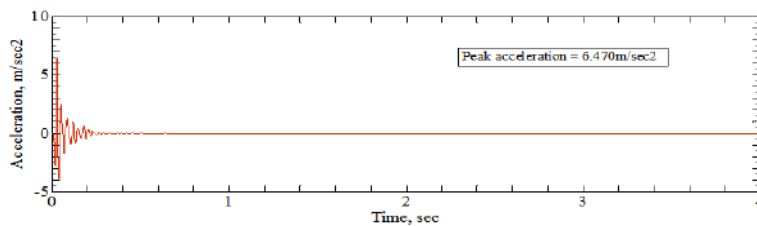Fig 10 Acceleration time history of ground

Figure 11 (a) Acceleration time history of structure supported on clay damper (at footing level)
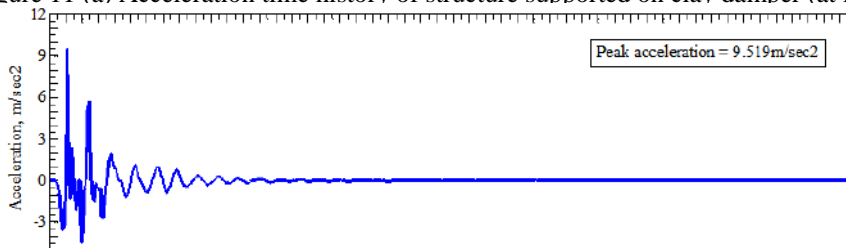
Figure 11 (b) Acceleration time history of structure resting on soil (at footing level)

TABLE 2 Peak horizontal accelerations (m/sec^2) of soil and structure with and without damper.

Obs. No	Peak horizontal acceleration (m/sec^2)			Percentage reduction due to clay damper
	In soil	In footing with damper	In footing without damper	
1	30.968	6.470	9.519	32.0%
2	30.542	6.435	9.591	32.9%
3	30.756	6.568	9.691	32.2%
4	30.609	6.486	9.592	32.4%
5	30.811	6.370	9.569	33.4%
6	28.654	5.982	8.686	31.1%

In another set of experiment, three accelerometers were used; one at ground level, the other over the tie beams and the third one at the roof level.The combined graphsare shown in Figures 8 and 9. It is observed that a considerable reduction in acceleration amplitude was achieved at the roof level. Observations are made for nine times and the peak values of accelerations are shown in Table 3.

TABLE 3 Peak Horizontal Accelerations of soil and structure (at tie beam and roof beam level)

Sl No	Soil (m/sec^2)	At Tie beam level (m/sec^2)	At roof beam level (m/sec^2)	Acceleration ratio of soil/structure at tie-beam level	Acceleration ratio of soil/structure at roof - beam level
With Damper					
1	45.075	3.872	2.254	0.086	0.050
2	46.080	4.072	2.212	0.088	0.048
3	34.587	2.937	1.626	0.085	0.047
4	46.747	4.011	2.057	0.086	0.044
Without Damper					
	Soil (m/sec^2)	At Tie beam level (m/sec^2)	At roof beam level (m/sec^2)	Acceleration ratio of soil/structure at tie beam level	Acceleration ratio of soil/structure at roof beam level
5	35.285	5.342	3.728	0.151	0.106
6	45.619	7.187	4.745	0.158	0.104
7	36.699	5.338	3.983	0.145	0.109
8	38.702	5.628	3.955	0.145	0.102
9	15.822	2.307	1.359	0.146	0.086

Settlement of structure

The main concept behind this research work was that consolidation of the clay should be completely arrested and oozing out of water would never be permitted. Necessary precautions as mentioned in this research were taken and a regular survey work for the last four years was conducted to observe the performance of the damper. Hence settlement of the structure was measured at suitable intervals. Table 4 shows the settlement record of single storey structure with and without clay damper. It is observed that the settlement was 20 mm during construction period and reduced to almost zero after 5 years.

TABLE 4   Date wise settlement records of structure with damper and without damper

Date	Stage of Construction	Total Settlement of structure with damper, mm	Total Settlement of structure without damper, mm
28 Oct 2013	Tie beam complete	0	0
18 Nov 2014	Column completed	15	--
16th Jan2014	1st floor slab complete	19.0	2.9
12th Jan 2015	---	21.6	5.2
11th Jan2016	---	22.8	6.5
18th Jan2017	---	25.0	8.0
24th Jan2018	---	26	8.0

4.   CONCLUSIONS

From the present study following conclusions are drawn on effectiveness of the clay damper

1)   Spectral acceleration of a footing decreases with application of clay dampers at the base of the footing.
2)   Inspite of several demerits of soft clay as a construction material, the high damping ratio of the soft clay can be effectively used as a damper for reduction in stress amplitudes.
3)   In comparison to other dampers/isolators clay damper is cheaper and can be easily installed below the foundation of a structure.
4)   The peak acceleration at foundation level may be reduced by 32.5%, at tie beam level by 42.2% and at first floor beam level by 53.3% by using clay dampers.

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Advanced energy - Challenges and New Initiatives

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Abstract: Alternative and renewable sources of energy and their innovative utilization are known as Advanced Energy. The consumption for power is more development-centric than population-centric as developed countries have higher per capita power consumption. As the world surges through the fourth industrial revolution based on telecommunications, computer science, information technology, robotics, nanotechnology, etc. mankind's need for power has increased manifold times and the only way to sustainable growth is the use of environment-friendly advanced energy. India is a country of 135 crores people, with great developmental aspirations. India is rich in natural resources and possesses diverse physical features. In India, apart from adequate power generation, challenges lie in the transmission and distribution of power to citizens. Hence, the nation pursues a multi-thronged advanced power policy by harnessing bio-gas, solar, wind, hydro, tidal, geothermal and nuclear energy in different innovative ways to meet the growing demand.

1-   Introduction

The progress of mankind can be traced to the time when man learnt to light, control and harness fire - the primeval power for his purposes. "I sell here, sir, what all the world desires to have - power." - The British steam engineer and pioneer, Mathew Boulton in 1776 said this at the time of first industrial revolution. The first two industrial revolutions were driven by energy. The first industrial revolution was facilitated by steam, coal and iron. The second industrial revolution was facilitated by oil, the internal combustion engine and electricity whereas Electronics and Internet powered the third revolution. Presently, the world is facing the emerging fourth industrial revolution which is likely to take place on the basis of 3D printing, robotics, artificial intelligence, biotechnology, nanotechnology, wonder materials such as graphene and most importantly and above all, use of advanced energy. Advanced energy technology means an innovative technology which provides improved efficiency and flexibility of use. Advanced energy includes low-cost renewable energy like hydro, solar, wind and geothermal energy, genetically modified bio-energy, 3D printed nuclear reactors, fusion power and carbon capture. These sources offer cheaper and cleaner energy to the world. The power sector has been identified by the Government of India as the key sector to promote sustainable industrial growth. We must reduce our dependence on conventional sources of energy like coal, petroleum, etc. because they are non-renewable and pollute our environment thus, endangering life itself. Indiscriminate use of conventional energy sources has led the world to face environmental hazards like depletion in ozone layer, greenhouse effect, El Nino, acid rains, hazardous waste trade, dangers of chemical weapons, etc. Protection of the environment and achieving sustainable development with the help of renewable advanced energy is the requirement of our times. India bears its responsibility towards conservation of environment very well. We are signatory to various international conventions, declarations, pacts and treaties regarding this.

2-   Literature

India is the third largest consumer of electricity in the world as well as the third largest producer of electricity. It is interesting to note that India possesses surplus power generation capacity but it lacks the infrastructure required to supply electricity to its entire people. The Indian electricity sector has one national grid with an installed capacity of 344 GW while renewable energy power plants constitute 33.23% of the total installed capacity. The private sector generates 44% of the total power generation. The National Electricity Plan of 2018 states that India does not need new non-renewable energy plants in the utility sector until the year 2027.

Traditionally rural India has remained dependent upon renewable fuel like firewood and fossil fuels like bio-mass fuel, coal and oil for heating (cooking) and lighting purposes. Although these fuels are easily available, they do not provide pollution-free energy. They are the root cause of indoor pollution. Recent studies indicate that indoor pollution is five times more hazardous than outdoor pollution. It is the second killing factor after unsafe water. Millions of people in India, predominantly women and children are forced to breathe air that is polluted by bio-mass emissions from such traditional fuel sources. The reasons are that these traditional fuels have low combustion efficiency leading to emission of suspended particles and poisonous gases in the air. Their incomplete combustion releases hundreds of complex toxic pollutants like particulate matter, carbon monoxide, nitrogen dioxide, sulphur dioxide, formaldehyde and carcinogens such as benzopyrene and benzene which not only cause pollution to the environment but also endanger the health and life of people.

3-   Challenges

- Although India is the largest consumer of electricity in the world, India's per capita consumption of electricity is only one-third of the world's average per capita consumption despite of cheaper power tariffs. The reason for this difference is that development is directly related to per capita consumption of electricity. This shows where we as people stand in terms of human development. Poverty, poor amenities as well as lack of educational and vocational opportunities are the causes of low per capita consumption of electricity.

- India's domestic need for energy is colossal on one hand while on the other hand we are inadequately endowed with conventional resources of energy and possess under-developed infrastructure. Thus a large portion of our domestic need remains unfulfilled. Electricity for every house remains a distant dream for us even today.

- Out of the 1.4 billion people in the world who have no access to electricity, 160 million people are Indians which means around 32 million Indian homes do not have electricity. Our electricity sector is dominated by fossil fuels, particularly coal which was used to produce about three- fourths of total electricity produced in 2017-18. However, the government has planned to increase investments in renewable energy.

- Apart from other energy generation challenges, India have one of the highest levels of electricity transmission and distribution (T&D) losses in the world. Electricity that is generated but does not reach intended customers is known as T&D loss. Almost 20% of India's power generation is wasted in terms of T&D losses. This is more than double the world average and three times the T&D losses of United States. Electricity is inevitably lost due to the resistance of wires and equipment as electricity passes through them over long distances. Such T&D losses range between 6% to 8% of the electricity generated and is usual and expected. However, in India the reason behind abnormally high T&D losses is mainly power theft and technical inefficiency as a result of outdated infrastructure.

- Thus, it can be said that the greatest challenge lies in generating and distributing uninterrupted, cheap and affordable power or fuel like electricity and gas to people of our country. Each and every Indian house-hold needs to be electrified and per capita consumption of electricity needs to be increased to alleviate poverty, raise the quality of living of people and provide equal opportunities to all. In addition to this, public awareness at grassroots level needs to be enhanced so as to wean people away from their age-old unhealthy and environment-polluting practices. Efficient energy should be provided and the public should be educated about power-saving and optimizing their energy needs.

- The situation of Indian power sector in juxtaposition to its agriculture sector is paradoxical. Agriculture is not only the most important sector of Indian economy but it is also the most vulnerable sector. In India, the agriculture sector is provided the highest amount of subsidies for power consumption. Here, the Agriculture sector pays only one-fourth revenue of the revenue arising for its actual consumption of power. As India has a federal feature, its different States subscribe to different power subsidy structures in accordance to their local needs. Therefore, states of Punjab and Tamilnadu may give free power for agriculture on one hand while some other states may impose power tariffs costing only few paise or few rupees per unit. Often for political reasons the States pursue such power subsidy policies which give them popularity in public eye. This combined burden of subsidy and general inefficiency to the power sector, the consumers as well as the state. Almost every state in India has been suffering losses in selling and distributing power without giving subsidy except for few states like Gujarat and Karnataka that have earned profits inspite of selling and distributing power with subsidy. Keeping in view the problems faced by Indian agriculture sector, a policy to curtail power subsidies to this sector to increase revenue does not seem to be viable anywhere in near future.

4- New Initiatives-

- All census villages in India got electrified on 30th April 2018 after seven decades of gaining independence. In order to bring electricity to each and every home, our government aimed for 100% electrification by the year 2022. Today India is only 2.4% short of meeting its target.

- Over past decades India has made capacity addition and efficiency upgrades to its transmission grid in an attempt to curtail T&D losses. Introduction of Computerized billing meters have also helped to reduce power theft by way of tampering of meters and bribing of billing agents.

- Initiatives and programmes undertaken by the Energy Efficiency Services (EESL) saved energy of 37 billion KWh and reduced greenhouse gas emissions by 30 million tonnes. By the end of the decade India may become the first country to use LEDs for all lighting needs, in which case the country will annually save Rs. 40,000 crores. The Union and State governments have planned to provide provision of more subsidies. A National Policy on Biofuels – 2018 was drawn for health benefits, cleaner environment, employment generation, reducing imports, investment in rural infrastructure and bringing additional income to farmers. A 10 years tax exemption will be provided for solar energy projects In order to achieve the ambitious targets of renewable energy.

Different sectors of advanced energy and new initiatives undertaken therein

- Since decades the Central and State Governments have addressed the above mentioned concerns by setting up commercial bio-gas production plants at different places in the country. There are BIO-GAS plants in Satara, Nashik(Maharashtra); Anand (Gujarat); Ferozepur (Punjab); Mangalore (Karnataka); Tuticorin (Tamil Nadu) and Thiruvanthapuram (Kerala). Under the NBMMP (The National Bio-gas and Manure Management Programme) government has been facilitating setting up of family type bio-gas plants at villages which have made rural homes energy self-sufficient. About 49.6 lakh household size bio-gas plants have been installed under this programme. The Ministry of New and Renewable Energy had made an annual target of setting up 65,180 bio-gas plants for the year 2017-18. For the purpose of cooking Bio-gas is safer than CNG or LPG. It is used for lighting and is also used as fuel for power generators. Bio-gas can also be used as transport fuel.

- Solar power in India is a fast growing industry. Especially in states like Bihar, Jharkhand, Bengal, etc. where there are challenges in adequate generation and distribution of power, solar energy installations provide respite and self-sufficiency to a greater extent to households and institutions. India has expanded its solar energy generation capacity 8 times more than what it was in 2014 to achieve 20 GW capacity by 2018. India aims to build 100 GW capacities which will include 40 GW from roof-top solar energy generation. Whereas the world's installed solar power capacity is presently over 303 GW. The price of solar electricity is 18% cheaper than the average price of coal-generated electricity. In the year 2015, under a national programme 1,18,700 solar home lighting systems were installed, 46, 655 solar street lighting installations were provided and 1.4 million solar cookers were distributed in India. The demand for Solar lanterns is rising across rural India. This has decreased the dependence on usage of kerosene oil for lighting purposes in rural India.The Indian railways have turned to solar energy in a big way. It ran its first solar powered DEMU (Diesel electrical multiple unit) train on 14 July, 2018. The train runs between Sarai Rohilla in Delhi to Farukh Nagar in Haryana. Six coaches of this train are fitted with total 16 roof-top solar panels, each producing 300 Wp. These solar panels have been manufactured under the government's 'Make in India' initiative and their cost is 54 lakhs. India is the first country in the world to use solar panels as grid in railways. Presently, these have been fitted only on top of the non-AC coaches. The train has a diesel locomotive engine. However, the solar energy is used to facilitate passenger amenities. These solar panels generate around 17 units of power in a day which is used for lighting the coach. The railways are planning to introduce 50 more solar powered coaches. Such coaches will be first introduced in urban trains and later in long-distance trains. In this way, railway estimates to save Rs. 672 crores per annum. The solar power will enable a reduction of 2.7 lakh tonnes of carbon dioxide emission per year. Railway has drawn a plan to generate 1000 MW solar power in the next five years. The government has initiated steps to install solar plants of about 8.8 MW capacities at roof-tops of railway buildings and level crossings across India.

- The Ministry of New and Renewable energy plans to set up small hydro projects (SHP) of 25 MW power generation capacities at different places in the country in addition to the major hydro power projects already functioning under it. This shall play a pivotal role in improving the overall energy scenario especially in remote areas of the country. The Ministry has identified 6,474 potential sites across India with a potential to generate upto 20,000 MW. The government is inviting and encouraging both public and private sector players for setting up of such SHPs. These are collectively categorized as white industry. What is White industry? it is a category given to clean power projects having a capacity of 25 MW power generation. They do not cause environment pollution and therefore do not require a clearance certificate from the environment ministry. In India 36 sectors have been categorized as white industries.

- India stands at fifth rank in the world regarding grid connected wind power installations. In India the potential for wind power generation is estimated at about 1,02,788 MW. A total capacity of 22,465 MW has been established until 2015. These are located mainly in Tamil Nadu, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Rajasthan. For the purpose of promotion the Government of India has adopted policies of giving fiscal and financial incentives, concessional customs duty, excise duty, sales tax and income tax exemption for 10 years, etc. to these projects. These initiatives have encouraged growth in wind power industry.

- In the 1970 India began exploration and study of geothermal power fields. The GSI (Geographical Survey of India) has identified 350 geothermal energy locations in the country have been identified by GSI (Geographical Survey of India). Out of these, projects have been undertaken at Puga valley in Ladakh and Tattapani in Madhya Pradesh.in India, the estimated potential for geothermal energy is about 10,000 MW. In India, the Himalayas, Sohana, West coast, Cambay, Son-Narmada-Tapti, Godavari and Mahanadi are the seven geothermal provnces. The natural heat of the earth is known as geothermal energy. Earth's heat originates from its fiery consolidation of dust and gas over 4 billion years ago in its interior. It is regenerated

continually by the decay of radioactive elements that are present in all rocks. This is a source of renewable energy.

- Inspite of facing dissuasion from international powers, India has stoically adhered to its nuclear power programme for the purpose of generating green energy. India has an installed nuclear power capacity of 6,780 MW (2016-17). Although the nuclear energy contribution is less, it is an important contributor to the nation's energy basket. Presently nuclear energy contributes to only 3% of the total energy generated in India. Although India is richly endowed with clean sources of energy, the intermittent nature of solar and wind energy sets a limit to their share in generation of energy. Building of Nuclear energy plants is capital intensive and entails technology transfer and also public safety concerns. Due to these reasons our progress in this area has been slowed down. Nevertheless, nuclear energy provides for large sustainable energy sources which once developed, will last a nation for many centuries.

- There are other sources of advanced or unconventional energy which are still in initial stages of development but they offer great power potential in future. One such source is harnessing of electromagnetic vibrations to produce electricity. This energy area is still undergoing research in order to provide practicable solutions to power generation.

- Another mode of advanced and green energy is generation of power through tidal wave energy. India has a long coastline of 7517 kms with a great number of estuaries and gulfs which can facilitate marine energy power projects. India's tidal wave power production potential is around 40-60 GW. A pilot wave energy plant was set up at Vizhinjam in Thiruvanthapuram, Kerala in 1991 with the assistance of IIT, Madras. This was the world's first plant working on Oscillating Water Column (OWC) technology. However, the plant was decommissioned in 2011 as power generation was intermittent and the project was unsuccessful. Although tidal wave energy holds good potential for future, its erratic nature and economic unviability is presently holding us back.

4- Conclusion

It may be concluded that power sector is the foundation upon which rests a nation's economy. It is the need of the hour for India to adopt smart grid technology on a large scale to in order to sustainably and efficiently meet the ever growing demand for electricity. A Smart grid ensures source to sink end-to-end delivery by integrating advanced and renewable energy source and their smart transmission and distribution. This shall build infrastructure for new business models like smart cities and also electric vehicles. A smart grid shall also provide efficient tariff structure. However, more efficient generation and distribution of power will result in higher energy consumption in future. This in turn will give impetus to the industrial and economic growth of the country and will also generate employment. NITI Aayog estimates three-fold increase in energy consumption till the year 2040. In the meantime the Indian Government has initiated the drive 'power for all' and is expected to meet its target by 2022, increased power consumption and greater development shall certainly lead us to aggravated environmental conditions. It is clear that with an ever rising development graph and the world undergoing the fourth industrial revolution, power consumption has jumped manifold times. The only sustainable solution for this growing demand for power can be advanced energy. We must harness renewable sources of clean energy for. India must resort to ways and methods of sustainable development to progress into future.

Table 1.

Sector wise installed generation capacity - 2022

SECTOR	MW	% SHARE IN TOTAL
CENTRAL GOVRNMENT	98,327	24.9%
STATE GOVERNMENT	1,05,314	26.7%
PRIVATE SECTOR	1,91,434	48.5%
TOTAL	3,95,075	100.0%

Table 2.

Fuel wise installed generation capacity – 2022

CATEGORY	INSTALLED GENERATION CAPACITY	% SHARE IN TOTAL
CONVENTIONAL/FOSSIL FUEL		
COAL	2,03,900	51.6%
LIGNITE	6,620	1.7%
GAS	24,900	6.3%
DIESEL	510	0.1%

TOTAL	2,35,929	59.7%
ADVANCE/RENEWABLE ENERGY		
WIND	40,101	10.2%
SOLAR	50,304	12.7%
BM/COGEN	10,176	2.6%
WASTE TO ENERGY	434	0.1%
SMALL HYDRO POWER	4,840	1.2%
NUCLEAR	6,780	1.7%
TOTAL ADVANCE ENERGY	1,59,146	40.3%
TOTAL CAPACITY	3,95,075	

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FIEELD ORIENTED CONTROL TECHNIQUE FOR SPEED CONTROL OF THREE-PHASE INDUCTION MOTOR

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ABSTRACT- As in modern world Induction motors are widely used in industrial application and this type of motor are rugged and robust. To change the speed of induction motor any one parameter either frequency or number of pole are to be changed, now the problem is number of poles are fixed during the design of machine so, cannot change without making any special arrangement. Now the only parameter that remain I frequency but it effect Torque of the machine that depend on the air gap flux, which kept constant to achieve good torque performance at all speed, so to contol the speed and torque we FOC or VECTOR CONTROL FOC converts the complex stator currents into two orthogonal components, one of which is responsible for speed control, and the other for the electromagnetic torque control, similar to DC machines. FOC has greater stability and capable of fast torque response and accurate speed control. This work explains the concept of FOC and its simulation using Matlab/ Simulink.

1- INTRODUCTION

Field Orientated Control The Field Orientated Control (FOC) consists of controlling the stator currents represented by a vector. This control is based on projections which transform a three phase time and speed dependent system into a two co-ordinate (d and q co-ordinates) time invariant system. These projections lead to a structure similar to that of a DC machine control. Field orientated controlled machines need two constants as input references: the torque component (aligned with the q co-ordinate) and the flux component (aligned with d co-ordinate). As Field Orientated Control is simply based on projections the control structure handles instantaneous electrical quantities. This makes the control accurate in every working operation (steady state and transient) and independent of the limited bandwidth mathematical model. The FOC thus solves the classic scheme problems, in the following ways: • the ease of reaching constant reference (torque component and flux component of the stator current) • the ease of applying direct torque control because in the (d,q) reference frame the expression of the torque is:

$$T \propto \psi_{RS} i_{SQ}$$

By maintaining the amplitude of the rotor flux (ψ_{RS}) at a fixed value we have a linear relationship between torque and torque component (i_{SQ}). We can then control the torque by controlling the

FOC is also known as Vector control technique. It was developed for operating high performance motor smoothly over full speed range. These motors have high dynamic performance which includes fast acceleration and deceleration.-and capable of fast torque response and accurate speed control. This work explains the concept of FOC and its simulation using Matlab Simulink .In vector model, an AC induction motor is controlled under all conditions. It is like a separately excited DC motor. The field flux linkage and armature flux linkage are created by respective fields. This control generates a three phase PWM motor voltage output.

The output is derived from complex voltage vector to control a complex current vector. The complex current vector is developed by projections or rotations back and forth from motor three phase stator current. The ac drives are considerably more complex than dc drives in case of controlling and estimation.

I. INDUCTION MOTOR MODELING

In Induction Motor Modeling the three-phase supply is converted to two-phase supply. This conversion is done with the help of 'Parks Transformation Matrix'. This machine rated has three HP and Four pole.
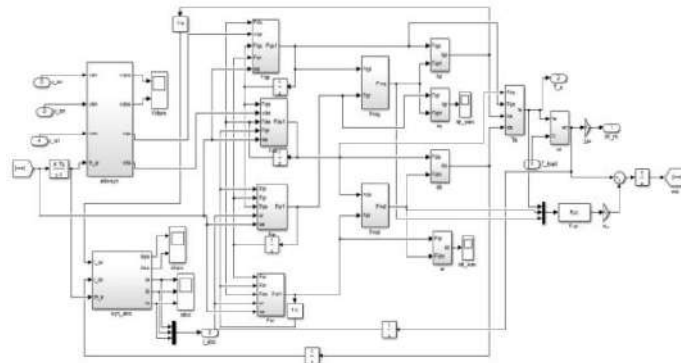

Fig.1. Implementation of induction motor in MATLAB.

II. MODELING OF FIELD-ORIENTED CONTROL

FOC uses current control to control the torque of three phase motors and stepper motors. These motors have high accuracy and bandwidth. FOC can be implemented in either software or hardware.
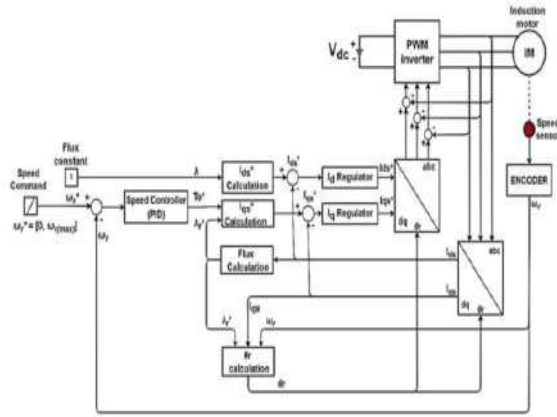
Fig.2. Block diagram of PID speed controller.

The field oriented control structure is based on Clarke and Park transformation matrix.

III.   COMPLETE FIELD ORIENTED CONTROL

This model consists of full model of field oriented control system. This consists of all connections of inverter, SPWM and FOC system.
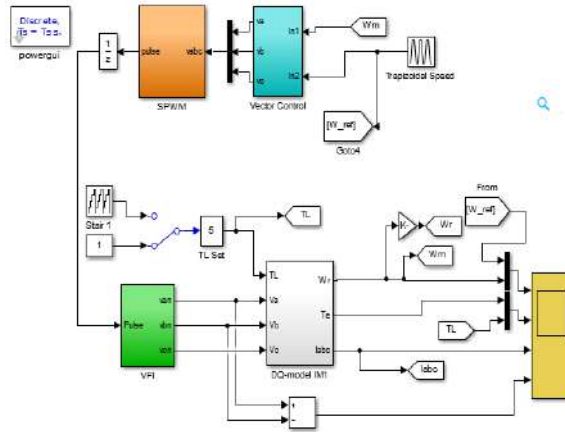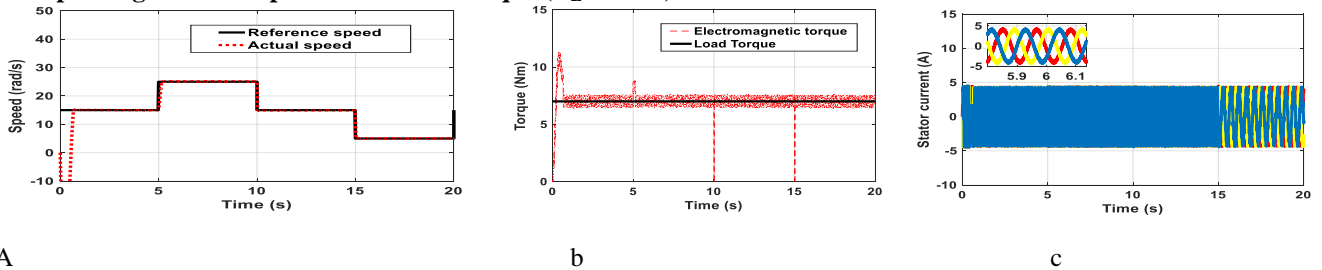

Fig.3 Implementation of Complete FOC Model in MATLAB/SIMULINK.

IV. SIMULATION RESULTS

The Simulation of Vector Control of Induction Motor is done by using MATLAB/SIMULINK. The below results are shown for speed, torque, stator current at torque load=7,tlim=4, clim=100.

1. Step change in rotor speed at constant torque (T_L= 7 Nm)

A   b   c
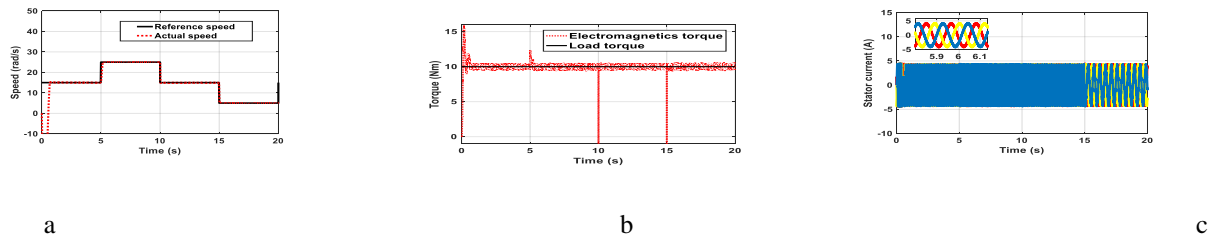
Fig. 4. Simulation results for step change in rotor speed at load torque of 7 Nm: (a) reference and actual speed, (b) load and   electromagnetic torque, and (c) three-phase stator currents.

Vector control of induction motor with a 2200W is simulated in MATLAB-SIMULINK. The induction motor used here is four pole, 50 Hz motor. At Torque load =10, Vdc = 560, at T_{lim}= 11.7, C_{lim}=100 for step

2. STEP CHANGE IN ROTOR SPEED AT CONSTANT TORQUE (T_L= 10 NM)

a

b

c

Fig.5. Simulation results for step change in rotor speed at load torque of 10 Nm: (a) reference and actual speed, (b) load and electromagnetic torque, and (c) three-phase stator currents**.**
Vector control of induction motor with a 2200W is simulated in MATLAB-SIMULINK. The induction motor used here is four pole, 50 Hz motor. At Torque load =7, Vdc = 560, at T_{lim}=5.7, C_{lim}=100 for Ramp

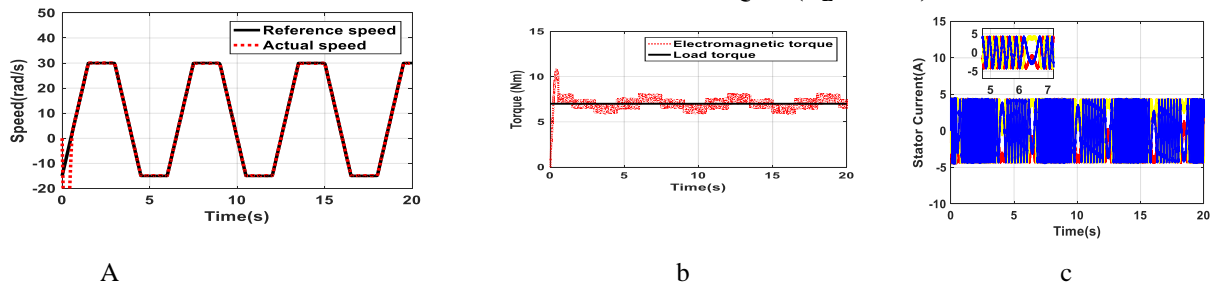## 3. RAMP CHANGE IN ROTOR SPEED AT CONSTANT TORQUE (T_L= 7 NM)

A

b

c

Fig.5. Simulation results for ramp change in rotor speed at load torque of 7 Nm: (a) reference and actual speed, (b) load and electromagnetic torque, and (c) three-phase stator currents.

4- CONCLUSION

The Induction Motor drive system, which is based on Field Oriented Control, is developed in this work. By using FOC scheme with induction motor, high starting torque can be obtained like in DC motor. The benefits of FOC are that all the advantages of DC motor can be obtained in FOC-induction motor drive, with the default advantages of IM over DC motor, which makes the induction motor the most suitable drive for the applications where variable speed operations are necessary with fast response.

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Latent Fingerprint Detection and Identification: A Review

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ABSTRACT: Latent fingerprint identification is increasing interest because of its important application in law enforcement. While the utilize of various fingerprint quality might be requisite for accomplishment on form latent fingerprint identification, method based going on minutiae are regularly readily applicable & commonly better former methods. We have reviewed the most well-known fingerprint feature representation reported in this literature. Nanomaterials are used for latent fingerprints technique for better result in forensic department to identifies the clues.

Keywords: Latent fingerprint identification, minutia, fingerprint feature representation, Nanomaterials.

I. Introduction

Fingerprints are an important tool for identification of individuals in our day to day life. There are so many biometrics tools and technologies that have been evolved and deployed successfully throughout the world likely face, iris recognition, fingerprints verification, palm print, signature and many more which are very suitable for identification, Confirmation & matching due to their uniqueness, universality and invariability. Among these biometric traits, the most widely used are fingerprints because of persistence and distinctiveness over time, with minimal cost, maturity of sensors & algorithms. Many times it is used by forensic experts in criminal investigations.

There are so many features are mostly used in fingerprint detection:

(i) Minutia/ins and outs points - edge ending and split points.

(ii) The singularities practical in every one of the fingerprints can be categorized as one of the accompanying classes: (a) Arch type – no Singularity (b) Loop and Tented arch – one core and one delta (c) Whorl and loop - two cores and two deltas

(iii) The ROI (Ridge Orientation field) is a bunged area which is limited at exterior mainly trim of its latent.

(iv) ROI is a worldwide formation of fingerprints.
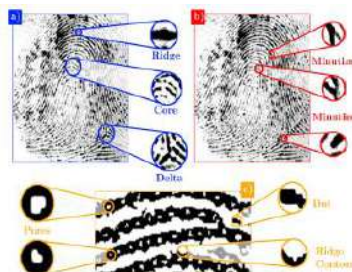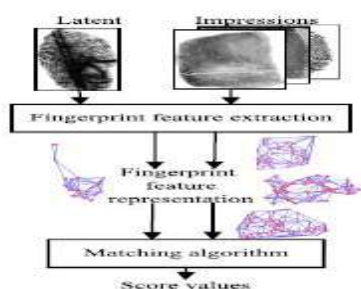
Figure(a): Pipelining of LFP

Figure (b). *Fingerprint features. i) Upper Left-Core, delta & ridges.*
   ii) Upper right- Minutiae. iii) Lower- Pores, dots, & ridge contours

II. RELATED WORK

D. Valdes-Ramirez *et al.*: Review of Fingerprint Feature Representations and Their Applications: Fingerprint feature representations have been classified based on different criteria by some authors [2], [3],[4], [5], [6]. It was found that minutia is the most widely used feature for latent fingerprint identification. They have developed a minutia descriptor that uses deep learning, which create new research topics in this field. This would bridge the gap between latent fingerprint identification and fingerprint verification.

Kai Cao et.al: Latent fingerprints are one of the most significant and commonly used sources of forensic evidence in forensic investigations. Some of industrial/companies are provide large-scale integrate latent SDKs. The latent identification problem is complicated appropriate to poor edge quality, relentless background noise, small friction ridge area, image deformation encounter in the latent images. Here this paper presents an automatic recognition latent fingerprint algorithm & benchmark with their performance. The Paper review with contributions is as follow:

a) Three latent templates that are 2 minutiae templates & last one is texture template for extracting information.

b) Different types of fourteen patches that is related to ConvNet in which three out of all patches are accurate.

c) High order like 2nd & 3rd -order graph based minutiae association algorithms are projected for establish minutiae correspondence.

They further suggested algorithm for latent recognition that can be improved as follows.

a) ConvNet architectures, e.g., GoogeLeNet, should be considered to improve the recognition effectiveness.

b) Filtering strategy during a cascaded network of identification engines to be go through to progress the system scalability to recognize next to large scale mention set.

c) Acquire large group of latent to instruct the ConvNet.

d) Recovering overall speed of feature taking out & comparison.

Azman et al.: Generally, the selection of visualization method depends on the nature of surface (for instance wet, dry non-porous, semi-porous or porous), available constituents of latent fingerprints (e.g., fatty acids and amino. Here, discussion on the physical method, i.e., powder suspension techniques (small particle reagent (SPR) and general powder suspensions), as well as chemical methods that include iodine fuming, physical developer. In some situations, water soluble constituent of fingerprints for examples acids, salts & proteins would partially been removed by water, leaving lipid constituents (non-water-soluble).

Eswaran Prabakaran et.al 'Nanomaterials for latent fingerprint detection: a review': This review paper is related to what type of materials we used in LFP-Latent Finger Print which is very helpful in supervision for Forensic department. All types of marks (bloodstains or images of fingerprint) are detected by the help of this analysis. We are specially focussed on different types nonmaterial which is used in all types of investigations.

- Gold (Au) & Silver (Ag) nanoparticles are used for MMD (Multimetal deposition) for detecting and enhancing the clue relted to fingerprint.
- Many metal oxides like europium dioxide, titanium dioxide, iron oxide, zinc oxide, silica oxide, etc are used to detect Aquatic clue or some organic clues.
- Comparatively Gold nano particles detect more clear images, sweating pores & also elevation pattern in crime place with respect to oxide metal nanoparticles.
- Many more different materials used like CdS QDs, CdSe QDs, CdTe QDs, CDs.
- We study for other additional silica nanomaterials which exploit to detect all criminal clues for the forensic team.

III. Challenges and issues with latent fingerprints.

- The minutiae's coordinates may change even with slight rotation.
- In partial fingerprint images, the number of minutiae points is relatively less.
- In partial fingerprint images, a change in reference point leads to change in coordinate locations of minutiae points.
- Poor quality of latent fingerprints is almost useless.
- Latent fingerprints are highly slanted prints which includes breaking of ridge etc., additionally overlapped with other fingerprints.
- An appropriate pre-processing is desired for obtaining the improved one.
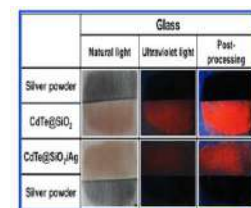
Figure(c): Comparative images of LFP detection by using different nanomaterilas on glass.

IV. CONCLUSION

This review concludes that latent fingerprint identification aids to modern forensic science in almost criminal cases involving fingerprints images. The only challenge remains with the process of extraction of LFP from the suspected surface. The objective of this paper is to provide a healthier research direction in latent fingerprint.

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CFD Investigation Of Heat Transfer Performance Analysis Of Square Ribbed Roughened Solar Air Heater

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ABSTRACT

Solar air heaters, because of their simple in design, are economical and most commonly used collection devices of solar energy. The thermal efficiency of a solar air heater is notably low because of the low down value of the convective heat transfer coefficient between the absorber plate and air, which leads to elevated absorber plate temperature and high heat losses to the surroundings. This research article presents the study of heat transfer in a solar air heater by means of Computational Fluid Dynamics (CFD). The effect of Reynolds number on Nusselt number is examined. A commercial finite volume package ANSYS FLUENT 12.1 is used to examine and visualize the character of the flow across the duct of a solar air heater.

Keywords: Solar Air Heater, Heat transfer, Pressure Drop, CFD, TEF.

INTRODUCTION

Solar air heater is one of the basic equipment by which solar energy is converted into thermal energy. Solar air heaters, because of their simple in design, are low-priced and most widely used collection devices of solar energy. The significant application of solar air heaters are curing of industrial products; space heating, seasoning of timber, and these can also be successfully used for curing of concrete building components. A conventional solar air heater normally consisted of an absorber shield, a rear plate, insulation below the rear plate, transparent cover on the exposed side, and the air flows between the absorbing plate & rear plate. A solar air heater is simple in design and need low maintenance. Though, heat transfer valued coefficient among the absorber plate and air is low which results in a lower efficiency. Due to this cause, the surfaces are occasionally roughened in the air flow channel.

The concept for mock roughness was initially applied by Joule [1] to improve heat transfer coefficients in-tube condensation of steam and because many experimental study were carried out on the function of artificial roughness in the areas of cooling of gas turbine, electronic equipment's, nuclear reactors, and compact heat exchangers etc. The flow model was first introduced by Nunner [2] and likens this sculpt to the temperature profile in smooth tube flow which increase the Prandtl number. The planned flow model signifies that roughness reduces the thermal resistance of the turbulence dominated wall region in absence of significantly affecting the viscous region. The disagreement was enumerated by using the Prandtl resemblance and replacing Pr by (f/fs)Pr. The present model predicts that value of St/Sts decreases with increase in Prandtl number. The proposed flow model also predicts that St/Sts, is independent of the roughness type. A friction connection for flow over sand-grain roughness was urbanized by Nikuradse [3]. Based on law of the wall correspondence, Nikuradse presented the pressure drop results in respect of roughness function R & roughness Reynolds number e+. Dipprey and Sabersky [4] developed the heat-momentum transfer analogy relative for flow in a sand-grain roughened tube and achieved excellent connection of their data. The idea proposed by Dipprey and Sabersky was so frequent and which can be applied to any roughness for where the law of the wall similarity holds. Prasad and Mullick [5] were the first to introduce the application of synthetic roughness in the type of small diameter wire attached on the underside of absorber plate to develop thermal concert of solar air heater for drying uses. Further, Prasad and Mullick's [5] performed multiple experimental investigations of solar air heater relating roughness elements of dissimilar sizes, shapes and orientations with reference to flow direction which was carried out to get best possible arrangement of roughness element geometry [6-7].

Chaube et al. [8] performed a CFD analysis of heat transfer & fluid flow characteristics of an artificially roughened solar air heater. Kumar and Saini [9] analyzed a CFD study of fluid flow & heat transfer characteristics of a solar air heaters having arc shaped simulated roughness on the absorber plate. Karmare and Tikekar [10] carried out CFD examination of fluid flow & heat transfer in a solar air heater duct through metal grit ribs as roughness elements on the absorber plate. Yadav and Bhagoria [11] performed a numerical prediction to understand only heat transfer show of a rectangular duct of a solar air heater which is having triangular rib roughness on absorber plate. Yadav and Bhagoria [12] obtained the numerical calculation of fluid flow & heat transfer in a conventional solar air heater by CFD. A commercial fixed volume package ANSYS FLUENT 12.1 was used to understand the nature of flow across the duct of a conventional solar air heater. Yadav and Bhagoria [13] presented a detailed literature survey about various CFD investigations on artificially roughened solar air heater.

The plan of our study is to enhance the prediction of the flow in the solar air heater. A near-wall function of TKE will be adopted in Computational Fluid Dynamics code Fluent. 2nd order upwind & SIMPLE algorithm were applied to discretize

the governing equations. The FLUENT software resolves the subsequent mathematical equations govern the fluid flow, heat transfer and related phenomena for a given physical problem.

The aim of the study is to enhance the prediction of the flow in solar air heater. Near-wall functions of TKE which will be applied in CFD code Fluent. 2nd order upwind and SIMPLE algorithm were used to discrete the governing equations. The FLUENT software resolves subsequent mathematical equations which follow fluid flow, related phenomena & heat transfer for a agreed physical problem.

CFD MODELING AND ANALYSIS

CFD is the science which helps in determining numerical solution of governing equation for the fluid flow at the same time as advancing the solution during space or time to attain a numerical description of the total flow field of interest. The equation can symbolize steady / unsteady, Compressible /Incompressible, & in viscid or viscous flows, including non-ideal and reacting fluid behavior. The meticulous form chosen depends on future application. The condition of the art is described by the intricacy of the geometry, flow physics, & the computing time required to obtain a solution.

The 2-D computational domain used for CFD analysis having the height (H) of 20 mm and width (W) 100 mm as shown in Fig. 1. In this present analysis, a 2- D computational domain of artificially roughened solar air heater has been adopted which is comparable to computational domain of Yadav & Bhagoria [14].
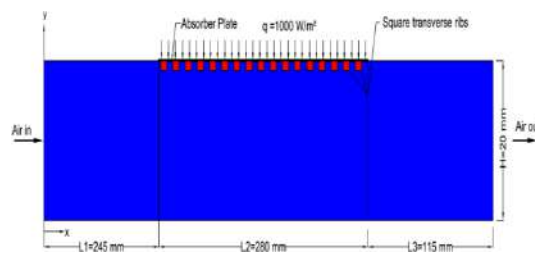

Fig 1: 2-D computational Domain

After defining the computational domain, non- uniform mesh is produced. In creating this network, it is desirable to have more cells near the plate because we want to resolve the turbulent boundary layer, which is very thin evaluated to the height of the flow field. After generating interconnects, boundary conditions have been specified. We will initially specify that the left edge is the duct inlet and right edge is the duct outlet. Top edge is top surface and bottom edges are inlet length, outlet length and solar plate. All interior edges of rectangle 2D duct are defined as turbulator wall. Meshing of the domain is done using ANSYS ICEM CFD V12.1 software. Since low-Reynolds-number turbulence models are employed, the grids are generated very fine.

Current un-uniform quadrilateral mesh contained 161,568 quad cells by un-uniform quadilateral grid of 0.22 mm cell size. The size is proper to solve the laminar sub- layer. Grid independence test, number of cells is varying from 103,231 to 197,977 in five steps. It is observed that after 161,568 cells, subsequent increase in cells has > 1% variation in Nusselt number & friction factor value which is noted as criterion for grid independence.

To choose the turbulence model, the past experimental design is simulated with different low Reynolds nos. models such as Standard k-ω model, Renormalization-group kε model, Realizable kε model & Shear stress transport k-ω model. The result of different models is analyzed by experimental results. The RNG k-ε model is selected on the basis of its closer results to the experimental results. The air was taken as working fluid which was understood to be incompressible for the operating range of duct as variation is very less. The average inlet velocity of flow was designed using Reynolds number. Velocity boundary condition has been measured as inlet boundary condition and outflow at outlet. Second order upwind and SIMPLE algorithm were used to discretize the governing equations. The FLUENT software resolves the subsequent mathematical equations which follows fluid flow, heat transfer and related phenomena for a known physical problem.

RESULTS AND DISCUSSION

Results are offered in form of graphs, representing the average Nusselt number at diverse Reynolds numbers, and in form of temperature and velocity contours at particular sections for a fixed Reynolds number. Fig. 2 describes the result of Reynolds number on mean Nusselt number for diverse standards of relative roughness height (e/D) and fixed value of pitch. The mean Nusselt number is noted to enlarge with increase of Reynolds number which was due to the increase in turbulence strength caused by augment in turbulence kinetic energy & turbulence dissipation rate.

The roughened duct by means of relative roughness height of 0.06 gives the highest Nusselt number at Reynolds number of 18000. The roughened duct by relative roughness height (e/d) of 0.015 provides the lowest Nusselt number at Reynolds number of 3800. The utmost enhancement of mean Nusselt number is observed to be 2.78 times than the smooth duct for comparative roughness height of 0.06.
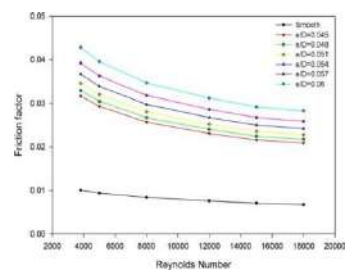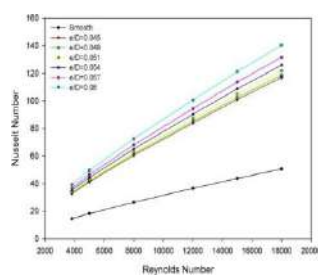
Fig 2. Variation in Nusselt number   **Fig 3. Variation in friction factor**

Fig 3 gives that the friction factor lowers with increasing values of the Reynolds number in complete cases as projected since of the suppression of laminar sub-layer of completely developed turbulent flow in the duct. The maximum & minimum value of friction factor which occurs at relation to roughness height (e/d) of 0.06 and 0.015 respectively for range of parameters observed. It is also observed that the utmost enhancement of mean friction factor was found to be 4.24 times than the smooth duct for mean roughness height of 0.06 at Reynolds number of 3800.

CONCLUSIONS

The result of relative roughness pitch & Reynolds number on the heat transfer coefficient & friction factor was analyzed. CFD examination has which was carried out in intermediate Reynolds number flow (Re = 3800–18,000). CFD investigations was based on the heat and fluid flow in a rectangular duct by protrusions as roughness element on single broad wall which was subjected to a consistent heat flux, following conclusions were concluded:

Standard Nusselt number enhanced with an increase of Reynolds number. The utmost value of mean Nusselt number was found to be 140.4 for average roughness height of 0.06 at a higher Reynolds number, 18,000. The utmost enhancement of average Nusselt number is found to be 2.78 times than that of smooth duct for average roughness height of 0.06.

Mean friction factor decreases with enhance the Reynolds number. The utmost value of mean friction factor was found to be 0.0428 for average roughness height of 0.06 where as at a lower Reynolds number, 3800. The utmost improvement of mean friction factor was found to be 4.24 times than that of smooth duct for average roughness height of 0.06.

The Renormalization-group (RNG) k-ε turbulence model evaluated very close outcome to investigational results, which defers confidence in the prediction done with CFD analysis in the presence of the study. RNG k-ε turbulence model was validated for soft duct & grid independence test was also performed to verify the changes with increasing in number of cells.

The discrepancy linking accessible experimental data & current computational outcome was less than ±10%. Therefore, it can be fulfilled that the current computational results were logically acceptable

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Application of e-EpidemicModel for Cyber Safety of e-Commerce Network

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Abstract:

Now-a-days, the majoraim of e-commerce is to tradeproducts and services online.Growinghabits of e-commerce network increases the safetyissues in the network where an e-commerce network can be simply compromised by attacks of malware. The nature of the spread of malware among the nodes can be coherently related with the spread of biological viruses (infectious diseases) within human population of any locality. The epidemic model for the spread of infectious disease can be suitably applied to predict the spread of malware into the e-commerce network. In this paper, we have formulatedan epidemic model to study the propagation of malwares and their dynamic behaviour in an e-commerce network. After categorizing the nodes of the network and based on their interface withinternet, a schematic compartmental model is designed to represent the propagation of bots within the network followed by a differential equation model is formulated to represent the dynamics of all the compartments, respectively. The proposed model is simulated using MATLAB andresults of the numerical simulations are presented to support the applicability of our proposed model.

Keywords:_Cyber-attack, EpidemicModel, e-Commerce, Stability_

I. Introduction

e-Commerce provides a virtual market for doing business where products are sold and bought using an internet based platform. In an e-commerce business, seller and buyer connect through the internet and trade is done via different payment gateways. There rae various types of e-commerce; B2B, C2C, B2G,C2B, B2C etc. In B2B type e-commerce, business organizationssells their products or services to each; e.g.indiamart, industrybuying.InC2Ctypee-commerce,consumersselldirectlytootherconsumersviaonlineclassified ads or by selling personal services orexpertiseonline,e.g.ebay, quikr, olx.InB2Gmodel,business organization sells products or services government agencies; e.g.iGov.com. In C2B model, consumers sell their products and services to business companies; e.g. job portals (Monster.com, TimesJobs.com etc.). In B2C type, the business organization sells to consumers directly. ExamplesofB2Ctypee-commerce are amazon, flipkart, meesho etc.

The essential requirement of any e-commerce model is to connect all the stakeholders (businessman, customer, payment gateway, logistic) throughtheinternet. The structure ofthee-commercenetwork may be vertical and/or horizontal. In an e-commerce network, each business organization has itsown data and the data of their customers and all of these dataarestoredintheserver(s). These data can be retrieved as when required by the respective applications.

Cyber-attacks on e-commerce network are growing challenges for the business companies. These attacks include fraudulent-email, pharming, snooping the shopper's computer, malware, Cross Site Scripting (CSS), password hacking, data breach etc. In this paper, we consider a specific type of malware attack, known as bots attack, on B2C category of e-commerce for formulation of our proposed model.

There are many different classes of malware that have varying ways of infecting systems and propagating themselves. Some of the more commonly known types of malware are viruses, worms, Trojans, bots, back doors, spyware, and adware. The activity of malware (virus/worms) throughout ane-commercenetworkcanbecapturedbyusingepidemiological models for disease propagation [1–7, 14-16]. Based on the Kermack and McKendrick S-I-R classical epidemic model[8–10],adynamicalmathematicalmodel(S-Sp-I-Q)formaliciousobjectspropagationisformulated in the next section.

II. Formulation of the Model

Dynamic models for infectious diseases or computer malware are mostly based on compartment structures that were initially proposed by Kermack and McKendrick[8-10] and later developed by other mathematicians. To formulate a dynamic model or the transmission of an epidemic disease, the population in a given region is often divided into several different groups or compartments. Such a model describing the dynamic relations among these compartments is called compartment model. Quarantine being the important remedial processes for malware attack in e-commerce network, several researchers developed model taking quarantine as one of the compartment in the epidemic models [11 -13]. The total number of nodes (N) in our e-commerce network is divided into four classes (compartments): Susceptible (S), Susceptible with Protection (Sp), Infected (I), Quarantine (Q).

That is, $S + Sp + I + Q = N$ (1)

Susceptible(S) Class: This class includes those nodes of the network which are free from infection i.e. they are healthy but they have an active potential threat of infection by the malicious software at any point of time. These nodes do not include antivirus software.

Susceptible with Protection (Sp) Class: This class includes those nodes of the network which are protected by the firewall and/or antivirus software.

Infected (I): The nodes of this class includes the units that have been infected and which now have the potential to transmit the malicious software to the rest of the nodes of the population on having adequate contacts with the Susceptible and 'Susceptible with Protection' class of the population.

Quarantine (Q): This class is used to separate the infectious nodes which may have been exposed to any infected node to see if that become affected. Once the nodes are added to the network it becomes the member of the S class. Initially all the nodes belong to the S class.

Once the antivirus software is installed into the nodes of the S class, it moves to the Sp class. If a node from S class is attacked by any virus or worms, then it moves to the I class. This model assumes that the antivirus software may not be too much effective as it may be an expired version which has not been updated. In that case the nodes with expired version of antivirus software, may be moved back to the S class again or due to attack of antivirus that node may move directly to I class. This model also assumes that a node from I class may rescued by cleaning the malware from that node through the use of updated antivirus software. In that case, it moves back to the Sp class, otherwise that node is moved to the Q class. The nodes from the Q class are moved to the S class once it is confirmed that the node is free from any affect of the malware. This fact is shownin Figure 1. The transmission between model classes can be expressed by the following system of differential equations:
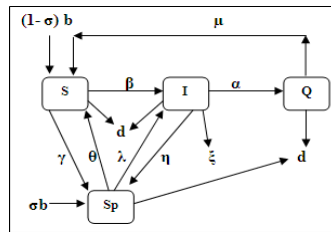

Fig. 1: (S–Sp–I–Q) Model
(An epidemic model for the flow of worms in the e-commerce network)

$dS / dt = (1- \sigma) b + \mu Q + \theta Sp - \beta SI - \gamma S - dS$ (2)
$dSp / dt = \sigma b + \gamma S + \eta I - \theta Sp - dSp - \lambda Sp$ (3)
$dI / dt = \beta SI + \lambda Sp - \eta I - \xi I - dI - \alpha I$ (4)
$dQ / dt = \alpha I - dQ - \mu Q$ (5)

where, b is the birth rate (new nodes attached to the network), d is the natural death rate, i.e. destroying of the computers because of the reason other than the attack of virus or worms, γ is the rate of execution of antivirus software initially (i.e. from class S to class Sp), θ is the rate of transfers of computer nodes from class Sp to class S, β is the rate of contact from class S to class I, α is the rate of quarantine from class I to class Q, μ is the rate of susceptible after recovery from class Q to class S, σ is the fraction of computer nodes (not belonging to the above mentioned classes, viz; S, Sp, I, and Q) on which we execute antivirus software and directly introduced at the class Sp, λ is the rate by which the nodes from the class Sp are infected by the malware are transformed to class I, ξ is the death rate (destroying of computer nodes) due to the attack of malware and η is the rate by which infected computers are recovered by updated antivirus and transferred back to the Sp class, i.e. from class I to class Sp. Using equation (2), (3) and (4), we get the value of Q, S and Sp as follows:

$Q = [\alpha / (d + \mu)] * I$ (6)
$S = [(\theta+d+\lambda)*1/\lambda*(\eta+\xi+d+\alpha)] / [(\gamma*1/I) + \{\beta (\theta+d+\lambda)*1/\lambda\}]$ (7)
$Sp = 1/\lambda [\eta+\xi+d+\alpha-\beta*[[(\theta+d+\lambda)*1/ \lambda*(\eta+\xi+d+\alpha)] / [(\gamma*1/I) +\{\beta(\theta+d+\lambda)*1/\lambda\}]]]*I$ (8)

III. Analyzing the Stability of the Model

Ourproposedmodelcontainsfourclassesofnodes,viz;Susceptible(S)-SusceptiblewithProtection(Sp)–Infected(I) - Quarantine (Q) to represent the propagation of worms in e-commerce network.

Figure 2 shows the dynamic behaviorof different classes of nodes with respect to time. Initially thenumber of nodes in the S class decreases drastically due to itstransfer into the Sp class by installing the antivirus softwareand later it maintains a stable number of nodes. Nodes in Spand Q classes increase initially and then decreaseswith time.

Installationof updatedantivirus may contribute to theincrease of nodes in Sp class. The figure shows thesudden increase of nodes in I class due to the non-identificationofthe presenceofthe malware in thenetwork.Once themalware is identified and removed by the updated antivirussoftware, it contributes to the sharp decrease in the number ofnodesinIclass.
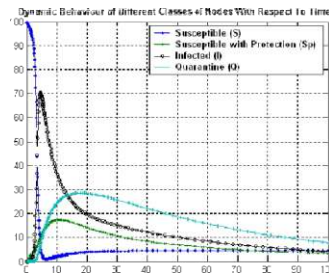

Fig. 2: Dynamic Behaviour of Different Classes of Nodes with Respect to Timewhen σ =0.09; μ =0.05; θ =0.07; β =0.03; γ =0.02; η=0.06; λ=0.04; ξ=0.03;α=0.08;b=0.07;d=0.01

IV. Conclusion

Understanding the cyber threat is the first step towards defending against it. There are many issues involved in securing the e-commerce network which is Being fraudulently represented as sender ofphishing messages, Password sniffing, Denial of Service, etc. The spread of malware in the e-commercenetworkimitates the epidemicbehavior.Hence, anepidemicmodel is developedto study the spread of malware in e-commerce network where infectednodesarequarantinedfromthenetwork.MATALBis used tosimulateandanalyzethebehaviorofdifferentclassesofnodesamongthemselvesandwithrespectto time to study the stability of the system. It was observed thatquarantining the highly infectiouse-commerce nodeshavepositive contribution to the stability of the system. Continuous study of the system a tdifferent states of thee-commerce network may contribute significantly to the stability of the system.

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TO STUDY VARIABLE FREQUENCY DRIVE AND IT'S ENERGY SAVING

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Abstract- As the demands of industrial needs varying the more outputs of the precise control of electrical prime movers i.e. motor. As compared to AC motors the DC motors can be controlled easily but have some limitations when capacity increases. Conversely AC motors (especially In Squirrel Cage induction motors are economical in operation but the speed control is difficult because it need alteration of supply frequency for operation. Nowadays with technological advancement in drives system, the control of AC motors is more economically, easy to use and the control the range of speed both below and above the base speed.

Keywords- **VFD, Energy Saving, Controller, Induction Motor**

INTRODUCTION

Variable Frequency Drive

Variable Frequency Drive (AC drives) are for steeples speed control.induction motors mostly ruggedness and are maintenance free long life. Through VFD speed of motor is controlled by varying the output voltage and frequency through processor controlled device.

YASKAWA A1000 is considered for our study which is generally installed on the panel at Motor control Center area. The A1000 is a full featured drive, it provide outstanding quality, optimized performance, working flexibility, and environmental friendliness through 1000HP. It also includes network communications feedback, and expandable I/O.

Applying Variable Frequency Drives (VFD's):-
Most types of adjustable speed loads are variable torque, constant torque and constant horse power loads. Variable torque load require much lower torque at low speeds than at high speed. In variable torque load, the horse power varies approximately as the square of the speed. This type of load is found in centrifugal fans, pumps and blower.
For years, industrial washing machine have been employed VFDs on three phase motors. Today, VFD is low enough in cost to be incorporated into the home's washer. The VFD provides its ability to change the rotational directional of motor. This allows the washing machine to be a front load type, thus using less water in cycle. The VFD allows for over speeding of motor to accomplish this and thus the clothes get much dryer while still in washing machine. This means that the drying time is reduced and saves electric costs overtime.
 Electrical Variable Speed Drive Method

Apart from variable speed control method of mechanical and hydraulic speed drive, the electrical variable speed drives are basically the speed of electric motor itself, rather than a intermediary device controlled. Variable speed drives that control the speed of DC motors are loosely called DC Variable Speed Drives or simply DC Drives and those that control the Speed of AC motors are called AC Variable Speed Drive or simply AC Drives.

Figure-comparing between the capacity control of mechanical and speed
Energy savings

Savings in Energy can be done with the applications of Variable Frequency Drive (VFD). These saving are achieved by eliminating throttling and friction losses affiliated with mechanical or electromechanical adjustable speed technologies. Efficiency, quality and reliability can also be improved. The application of variable frequency drive is load dependent.

Scope for power saving with variable frequency Drive

%SPEED	% FLOW	% HEAD	%POWER
N_s	$Q \propto (N_s)$	$H \propto (Ns)^2$	$P \propto (Ns)^3$
100	100	100	100
90	90	81	73
80	80	64	51
70	70	49	34
60	60	36	22
50	50	25	13
40	40	16	06
30	30	09	03

Table-Relation between of flow, head and power with respect to speed

As we know the variation of flow, head and power with respect to speed are as follows:

1. Flow α Speed
2. Head α $(Speed)^2$
3. Power α $(Speed)^3$

The table shows the relation of flow, head and power with respect to speed for e.g. at 50% speed flow reduces to 50%, head reduces to 25% and power reduces to 13%.

Controller

The aim of the Power Electronic Drive Controller is to obtain optimum performance from the   motor, to obtain the maximum power from it over as wide speed range as is required to   achieve highest operating efficiency from the motor and to obtain the best dynamic performance possible.

In all case it is necessary for the motor and the controller to be matched together carefully if overall optimum performance is to be achieved. Hence the starting point of exploration into Variable Frequency Drive must be the motor, how it works, how it develops torque and how to understand it when operating as Variable Speed Drive.

Earlier the Variable Speed Motors have been DC motors and they reigned supreme in this field since electricity has been put to practical use. However there is an increasing area of application where the DC motor is unable to satisfy the performance required or cope with environment specified. In some cases it is the lack of commutator or brush gear which can decide on the use of an AC Motor. In others it is the need for speeds above those achievable with a DC motor in yet other it may be wish to apply a Variable Speed Controller to an existing fixed motor. It may even be the ready availability of an AC motor which is the deciding factor. Whatever the reason may be, the availability of a wide range of Variable Frequency Drive system is leading to a steady increase in the use of AC variable speed motor drives throughout the industry and this trend is clearly going to continue.
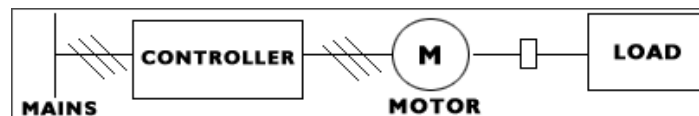

Figure -Controller is connected to main supply and electrical machine

VFD OPERATION

The Variable Frequency Drive comprises of three sections - an input Rectifier unit, an inverter unit and a DC bus. An input Rectifier unit is used for converting input AC supply into DC supply. Here three phase supply is applied with three phase full wave diode to converts into DC supply. The DC bus contains a filter section to filter out the harmonics generated during the AC to DC conversion. In the last section an inverter section is used which consist of six IGBT (Insulated Gate Bipolar Transistor). It is used to convert the DC supply to quasi sinusoidal wave of AC supply which is input to the induction motor connected to it. In a basic DC-link variable frequency motor controller, the input AC power is converted to DC, filtered and then converted to variable frequency DC by an inverter. A set of SCR switches is used to convert the DC to three phase AC power to drive induction motor. Bypass diodes are needed for reactive power flow and to clamp the voltage to that of DC supply.

The filter supplies a DC voltage to the inverter that is largely independent of load current due to filter capacitor. The inverter tends to keep the current constant. The AC to DC converter output may be fixed or variable (voltage or current) depending on the type of inverter and the filter used.
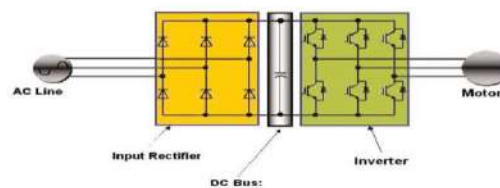
Figure -Mechanical capacity control

As we know that the synchronous speed of motor is directly proportional to the supply frequency, therefore synchronous speed of the motor can easily vary by changing the value of the frequency. This is the main working phenomenon of the VFD.

How Drive Changes Motor Speed

Pulse Width Modulation Drives are used for controlling speed of a motor. Pulse width modulation (PWM) inverter produces pulses of varying widths which are combined to build the required waveform. A diode bridge used to reduce harmonics. PWM produce a current waveform that more closely matches a line source, which reduces undesired heating. PWM drive have almost constant power factor at all speeds which is closely to unity.
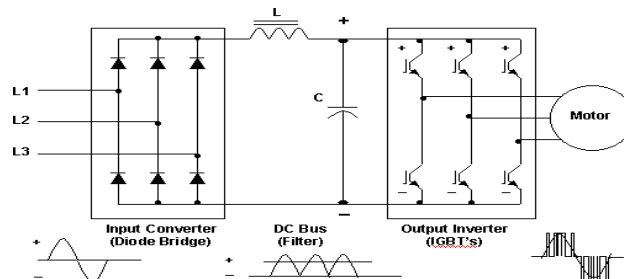
Figure-Circuit Diagram of Basic VFD

In a square wave inverter, each input is connected alternatively to the positive and negative power supply outputs to give a square wave approximation to an AC waveform at a frequency that is determined by gating of switches. The voltage in each output line phase shifted by 1200 to provide a three phase source.

The switches provide a stair-step voltage for each motor phase at frequency below rated frequency of the motor, the applied voltage must be reduced otherwise the current to the motor will be excessive and cause magnetic saturation. A decreasing voltage level to keep the flux constant can be done with square wave inverter decreasing DC voltage as motor speed is reduced below the rated speed. This can be done by a controlled rectifier but this problem with harmonics in the power system of supplying controller.

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Conclusion and future work

Through use of VFD speed control of electric motor, increase in efficient energy use, decrease in energy consumption and/or consumption from conventional energy sources is reduced that leads to the conservation of energy.Rapid improvements in AC control technology combined with ready availability of standard fixed frequency of AC motor have increased the number of possible solution. With the process of pulse width modulation, the frequency given to the induction motor can be set in order to control the speed of the induction motor. Variation of frequency leads to the harmonics distortion which can be mitigating by several techniques of harmonics mitigation.

The elimination techniques of harmonics are generally applied to lowest harmonic because as the filtering is more practical at higher harmonics, the filtering component can be smaller and less expensive. Also application of several multilevel inverters provides another approach to harmonics cancellation. For the mitigation of harmonics from the circuit of the inverter application of active filters are required into the circuit such as Band Pass Active Filter.

 At last the conservation of energy may result economical running expenditure, environment friendly, national and personal security. Increase energy use efficiency

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ROLE OF BETTER PROGRAM AND CURRICULUM FOR IMPROVING HIGHER AND TECHNICAL EDUCATION IN JHARKHAND

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Abstract: *At present, Jharkhand is one of the poor states in India in which a high percentage of rural poverty seems in the year 2000, Jharkhand was lagged behind the economic growth compared to other states in India about 50% of the workforce in this state is dependent on agriculture and allied farming activities. It has a tribal-dominated region with 28% of individuals being tribal and 12% are basically Schedule Caste. There are 3 districts of Jharkhand- Lohardagga, Gumla, and West Singhbhum, which boast of more than 50 percent of tribal population, Gumla being at the apex with 68.4 percent tribal population. The Gross Enrolment Ratio in higher education is only 18 percent in Jharkhand. Munda, Santhal, Bhumji Kharia, are the main tribes here. Technology plays a major role and contributes to the development, advancement, and supremacy of the society, state, and nation. Program and Curriculum development helps in suitable teaching-learning strategies, teaching methods, instructional materials, etc. It also helps in the selection of study matter and other activities so that learners are able to acquire the goals and objectives of teaching. The Jharkhand University of Technology is going through the curricula as per the NEP. It helps students to move from particular knowledge and skills toward an understanding of deeper structures, more complex ideas, and mathematical reasoning including problem-solving. The curriculum will also include suitable knowledge which will help in the achievement of aims of education and providing practical exposure as related with sustainable development in Jharkhand. This curriculum includes well-selected activities and experiences needed for the development of pupils in Jharkhand State.*

Keywords: *New Education Policy (NEP), work force (WF), Sustainable Economic Development (SED), Program for Curriculum Development (PCD)*

1. Introduction

Jharkhand is separated from the state of Bihar in 2000 since then even 21 years after being carved out of Bihar, Jharkhand's education sector is very poor and in a shambles. Jharkhand is one of the poorer states of India where poverty often forces youngsters to take up menial jobs or to simply migrate to other states. The program and syllabus of the different universities is not as per the recent requirements. A lot of modification is required in this field. In the state, Jharkhand, there are 428 colleges, which include polytechnics and technical colleges, still running the old syllabus. Therefore, the Govt. of Jharkhand should have taken a meticulous and visionary plan for establishment of New Colleges in rural semi urban areas where no colleges.

2. Literature Review

In the section of Literature review, we the researcher have trying to root out the role of better program and curriculum for improving the higher and Technical education. "We are trying to establish such institutions with private partners but also go for the curriculum as per NEP. To improve the quality of education and a good curriculum is not rigid- it allows room for flexibility, monitoring and evaluation by administration. It should provide sufficient scope for the cultivation of unique skills, interest, attitudes and appreciations. The government is planning on demand- and choice-based education which will focus on a student's employment prospects in this regards.
In connection with "The Technical University "Jharkhand university of Technology" has already started to build the curriculum as per new education policy. The government of Jharkhand will soon establish four professional and technical colleges in different districts of Jharkhand in order to providing better education facilities to the students in higher and technical education. In this regard, Jharkhand University of Technology will be seating in a pilot seat for driving the technical education vehicles under its dynamic leadership and vision.

3.   Objectives of Study

The major objective of better program and curriculum development is to improve the educational offerings and its instructional activities and practices in order to increase student engagement in the learning process and to improve student achievement. It will provide the resources to develop and implement the curriculum within the financial capabilities of the state. It will define the direction of educational development, determine the program level, curriculum planning and finally must demonstrate the progression.

4. Essential consideration for curriculum development

The curriculum development process systematically organizes what will be taught, who will be taught and how it will be taught. Each component affects and interacts with other components. The following are widely essential considerations in technical education in non-formal settings:
 ➢ issue/problem/need is identified (issue ® what)
 ➢ characteristics and needs of learners (target audience ® who)
 ➢ changes intended for learners (intended outcomes/objectives ® what the learners will be able to do)
 ➢ the important and relevant content ®(what)
 ➢ methods to accomplish intended outcomes ®(how)
 ➢ Evaluation strategies for methods, content, and intended outcomes.

Consequently, key curriculum considerations are the identification of pathways of experiences and engaging students in activities and interactions directed towards them securing the kinds of knowledge intended to be learnt through these processes

5.   Proposed Curriculum design

The following objectives have been taken by the researcher in order to find out the benefits of better program and curriculum under the development of education system in Jharkhand and the planning phase lays the foundation for all of the curriculum development steps. In Figure 2, it is illustrates how the 12 essential steps progress from one to the next. It also shows the interaction and relationships of the four essential phases of the curriculum development process:

Phase I: Planning: The planning phase lays the foundation for all of the curriculum development steps. The steps in this phase include:
 ➢ Identify Issue/Problem/Need
 ➢ Form Curriculum Development Team
 ➢ Conduct Needs Assessment and Analysis

Phase II: Content and methods: It determines intended outcomes (what learners will be able to do after participation in curriculum activities), the content (what will be taught), and the methods (how it will be taught). Steps include:
 ➢ State Intended Outcomes
 ➢ Select Content
 ➢ Design Experiential Methods
Additional topics include:
 a) learning styles and activities appropriate for each style;
 b) a list of types of activities (with descriptions);
 c) an activity design worksheet for facilitators; and
 d) brief discussions on learning environments and delivery modes.

Phase III: Implementation:
 ➢ Produce Curriculum Product
 ➢ Test and Revise Curriculum
 ➢ Recruit and Train Facilitators
 ➢ Implement Curriculum

Phase IV: Evaluation and Reporting:
 ➢ Design Evaluation Strategies
 ➢ Reporting and Securing Resources

6.   Present scenario of Higher Education in Jharkhand

At Present, the Government of Jharkhand has taken several initiatives in the areas of skill development and in higher education, at this moment such as:

- Jharkhand university of Technology is going to change the curriculum as per new education policy. University is going to start M. Tech program, Ph. D program in different discipline and several other course is going to be added. It will definitely improve the education level of state.
- To access the higher and Technical Education against the national average of 23 Gross Enrolment Ratio (GER), we have only 13 GER in the state. In terms of deficit of number of colleges in higher education, we have college population index of 8 viz-a- viz national average of 26. So, in order to match the national average, we require 692 national colleges.
- It clearly indicates that there is a large deficit of national colleges in the state and in order to address this crucial issue, the government has planned to construct and open about 100 new engineering, degree and polytechnic colleges in near future.
- We have already signed MoU with Cisco, Oracle and Tata and we are soon going to sign MoU with Siemens. These companies will be bringing new software, technology and solutions to provide better education to our students. It will enable students to get immediate jobs. We are also incorporating skill development certificate courses in our colleges for all. These courses will get integrated in our education systems so that students studying in regular courses can get relevant hands-on experience to help them while working in industry.

Major challenges for improving higher and Technical Education in Jharkhand:

The following major challenges has seems to visible in the state Govt. like

- To access the education policy and System in state
- To share and contribute the equity for providing quality education
- To provide quality of Higher and technical Education and its Excellence
- To attract new investments, it is crucial for a state to communicate to the business fraternity for enhancing the good quality of higher and Technical Education in Jharkhand.

The aforesaid major features for higher and technical education are the major challenges in the state Jharkhand. However, for us – at this point – the greatest challenge is to increase the GER. It is 13 and we need to take it to 32 by 2022. Therefore, the state Govt. should need to produce students which can directly be deployed by the industries requirement.

7.   Suggestions & Recommendations

After the careful investigation and observations made by the researchers, we may suggest and recommend to honourable authorities of JUT and state Govt. for consideration the following things such as:

- ❖ Implementation of better program and curriculum as per current requirement for Higher and Technical Education in state where it will be needed.
- ❖ Focussed on establishment of high standard of infrastructure of skill and employability based education.
- ❖ Establishment of more research centre, incubation Centre, centre of Excellency by which new and innovative research will be possible along with produce good quality of product and Patent will be possible.
- ❖ Appointment of high qualified and experienced academicians, professors, Industrial experts in different colleges and Universities so that a quality of teaching and Productive work is expected.

8.   Conclusion

In sum, the above summations are summering that, Jharkhand state is not poor in education, some extent it may be back foot in comparison to other states in India, it will becomes an education hub in India if the aforesaid suggestions and recommendations are taken to kind consideration by the authorities of state government as well as central government in order to establishment of new colleges and universities in different districts in Jharkhand with the updated program and curriculum as per necessity of industry. Besides that, the govt. should have consider the economic development of the peoples of Jharkhand by inviting various companies, industrialist for establishment of industries, so that the people of Jharkhand becomes economically sound and contribute money for their children's well education and maintain a better life style in their future .

Content-Based Visual Information Retrieval using Image Feature Extraction- Color and Edge

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Abstract- In the last few years, the complexity of multimedia content, especially the images, has grown exponentially, and on daily basis, more than millions of images are uploaded on different platforms (online/offline) such as Google Photos, Twitter, Facebook, Instagram and many more. Search for a relevant image from an archive is a challenging research problem for the computer research society. Having humans manually comment/add notes to images by entering keywords or indexing in a large database can be laborious and may not capture the keywords desired to describe the image. The evaluation of the effectiveness of keyword image search is individual and has not been well-defined. In the same regard, CBIR systems have similar objections in defining success rates. "Ideas and topics that define what your content is about also limit the scope of queries/inquire to the set of pre-planned criteria" and, "having been set up" are more uncertain than using the content itself.

Keywords: YC_bC_r color space, Color histogram, Edge histogram, Content-Based Image Retrieval (CBIR).

I. INTRODUCTION

The aim of content-based image retrieval (CBIR) is to find similar images from a large-scale image dataset against a query image. "Content-based" means that the search analyses the contents of the image rather than the metadata such as ideas and topics, keywords, tags, or descriptions aligned with the image. The term "content" within this framework might refer to color, shapes, textures, or any other information that can be filtered out from the image itself. CBIR is desirable because searches that rely purely on metadata are dependent on annotation (keywords) quality and wholeness. Over the last few years, more and more attention are fascinated to Content-Based Image Retrieval (CBIR). The tremendous growth of the numbers and sizes of digital image and video collections on the Web and the large storage sizes available on digital devices (such as mobile, personal computers, etc,.) are making it necessary to develop powerful tools for retrieving this unconstrained imagery. The retrieval performance of a content-based image retrieval system depends crucially on the feature representation and similarity measurement of an image.

Despite the advances in both the feature selection techniques and matching, and retrieval techniques, the current CBIR systems still have a major difficulty that it has yet to overcome, i.e., how do we relate the low-level characteristic to the high-level connotation? From extensive experiments on CBIR systems using features like color, texture, shape, spatial layout, etc., and relevance feedback from the user, we still found out that the low-level attributes of an image cannot always describe the high-level connotation concepts in the user's mind. From a high-level standpoint, such challenges can be deep-rooted to the elementary challenge of Artificial Intelligence (AI), i.e., how to build and train intelligent machines like humans to face up to real-world tasks. Machine learning is one of the optimistic techniques that attempt to address this grand challenge or issue in the long term.

To overcome this burden, on the one hand, one can go in the direction of searching for more low-level features that can improve the performance of the current content-based retrieval schemes; on the other hand, whenever possible, incorporating text-based retrieval with content-based retrieval is desirable. Most image search engines are annotated with keywords. attempts have been made to develop general-purpose image retrieval systems based on color features, such as the QBIC system in IBM (Niblack et al., 1993), Visual Seek system in Columbia University (Smith, 2020). These systems contribute lots to the research of CBIR. Except for the color histogram information, the position information of each pixel plays an important role too.

In this paper, we propose an algorithm, which could include several spatial features of color and edges in an image for retrieval. By computing the color and edge histogram in a region, we can evaluate the similarity of two images according to the weight of each factor. Because the features are simple and can be calculated at a fast speed, a better result can be made easily through training.

II. LITERATURE REVIEW

A standard image retrieval system includes three important building blocks: i) high dimensional indexing, ii) system design and iii) feature extraction (usually in conjunction with feature selection), (Rui et al., 1999). An image can be represented as a set of low-level visual features (attributes) such as color, texture, shape, and other image features. While certain image retrieval systems rely on only one feature for the drawing out of relevant images, it has been shown that a proper combination of relevant features can yield better execution (Liu et al., 2007). The process of determining the combination of features that is most representative of a particular query image is called feature selection. Some work has been done on color and texture feature extraction algorithms.

III. COLOUR SPACE AND EDGE HISTOGRAM

Image feature extraction is a crucial part of any CBIR algorithm which directly affects the performance of the algorithm. The visual feature which is optimal for image processing applications should satisfy several main requirements. Those are reliability, discriminability, conciseness, and solitary (Cvetkovic et al., 2013). The present scheme uses color histogram and edge histogram descriptors as those features are characterized by low computational complexity, very compact representation, and invariance to resolution changes.

1. YC_bC_r color space

The color histograms have been commonly used for key feature extraction in frame difference-based techniques and also used for image retrieval (Liu et al., 2013). This is because color is one of the most important visual features to describe an image (Liu, et al., 2013). Color histograms are easy to compute and are robust in the case of small camera motions (Rajendra and Keshaveni, 2014). It has been observed in the literature that the YC_bC_r color space always yields better results as compared to other color spaces in the case of a similar keyframe detection (Mishra and Subban, 2014). That is why the present scheme uses YC_bC_r color space. Moreover, by the use of YC_bC_r color space, the influence of illumination changes and shadows are also to be reduced (Angadi and Naik 2012). The distinction between YC_bC_r and RGB is that YC_bC_r represents color as brightness and two-color difference signals, at the same time RGB represents color as red, green, and blue. In YC_bC_r, the Y is the brightness (luma), C_b is blue minus luma (B-Y) and C_r is red minus luma (R-Y). This color space exploits the properties of the human eye. The eye is more sensitive to light intensity changes and less sensitive to hue changes. When the amount of information is to be minimized, the intensity component can be stored with higher accuracy than the C_b and C_r components. The joint photographers engineering group (JPEG) file format makes use of this color space to throw away unimportant information (Kekre, et al., 2012). In this paper, the Y component is used for the edge histogram feature and the color component, i.e., C_b and C_r are used for the color histogram feature. RGB images can be converted to YC_bC_r color space using equation (1). Y component is luminance, C_b is blue chromaticity and Cr is red chromaticity.

$$\begin{bmatrix} Y \\ Cb \\ Cr \end{bmatrix} = \begin{bmatrix} 0.2989 & 0.5866 & 0.1145 \\ -0.1688 & -0.3312 & 0.5000 \\ 0.5000 & -0.4184 & -0.0816 \end{bmatrix} * \begin{bmatrix} R \\ G \\ B \end{bmatrix} \tag{1}$$

2. Edge histogram

Edge detection is one of the most commonly used operations in image analysis. Edges define the boundaries between regions in an image, which helps in segmentation (Seixas et al., 2009) and object recognition. The edge histogram is used to match the edges of adjacent frames to eliminate redundant frames (Rajendra and Keshaveni, 2014). Edge detection operators that are commonly used are viz Robert's operator, Canny operator, Sobel operator, Prewitt operator, and the Laplace operator (Dhagdi and Deshmukh, 2012), etc. To find the edge histogram, the image (f) is first divided into (4×4) sub-images as shown in Fig 1.

(0,0)	(0,1)	(0,2)	(0,3)
(1,0)	(1,1)	(1,2)	(1,3)
(2,0)	(2,1)	(2,2)	(2,3)
(3,0)	(3,1)	(3,2)	(3,3)

Fig.1. Definition of sub-image.

The present scheme uses a *Canny edge detector*. It finds edges based on the local maxima of the gradient of image f(x, y). The gradient is calculated using the derivative of the Gaussian filter. The image is smoothed using a Gaussian filter with a specified standard deviation, to reduce noise. To generate the histogram, edges in the sub-images are categorized into five types; vertical, horizontal, 45-degree diagonal, 135-degree diagonal, and non-directional edges. Since there are 16 sub-images, a total of $(16 \times 5) = 80$ histogram bins are required (Chang et al., 2001; Manjunath et al., 2002).

Table 1. The semantics of local edge bins

Histogram bins	Semantics
BinCounts[0]	The vertical edge of the sub-image at (0,0)
BinCounts[1]	The horizontal edge of the sub-image at (0,0)
BinCounts[2]	45-degree edge of sub-image at (0,0)
BinCounts[3]	135-degree edge of sub-image at (0,0)
BinCounts[4]	non-directional edge of sub-image at (0,0)
BinCounts[5]	The vertical edge of the sub-image at (0,1)
BinCounts[78]	135-degree edge of sub-image at (3,3)
BinCounts[79]	non-directional edge of sub-image at (3,3)

IV. OVERVIEW OF THE PROPOSED METHOD

We propose an approach that is based on several efficient image processing procedures. At first, query image and images dataset are taken. Then, color and edge histogram features are extracted from query images and images of the dataset, and the Euclidean distance measure is used to evaluate the similarity between the images. Then, similar images are extracted. Fig 2 depicts the flow chart of the proposed scheme. In the rest, a detailed description of the proposed method is presented.

Step 1 *Image Datasets:* Our proposed method aims to evaluate the performance of the two feature generalization schemes based on different sample image datasets, including the general image database "ImageNet", the object image database "Caltech256", and the facial image dataset "Pubfig83LFW".

Step 2 YC_bC_r *color space:* query image and image datasets in Step 1 are converted in YC_bC_r color space using equation (1).

Step 3 *Image feature extraction:* image feature extraction is a crucial part of any CBIR extraction algorithm. It directly affects the performance of the proposed scheme. In this paper, we have used two features, i.e., color and edge. This is because several methods for retrieving images based on color features have been described in the literature. The color feature is easy and simple to compute. The color histogram is one of the most commonly used features for Content-Based Image Retrieval (CBIR) as it is invariant to scaling and rotation. Color histogram of images in the C_b (chrominance of blue), and C_r (chrominance of red) color space are calculated. A color histogram is very effective, for the classification of images based on color. Algorithm 1 shows the steps to find the color histogram.

Algorithm 1: Color Histogram

Input: query image and image datasets
Output: Euclidean distances (EDC_b & EDC_r) between the query image and each image in datasets for each component C_b and C_r
begin
1: **For** 1st image in the dataset **do**
2: Convert the image from RGB to YC_bC_r using Eq (1).
3: Calculate the normalized histogram of each component i.e., C_b and C_r by using Eq (2)

$$P_i = imhist(f,b)/numel(f) \qquad (2)$$

were,   i: image number
        f: color difference components that is C_b and C_r

---

b: the number of bins used in forming the histogram (b=256 for 8-bit grayscale image)

numel(f): the number of components in array f (i.e., the number of pixels in the frame)

4: **End For**

5: **For** the second image onwards **do**

6:      Repeat steps 2 and 3

7:      Calculate Euclidean distance (EDC_b and EDC_r) between two normalized histograms using Eq (3) for C_b and Eq (4) for C_r respectively, for query image and each image in image datasets

$$EDC_b = \sum((P_{oldimage} - P_{newimage})^2)^{\frac{1}{2}} \quad (3)$$

$$EDC_r = \sum((P_{oldimage} - P_{newimage})^2)^{\frac{1}{2}} \quad (4)$$

EDC_b: Euclidean Distance of C_b, stores Euclidean Distances between the query image and each image in image datasets.

EDC_r: Euclidean Distance of C_r, stores Euclidean Distances between the query image and each image in image datasets.

$P_{oldimage}$ = first image

$P_{newimage}$ = consecutive second image

8:      $P_{oldimage} = P_{newimage}$

9: Store the values of EDC_b and EDC_r

10: **End For**

end

and Algorithm 2 shows the steps to find the edge histogram.

Algorithm 2: Edge Histogram

Input: query image and image datasets

Output: Euclidean distances (EDY) between two consecutive frames of component, Y

begin

1: **For** 1st image in the dataset **do**

2:      Convert the image from RGB to YC_bC_r using Eq (1)

3:      Store the component(Y) i.e., luminance information

4:      Split the image into (4×4) non-overlapping rectangular region

5:      In each region, a (1×5) edge histogram is computed (horizontal, vertical, 2diagonal and 1 non-directional) Say,

            E1 = contains 80 histogram bins

6: **End For**

7: **For** the second image onwards **do**

8:      Repeat steps 2, 3 and 4

9:      In each region, a 1*5 edge histogram is computed (horizontal, vertical, 2diagonal and 1 non-directional) Say,

            E2 = contains 80 histogram bins

10:     Calculate Euclidean Distance (EDY) between the two-edge histogram using the Eq(5)

$$EDY = \sum((E1 - E2)^2)^{\frac{1}{2}} \qquad (5)$$

      EDY: Euclidean Distance of Y component, stores Euclidean Distances between two consecutive frames.

11:     E1 = E2

12:     Store the value of EDY
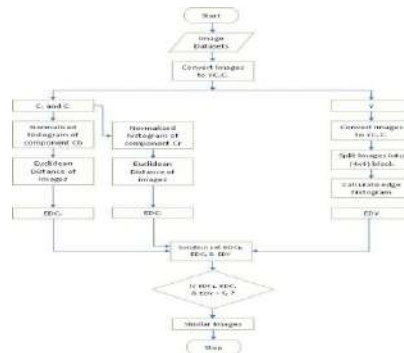
13: **End For**

End

Fig. 2 Flow chart of the proposed scheme.

Step 4   *Detection of similar images:* The proposed model is based on color histogram and edge histogram features. Given a query image and image datasets which contains many images, the color histogram and edge histogram for each image is computed and the Euclidean distance measure is used to measure the dissimilarities between the query image and individual images of image datasets. A similar image or images are said to be detected if the dissimilarity between the compared images is smaller than the objective function value. The objective is to minimize the objective function. The normalized objective function 'f_n' is then defined as:

$$f_n = \frac{P + R}{2} \tag{6}$$

The precision (P) is defined as the proportion of retrieved images that are relevant to the. Precision is the ratio of the number of relevant images you have retrieved to the total number of irrelevant and relevant images retrieved. In other words, supposing that A was the number of relevant images retrieved and B was the total number of irrelevant images retrieved.

$$Precision = \frac{A}{A + B} \tag{7}$$

The recall (R) is defined as the proportion of relevant images in the database that are retrieved in response to a query. Supposing that A was again the total number of relevant images you have retrieved out of a bunch you have grabbed from the database, and C represents the total number of relevant images in your database. The recall is thus defined as:

$$Recall = \frac{A}{C} \tag{8}$$

Algorithm 4 shows the steps for the Detection of similar images.

Algorithm 4: Detection of similar images
Input: Euclidean distances (Y, EDC$_b$ & EDC$_r$) between the query image and images in image datasets for each compo Y, C$_b$ & C$_r$ from Algorithm 1 and Algorithm 2 respectively and objective function (fn) of each comp Y, C$_b$, and C$_r$
Output: Similar images
begin
1: **If** EDCb>fn & EDCr>fn & EDY>fn **then**
2: Select similar images
3: **End If**
end

V. PERFORMANCE EVALUATION

This section presents the results of the experiments conducted to confirm the success of the proposed model. The experimentation is conducted on set open Image Datasets. The experiments are conducted in Intel(R) Core(TM) i3-3220 CPU @ 3.30GHz processor with 4GB RAM using MATLAB 9.2 (R2017a).

    1. The gold standard

The results of the proposed method are compared with the ground truth agreed by multiple human judges. The goals of creating the ground truth are to:

1   create a reference database of images
2   identify a foundation by which automated algorithms can be used for comparison.

To establish the ground truth, human judges were asked to independently surf the image datasets and provide similar images. The similar images estimated by the judges were reviewed in a group meeting with a final judge to derive similar images for each of the categories of Image Datasets.

The performance measure for 3 queries was calculated and summarized in Table 2 and Figure 4

Table 2. Performance Measure

No. of sampled	Performance measure of Proposed Work (%)

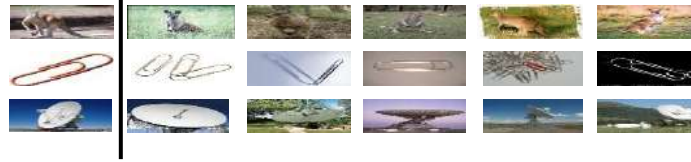|	images	Precision	Recall
Image Dataset 1 (169.radio-telescope)	92	90	95
Image Dataset 2 (121.kangaroo-101)	82	95	96
Image Dataset 3 (155. paperclip)	92	89	92

Fig. 3. Preview of proposed scheme.

VI. CONCLUSIONS

In this paper, we have proposed an efficient method for Content-Based Image Retrieval (CBIR) based on two feature extraction. Experimental results on standard open Image Datasets show that the proposed scheme offers satisfactory performance for image or images retrieval from Image Datasets based on query images in terms of recall (R) and precision rate (P). The limitation of our proposed method is that it is based on only two key features of images. We propose this scheme in hope of bridging the gap between the machine and the human user for image retrieval.

VII. FUTURE WORK

Future work can be concentrated on further performance improvement of the proposed scheme by selecting an adaptive threshold based on a Genetic Algorithm (GA). We will try to improve more by taking more image features.

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Antimicrobial Textiles

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Abstract

Increasing global competition in textiles has created many challenges for textile researchers and industrialists. The rapid growth in technical textiles and their end-uses has generated many opportunities for the application of innovative finishes. Novel finishes of high added value for apparel fabrics are also greatly appreciated by a more discerning and demanding consumer market. The present research work is aimed at synthesizing the composites of antibacterial agents on the textile substrates like Neem, Tulsi, Aloe Vera for improving their performance. These are selected for the experimental work as they are easily and cheaply available in the surrounding. The anti-microbial finishes covers the full range of positive effects that antimicrobials bring to textiles industry and provides the types and properties of antimicrobial by using the antibacterial properties of Neem oil, Aloe vera and Tulsi. We conclude that in the 5% Neem oil, 5% aloe vera + 5% tulsi shows better control of bacterial activity over the fabrics

Key Words: - Antimicrobial, Tulsi, Neem, Aloe Vera, Tulsi, E-Coli, Staphy, etc.

Introduction

Increasing global competition in textiles has created many challenges for textile researchers and industrialists. The rapid growth in technical textiles and their end-uses has generated many opportunities for the application of innovative finishes. Novel finishes of high added value for apparel fabrics are also greatly appreciated by a more discerning and demanding consumer market. Antimicrobial textiles with improved functionality find a variety of applications such as health and hygiene products, specially the garments worn close to the skin and several medical applications, such as infection control and barrier material.

Necessity of Antimicrobial Finishes

Antimicrobial treatment for textile materials is necessary to fulfill the following objectives:
1. To avoid cross infection by pathogenic microorganisms.
2. To control the infestation by microbes.
3. To arrest metabolism in microbes in order to reduce the formation odor.
4. To safeguard the textile products from staining, discoloration and quality deterioration.

Natural Antimicrobial Agents for Textile:

1. Neem extract
2. Aloe vera
3. Sericin
4. Citosin
5. Tea tree
6. Tulsi leave
7. Clove oil

EXPERIMENTAL WORK

The present research work is aimed at synthesizing the composites of antibacterial agents on the textile substrates like Neem, Tulsi, Aloe Vera for improving their performance. These are selected for the experimental work as they are easily and cheaply available in the surrounding.

Application of Antimicrobial agents on textile substrates

The antimicrobial agents can be applied to the textile substrates by exhaust, pad-dry-cure, coating, spray and foam techniques. The substances can also be applied by directly adding into the solution bath. It is claimed that the commercial agents can be applied online during the dyeing and finishing operations. Various methods for improving the durability of the finish include:

1. Solubilisation of the active substances in/on the fiber.
2. Treating the fiber with solution, condensates or cross-linking agents.
3. Micro encapsulation of the antimicrobial agents with the fiber matrix.
4. Coating the fiber surface.
5. Chemical modification of the fiber by covalent bond formation.
6. Use of graft polymers, homo polymers and/or co-polymerization on to the fibre.

Coating the fiber surface

In this research we have used the coating of fibers with different proportion of antibacterial agents in isolation and also in combination for analyzing their effect and performance.

Tulsi extract for the study was obtained by finely powdering the dried leaves. Then the powder was macerated with water followed by filtration.

Neem extract (*A. indica*) was prepared by washing fresh mature neem oil dissolve with emulsifier in sterilized water. This was thoroughly mixed for 1–2 min and then the extract was filtered. .

Sample Preparation

For the present research total of 20 samples are prepared and tested for their performance against *Escherichia coli* and *Staphylococcus* bacteria. The composition of the samples is as follows

mples	Composition
S1	Untreated
S2	Treated with 5% N.E
S3	Treated with 10% N.E
S4	Treated with 15% N.E
S5	Treated with 5% Aloe Vera
S6	Treated with 10% Aloe Vera
S7	Treated with 15% Aloe Vera
S8	Treated with 5% Tulsi
S9	Treated with 10% Tulsi
10	Treated with 15% Tulsi
11	Treated with 7.5 % Tulsi+7-5%Neem
12	Treated with 7.5% Aloe Vera +7.5% N.O
13	Treated with 7.5% Tulsi + 7.5% Aloe Vera
14	Treated with 5% N.O+10% Aloe Vera
15	Treated with 10% N.O+5% Aloe Vera
16	Treated with 5% N.O+10% Tulsi
17	Treated with 10% N.O+5% Tulsi
18	Treated with 5% Aloe Vera +10% Tulsi
19	Treated with 10% Aloe Vera+5% Tulsi
20	Treated with 5% Tulsi + 5% Aloe Vera +5% N.O

Table No. 1 Specification of Samples

Testing

The research samples are tested and analysis with following test;

1. Parallel Streak Method (AATCC Test Method 147-1988),[16]
2. Quantitative Bacterial Reduction Test
3. Wash Durability Test
4. Scanning Electron Microscopy

Parallel Streak Method (AATCC Test Method 147-1988),[16]

Test specimens(non sterile) were out into pieces(25mmx50mm).A 50mm length permits the specimen to lay across 5 parallel inoculums streaks each of diminishing width from both 8mm to 4mm wide. Sterile AATCC bacteriostasis ager plate plates were prepared. Using sterile 4mm inoculating loop .one loop full of culture was loaded and transferred to the surface of the agar plate by making five parallel inoculums streaks spaced 10mm covering the central area of the Petridis

without refilling the loop. The test specimen was gently pressed transversely, across the five inoculums of streaks to ensure intimate contact with ager surface. The plates were incubated at 37 0c for 18-24 hours

Evaluation

The inoculated plates were examined for the interruption of growth along the streaks of inoculums beneath the fabric and for a cleat zone of inhibition beyond the fabric edge. The average width of the zone of inhibition around the test specimen calculated in mm using Eq.(1).

Zone of inhibition (mm)=(T-I)/2

Where

T-width of zone of inhibition.

I-width of specimen.
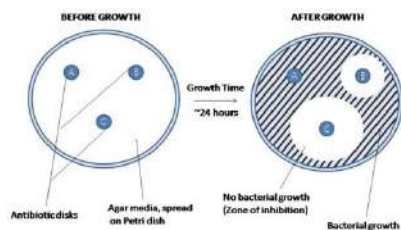
Fig 1   Zone of inhibition

Qualitative bacterial reduction from treated fabric by disk diffusion method in which percentage in reduction of the test bacteria (s.aureus) was conformed the result was calculated in table:-

Antibacterial agent used	Antimicrobial activity(zone of inhibition in mm)	Antimicrobial activity(zone of inhibition in mm)
	Escherichia coli	Staphylococcus
Untreated	0	0
Treated with 5% N.O	9.7	15.8
Treated with 10% N.O	10.5	16.2
Treated with 15% N.O	11.3	16.5
Treated with 5% Aloe Vera	17.2	10.1
Treated with 10% Aloe Vera	18.3	10.5
Treated with 15% Aloe Vera	19.3	11.1
Treated with 5% Tulsi	5.1	8
Treated with 10% Tulsi	5.4	8.3
Treated with 15% Tulsi	5.7	8.5
Treated with 7.5% Tulsi +7.5 Neem	8.3	13.2
Treated with 7.5%+7.5% N.O+Aloe Vera	11.2	19.3
Treated with 7.5% + 7.5% Aloe Vera + Tulsi	18.5	17.2
Treated with 5% N.O+10%Aloe Vera	18.7	18.9
Treated with 10%N.O+5% Aloe Vera	18.3	16
Treated with 5% N.O+10% Tulsi	14.4	17.2
Treated with 10% N.O+5% Tulsi	14.8	17.4
Treated with 5% Aloe Vera+10% Tulsi	18.4	14.4
Treated with 10% Aloe Vera + 5% Tulsi	19.2	15.2
Treated with 5% + 5% +5% N.O + Aloe Vera	19.4	19.2

Table No. 2 Parallel Streak Method Antimicrobial Activity
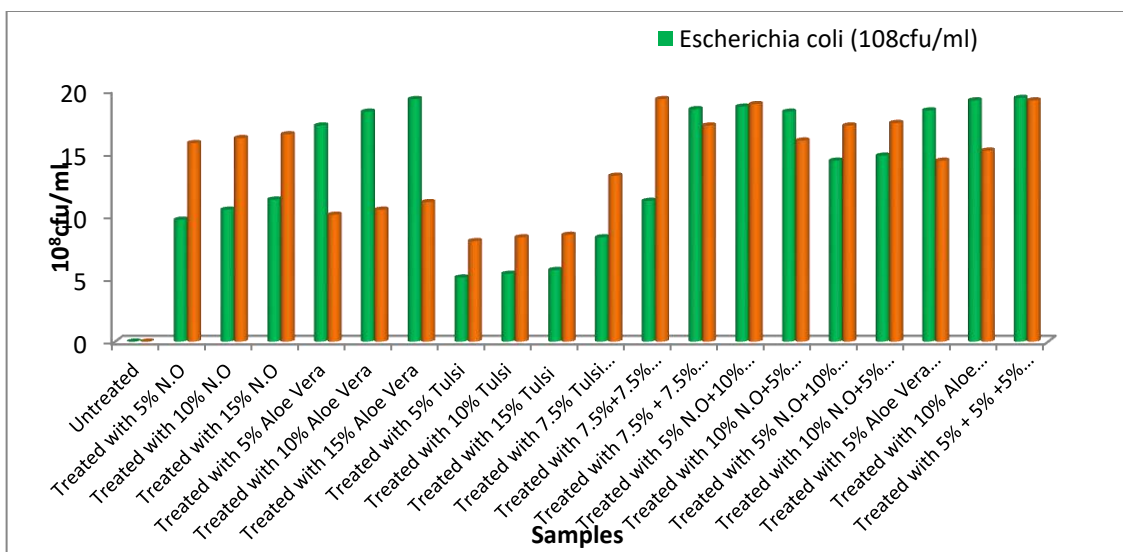
Graph No. 1 Parallel Streak Method

Quantitative Bacterial Reduction Test

Quantitative Bacterial Reduction of cotton fabrics was carried out by serial dilution method in which the percentage in reduction of the test bacteria *(S. aureus* and *E.coli*) was confirmed. The results were calculated and tabulated below in *Table.* Due to the combined activities of the two antimicrobial agents in the form of finishes, the fabric treated with Neem composite finishes showed an increased bacterial reduction percentage when compared to other antimicrobial agents used in the study. It is evident that the Neem composite finishes with 10% Neem oil showed 56% reduction against *S. aureus* and. 86% reduction against *E.coli* whereas the fabric finishes with 10% Aloe Vera Gel reduced to 80% of *S.aureus* and, 95% of *E.coli.* This difference can be attributed to the fabric finishing with antibacterial finishing in the former, which proves the way for the better surface properties of the antimicrobial agent resulting in enhanced activity. The antibacterial activities of bulk Azadirachtaindica and Aloe Vera were studied respectively which proves the potent antibacterial property of the Neem oil extract, Tulsi and aloe Vera.

Formula used for CFU calculation:-

$$\text{CFU} = \frac{No. of colonies}{Amount plated (ml)} \text{ x } dillution factor$$

$$\text{For control Specimen,} \quad \text{CFU} = \frac{1100}{1(ml)} \textbf{X10}^8$$

$$= 1100 \text{ x} \mathbf{10^8} \text{cfu/ml.}$$

Where, CFU = Colony Forming Unit

Effect of Treatment for E-coli Resistance

The below given figure illustrates the effect of fabric antibacterial treatment and reduction of bacterial growth on the fabric for E-coli. The results clearly reflect that the growth of bacteria on the finished fabric has significantly reduced. The fabric sample treated with 15% Aloe Vero has shown the best results with minimum growth of bacteria on the fabric. The results of composite finish i.e. combination of neem and tulsi, aloe vera and neem tulsi and aloe vera shows the second best results after aloe vera. Similarly composites of neem, aloe vera and tulsi treated fabric has shown results after the aloe vera and tulsi followed by the results of Tulsi.

Effect of Treatment for Staphy Resistance

The below given figure illustrates the effect of fabric antibacterial treatment and reduction of bacterial growth on the fabric for E-coli. The results clearly reflect that the growth of bacteria on the finished fabric has significantly reduced. The fabric sample treated with 15% Aloe Vero has shown the best results with minimum growth of bacteria on the fabric. The results of composite finish i.e. combination of neem and tulsi, aloe vera and neem tulsi and aloe vera shows the

second best results after aloe vera. Similarly composites of neem, aloe vera and tulsi treated fabric has shown results after the aloe vera and tulsi followed by the results of Tulsi.

Samples	Escherichia coli (108cfu/ml)	Staphylococcus (108cfu/ml)
Untreated	1100	1200
Treated with 5% N.O	200	600
Treated with 10% N.O	150	530
Treated with 15% N.O	100	475
Treated with 5% Aloe Vera	69	320
Treated with 10% Aloe Vera	60	250
Treated with 15% Aloe Vera	52	243
Treated with 5% Tulsi	300	800
Treated with 10% Tulsi	256	734
Treated with 15% Tulsi	195	698
Treated with 7.5% Tulsi +7.5 N,O	154	635
Treated with 7.5%+7.5% N.O + Aloe Vera	80	600
Treated with 7.5% + 7.5% Aloe Vera + Tulsi	75	387
Treated with 5% N.O+10% Aloe Vera	82	245
Treated with 10% N.O+5% Aloe Vera	92	272
Treated with 5% N.O+10% Tulsi	182	540
Treated with 10% N.O+5% Tulsi	142	510
Treated with 5% Aloe Vera +10% Tulsi	62	305
Treated with 10% Aloe Vera+5% Tulsi	56	246
Treated with 5% + 5% +5% N.O + Aloe Vera + Tulsi	41	232

Table No. 3 Quantitative Bacterial Reduction of Treated fabrics

RESULTS AND DISCUSSION
Parallel Streak Method
It is concluded from results that Aloe Vera 5%.10%.15% higher the inhibition out of them Aloe Vera15% concentration shows the highest inhibition among 5%,10%&15% 19.3mm zone of inhibition. In neem5%,10%&15% compare the inhibition out of them, Neem 15% concentration gives 11.3mmm zone of inhibition, In.Tulsi 5%,10%& 15% compare the inhibition out of them tulsi 15%concentration shows height inhibition among 5%10%&15% ie 5.7mm zone of inhibition. Neem5% Aloevera5%& Tulsi5%composite shows19.4mm zone of inhibition.

Quantitative Bacterial Reduction of cotton fabrics was carried out by serial dilution method in which the percentage in reduction of the test bacteria (Staphylocosccu *E.coli*) was confirmed. . Due to the combined activities of the two antimicrobial agents in the form of finishes, the fabric treated with herbal finishes showed an increased bacterial reduction percentage when compared to other antimicrobial agents used in the study. It is evident that the herbal finishes with 15% Neem oil showed 59% reduction against Staphylocosccu. 91% reduction against *E.coli* whereas the fabric finishes with 10% Aloe Vera Gel reduced to 79% of Staphylocosccu, 95% of *E.coli*. This difference can be attributed to the fabric finishing with antibacterial finishing in the former, which paves the way for the better surface properties of the antimicrobial agent resulting in enhanced activity. The 15% Aloe Vera treated fabrics reduced to 80% and 96% of Staphylocosccu *and E.coli* respectively. The antibacterial activities of bulk Azadirachtaindica and Aloe Vera were studied respectively which proves the potent antibacterial property of the Neem oil extract Tulsi and aloe Vera.
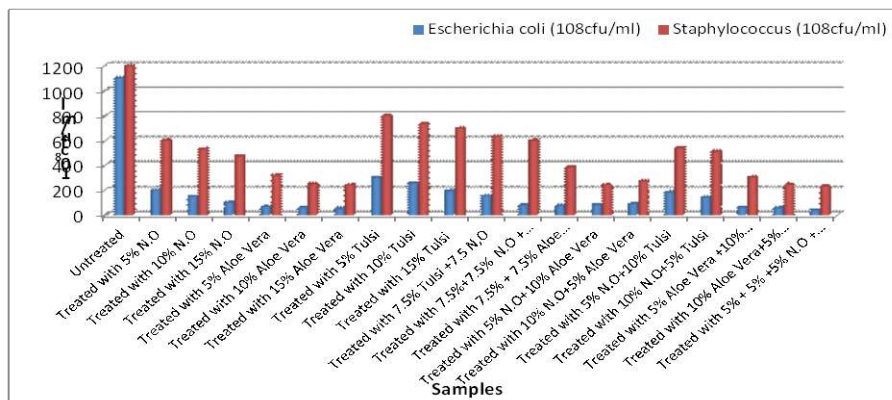
Conclusion

The anti-microbial finishes covers the full range of positive effects that antimicrobials bring to textiles industry and provides the types and properties of antimicrobial by using the antibacterial properties of Neem oil, Aloe vera and Tulsi. We conclude that in the 5% Neem oil, 5% aloe vera + 5% tulsi shows better control of bacterial activity over the fabrics

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Overview of Wireless sensor networks and its applications in Agricutlure using IoT Techniques

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Abstract- Agriculture is the back bone of India and more than 70% of people in our country depend on agriculture. The yield of agriculture should be increased rapidly to fulfill the food requirements of population throughout the world. Presently, Wireless Sensor Network (WSN) used for solving many real time problems. By combining Agriculture and technology it would be very helpful to the farmers and agriculture can be controlled by farmer. By positioning the various sensors in field, a farmer can sense as well as control the parameters like Humidity, PH value, Temperature, Deficiency, Pest/Insect control, which leads to smart agriculture.This helps to increase the productivity of agriculture. The human efforts are reduced by automatic process and it encourage the farmer to develop the field.

Keyword- Wireless Sensor Network (WSN) 1, Sensor Node 2, Internet of Things 3, Agriculture 4

1.   INTRODUCTION

The agriculture is in the transition from traditional agriculture to modern agriculture currently. Internet of things (IOT) for agriculture will play greater role for the promotion of agriculture informationize, including the construction of agriculture information network, the development of agricultural information technology and the agricultural use of information resources. The application of intelliSense, identification technology and pervasive computing, ubiquitous network integration applications of IOT will promote the development of smart agriculture and precision agriculture. The crop monitoring system has its practical significance as a large-scale application of agriculture IOT [1]. As the global climate changing, not only a wide range of research and study of the crop growth is needed, the small scale environment for the growth of crops needs to be understood. The growth pattern and environmental parameters of crop growth provides scientific guidance and countermeasures for agricultural production. An environmental parameter model of different regions of crop growth pattern of different environments can be established to improve the overall efficiency of agriculture. The platform for the crop monitoring system implements two types of nodes and accomplishes the system networking. The environmental parameter acquisition platform collects meteorological and soil information such as temperature, humidity, wind, air, rainfall, soil ph and so on [6]. The image capture platform obtains crop growth images. The growth of crops and growing conditions can be observed directly. A large number of nodes form the agricultural condition monitoring sensor network, and then access to the internet.

Wireless Sensor Networks helps the farmers to change the traditional agriculture to modern agriculture. WSN helps the farmers in different aspects. Wireless Sensor Networks use distributed sensors to gather the information and transmit the gathered information using wireless networks. In WSN micro sensors are used and global positioning system (GPS) is used in the sensors to find the exact location. It is mainly used to monitor the environmental changes as well as climatic change, temperature, humidity, soil test. Sensor networks are very small, cheap and can be used even in rural areas. Wireless Sensor Networks use three types of topologies. They are star, cluster tree, mesh and by using these topologies connection can be done. WSN use some components like battery, radio, microcontroller, analog circuit and sensor interface.

2   Literature Review

Literature review is vital to have an in depth knowledge of one's intended research area and to learn more about subject matter. Importance of carry out a literature review is to identify research area, review state of the art and

learn the area that needs further investigation or contribution. Purpose of this literature review is to know more about the study area of the topic which we are going to research and to learn from previous works done by other researchers in the area.

2.1 Use of WSN in Agriculture-

Wireless Sensor networks can be used for monitoring spatio-temporal changes in climate, hydrology, pressure, motion, soil moisture, plant eco-physiology, pests and reporting best options to the agriculturist. Having such information at regularly would be a big boon for him. In order to ward of the adverse conditions which challenge the agriculturists, automatic actuated devices can be used to control irrigation, fertigation and pest control. Irrigation management is also one of the important activities in precision agriculture. Microplitis Croceipes, a tiny parasitoid wasp, locates caterpillars attacking cotton plants by keying on a complex volatile organic cocktail emitted from the plant when attacked. Thus sensors capable of detecting this cocktail would result in early detection and mitigation of these attacks by highly selective pesticide applications or wasp introductions [5, 6, 11] In precision agriculture (PA), various parameters including soil type and temperature vary dramatically from one region to the other; consequently, any irrigation system must be flexible to adapt to such variations. Off-the-shelf irrigation controllers are usually expensive and not effective in managing scarce water resources. On the other hand, an irrigation management system (IMS) based on wireless sensor networks (WSNs) can accept any desired irrigation scheduling strategy to meet specific environmental requirements. However, WSNs are still under a developmental stage; as such, they are at times unreliable, fragile, and power hungry and can easily lose communication especially when deployed in a harsh environment like an agricultural field [6, 12, 13]. Crop field monitoring is a crucial practice in agriculture to reduce resource waste and to increase yield in activities like irrigation and fertilization, because it allows farmers to access to solid information on the environmental, soil, and plant conditions and variations of their crops and make decisions from there. Although crop field monitoring have been made traditionally with human resources, single-point agrometeorological stations, and sensor wired networks, this topic immerse in precision agriculture demand a high density and flexible deployment of instrumentations to collect data in real time. WSNs have emerged to offer low-cost, flexible, easy-deployment, and high-accuracy advantages for crop monitoring in real time [8, 13].

2.2 Overview of WSN

Wireless sensor networks (WSNs) have gained worldwide attention, especially with the proliferation in microelectromechanical systems (MEMS) technology, which enables the development of multi-functional sensor nodes with considerable characteristics like small size, low cost and limited processing and computing resources [1]. These sensors are able to sense both physical quantity and environmental conditions to process information locally, communicate wirelessly and to work cooperatively. The general structure of WSNs is presented in Figure 1. In this context and due to their characteristics, WSNs have emerged in a variety of applications like health, military, smart home, and other commercial applications, such as quality control, inventory management and supervision of non-accessible areas [2]. These applications are classified according to some priorities such as mobility, topology, coverage, heterogeneity and quality of service (QoS).
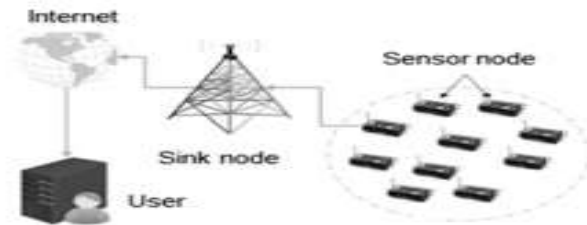
Figure 1: General structure of WSN[3]

WSNs are composed of different homogeneous or heterogeneous sensor nodes responsible for collecting and processing sensed data for a defined service. The general architecture of a sensor node is depicted in Figure 2, which presents three main parts: the sensing, processing and transmission subsystems and other complementary and optional components such as the mobilizer and position finding system. In the beginning of each process, the sensors start by collecting physical and environmental information from their surrounding. Once finished, sensed data are transmitted to the processing subsystem for further treatment and calculations. The radio module checks the availability of the medium's access to send these data to the sink or base station, where an adequate decision is made for suitable intervention.
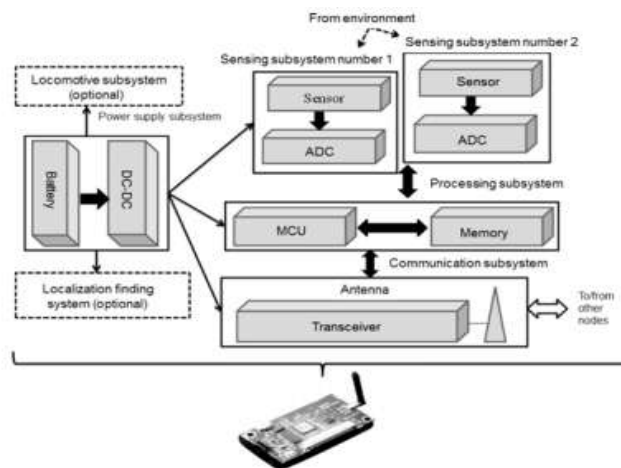
Figure 2: Architecture of Wireless sensor node [3]

Each sensor node deployed in the network is susceptible to follow the same defined process starting by sensing surrounding environment for data collection and finishing by sending this information to the sink and waiting to receive the decision. Indeed, this creates excessive demands to manage the relative available energy sources to increase the lifetime of the node and, consequently, the whole network.

2.3 Characteristic Features of WSN

A WSN can generally be described as a network of nodes that cooperatively sense and control the environment, enabling interaction between persons or computers and the surrounding environment. WSNs nowadays usually include sensor nodes, actuator nodes, gateways and clients. A large number of sensor nodes deployed randomly inside of or near the monitoring area (sensor field), form networks through selforganization. Sensor nodes monitor the collected data to transmit along to other sensor nodes by hopping. During the process of transmission, monitored data may be handled by multiple nodes to get to gateway node after multihop routing, and finally reach the

management node through the internet or satellite. It is the user who configures and manages the WSN with the management node, publish monitoring missions and collection of the monitored data [8, 14, 18].

2.4 WSN and Communication Technologies

The term wireless refers to the communication or transmission of information over a distance without requiring wires, cables or any other electrical conductors. Wireless communication is one of the important mediums of transmission of data or information to other devices. In recent days, the wireless communication technology has become an integral part of several types of communication devices as it allows users to communicate even from remote areas. The devices used for wireless communication are cordless telephones, mobiles, GPS units, ZigBee technology, wireless computer parts, and satellite television, etc. A WSN is composed of several sensor nodes that have the capacity of sensing and gathering data. The sensor nodes can sense varying types of parameters and send it to a central gateway. WSN sensor and processing boards have the capability of working with various communication technologies. WSN can be linked to external servers or services both with wires or wirelessly (see Table 1: Connectivity options). Amongst others some of connection options could be using Ethernet connection, Wi-Fi, Bluetooth, or GSM-GPRS [15, 16, 17, 18].

Table 1: Options for connection

Communication ways	Communication distance coverage
Bluetooth	0-10m
GPS-GPRS	Network carrier coverage
Zigbee	1-30m
Wi-Fi	100m

1.5 Applications of WSN

Applications of Sensors An important application of sensors in agriculture is in the direct measurement of soil chemistry through tests such as pH, moisture, nutrient content, Humidity, temperature. Soil testing results are important to obtain to get high yield with good quality. ISE (Ion Selective Electrode) and ISEFT (ion-sensitive fieldeffect transistor) sensors have also been used to monitor the uptake of ions by plants. The rate of nutrient uptake is determined by the demand of the plant, which is dependent on the growth rate and on the status of the plant's nutrient content. Ion-selective sensors have been developed to detect a variety of ions. ISE sensors have been developed to monitor nitrogen ions in the soil and crops. Hi-tech systems are in demand to help grow high-performance crops. Researchers are using sensors to match the crops to different soils and weather conditions.

Sensors in Farming The day-to-day farming activities are focused on how to grow plants, kill weeds and pests, identify and correct plant diseases, apply fertilizers, and estimate growth/yield of crops. They involve a handful of tasks which are performed in the field, that is, seeding, weeding, fertilizing, and watering, which are repetitive, mundane, and labor-intensive. Nevertheless, these very tasks are vital and precursory decisionmaking steps prior to actual farming activities and crop cycling to be effective.

1. Disease identification & Diagnosis
2. Fertilizer Calculator
3. Soil Study
4. Water Study
5. Need of Crop Needs Estimation
6. Analysis of Crop Produce Readiness
7. Identification Temperature and Humidity (for Horticulture crops)

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Traditional Appliqué Work of Western Rajasthan: A Study on Production Process

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Abstract

In India, appliqué has been a part of religious traditions for centuries. It also holds historic prominence in countries such as China, Pakistan, and Egypt. Appliqué has been found in India's western part of Rajasthan. Appliqué craft is a traditional craft of Rajasthan. Appliqué is a French term explaining the technology of appliqué patches of colorful fabric pieces on the base. Rajasthan appliqué work is similar to the patchwork is done to cover up or replace a damaged fabric. The craft is found in the surrounding villages of Chotan and Dhanu, Barmer districts. Appliqué work is a hereditary craft that is practiced by the women artisans of the Marwari community. The data was used in the survey method. The present paper describes the different types of appliqué and their manufacturing method in detail.

Keyword: Rajasthan, Religious tradition, Production Process, Barmer district, Appliqué

Introduction

India has a rich tradition of handicrafts, which constitute an essential part of its social and economic life. Each state in the country has its own unique set of handicrafts, which are different from those of the others in colour, the material used, and the technique of construction. This difference in craftsmanship can be seen in the handmade textiles as well as in the surface ornamentation of the textiles.

In India, craftsmen have been responsible for the beautification and enhancement of textiles through many mediums, one of them being embroidery. Since ancient times, embroidery has been used for different purposes and occasions and has thrived at the domestic and commercial levels.

Rajasthan formely called Rajputana, has extreme weather. It has a rich heritage of varied colourful embroideries, each community practicing in its own style. It is amazing to note that the women of remote village, unexposed to the modern civilization are expertise in preparing articles of great aesthetic value, commonly used at household level. The striking colour combination, bold geometrical designs are in contrast to the tepid and arid sands of the desert. Perhaps, this is one of the ways through which *Rajasthani* add contrast colour to their lives.

Barmer is the second largest district of Rajasthan. It is located in the western part of the state forming a part of the Desert. The district border Jaisalmer district in the north jalore district in the south, pali and jodhpur in the east and Pakistan in the west. (http://en.wikipedia.org/wiki/Barmer_district).

Despite the hard weather and difficult terrain. Barmer is known for its numerous crafts, dances, and musical performances. It is a hub of wood carving, ceramics, weaving floor covering, embroidery, blocks printed cloth, patchwork, and appliqué historically known as *ralli,* and also known as ancient camel trading route also. The name *ralli* may have come from the local word *ralanna,* which means "to mix" or "to unite." The craft is thought to have originated in the west, traveled to what is now Pakistan, and then to India as a result of large-scale migration in 1947, during India's division

Every embroidery narrates a beautiful story of its origin. Some embroidery evolved through the patronage of royalty, others developed as a source of livelihood for trades and commerce. A few of them were done only on articles used as offering to deities some only for folk and tribal groups. Due to these differences, the embroidery has been classified as court embroideries, commercial embroiders, religious embroideries, folk embroideries, and tribal embroideries. Appliqué is another form of fabric ornamentation. It is a delightful way to create decorative fabric.

1.1 Appliqué

Appliqué is one of the traditional and finest crafts of India. This craft, now commercialised, has been prevalent in many Indian states.

Appliqué is a French term which signifies the process of attaching one fabric or motifs to a foundation fabric by mean of stitches, to form a design or a pattern. The patches are stitched on to the foundation fabric to create different forms and patterns, unlike patchwork in which small pieces of cut fabric are joined at the edge to make a larger piece of cloth.

The appliqué was earlier categorised under the white cotton textile items which are crafted by the men folk of the Marwari community. Saris and blankets are traditionally known as appliqués, which are made from cotton fabric and natural dyes are used.

An NGO, Gramin Vikas Evam Chetna Sansthan (GVECS), is situated in Barmer and is working on the promotion of appliqué craft. The appliqué artisans in the surrounding villages are this NGO, which provides the raw materials, is linked to. However, at Barmer village chotan and dhanu, some are working under the middlemen while some are working independently.

Type of Appliqué

In **Gujarat,** the appliqué work is mostly done on articles for domestic use and primarily used on festive occasions, when rituals are performed or as trapping for the domestic animals. Appliqués articles are used as banners, canopies, and bags for religious purposes in festivals quilts door fringes, and some traditional dresses. Colors are vibrant and ornamental motifs of peacock, parrot, horse, elephant, etc. are appliquéd (Shrikant 2009).

In **Bihar, appliqué** is known as Khatwa, and men are skilled at pattern cutting while women are skilled at stitching. The art is often seen on religious tents and canopies, as well as garments like sarees, blouses, and sashes. Khatwa is also used to decorate household objects including quilts and cushion covers. Since clothing is a personal object, the motifs that appear on it are abstract and stylized. The use of red, black, green, and orange motifs distinguishes Bihar appliqué. These vibrant colours can be seen on appliqué textiles all over India, representing the vibrant lifestyle of everyday India and its diverse communities and cultures.

Pipli a small town in **Orissa** near the great Jagganath temple produces much-colured appliqué work. The craft involves embroidering and stitching small pieces of coloured cloth with flowers, animals, the village's scene, and traditional design onto a large base cloth. The cloth used appliqués patch work items are garden umbrella, wallet, walls hanging, lampshades, pouches, and bags.

Phool patti ka kaam is a traditional craft that originated in Aligarh, also practiced in Rampur. *Phool* means flowers and *Patti* means leaf. This textiles decoration style consists of little bits of fine mulmul fabric which are cut by hand and deftly folded and shaped into tiny pieces leave and other geometrical shapes. These are then embroidered onto the fabric to create a variety of intricate patterns. The entire embroidery is done by hand including this finish of edging and joining of the seams.

In Patna appliqué both commercial and domestic use is of two types. One called *Khatwa* has patterns cut into complete piece of cloth, which is then applied to a background cloth. The other method involves creating pattern formed with single motifs of cloth or edging strips that are then individually appliquéd.

In **Rajasthan,** the Marwari community was traditionally engaged in appliqué art. Mill made medium weight white cotton cloth forms the base on which patches of various tints, shades, sizes and shape are arranged in a pictorial pattern later trimmed, slip stitched and finishing with running stitch and buttonhole stitches. (Naik, 1996)

The main objectives of the study are:

- To collect information on appliqué works in terms of origin and raw materials.

Materials and procedures

A preliminary study was conducted in Barmer prior to data collection. The data was gathered using a survey method. Interview schedules, as a tool along with an observation method, were used as tools. The Gramin Vikas Evam Chetna Sansthan (NGO) in Barmer provided an information appliqué craft. Twenty five appliqué units were visited and the researcher observed nearest village Chotan and Dhanu.

Figure 3.1 Interview Schedule

3. Results and Discussion

Results collected from the survey method are summarized below:

Raw Materials

The raw material used for appliqué consisted of base fabric, fabric for appliqué, needle embroidery, threads, and accessories like mirrors. It was found that men sourced the raw materials from different places like barmers, Chotan, and Dhanus.

Base fabric: Initially, cotton and organic fabric were used as base fabrics. Presently, printed medium cotton fabrics were found to be more popular. Printed cotton fabric was used by individual artisans which coasted around Rs.100-150/per meter, while NGOs used plain cotton fabric, which cost around Rs.70-80/per meter. It was observed that the fabric used by NGO officials was of slightly inferior quality.

Fabric for appliqué: Cotton fabric was being used as fabric for appliqué fabric. It could be either plain or printed. Plain cotton fabric cost around Rs.60/-per meter and printed fabric cost around Rs.100/-for both the groups of artisans.

Printed hand-block printed fabrics were also used. Independent artisans used plain fabric for appliqué, which cost around Rs. 60/-per meter, while NGO's used both printed fabric, which cost around Rs. 100/-per meter, and plain fabric, which cost around Rs. 60/-per meter. Traditionally, silk embroidery threads were used for embroidery, which were referred to as "resham". It was found that reshams thread, being expensive in nature, was replaced by anchor embroidery threads in cotton.

Embroidery needle: Fine hand needles, usually with sizes ranging from number 8 to 10, were commonly used traditionally and are being used presently also.

Techniques

According to the artisans' information, the techniques for doing appliqué work were as follows:

Making of *Khakha*: The design is drawn on a butter paper by using ink pen or pencil. After the design is made on the butter paper, holes are pinned/ punched on the design lines manually. This process is called pining.

Tracing/ chapaayi: The punched butter paper is carefully placed on the fabric. A mixture of chalk powder and kerosene oil is prepared. Cotton soaked solution is rubbed on the butter paper and this process is also known as *chapaayi.*

Figure3.2 Fabric Traced Chalk Powder

Figure 3.3 Cut Fabrics (Hammer and Chisel)

Once the designs are transferred on the fabric the designs pieces were cut with a hammer and chisel (chenna and hathodi).

Pasting: The cut fabric pieces were placed on the base fabric according to the designs and pasted with gaur gum paste.

Figure 3.4 Guar Gum

Gaur was a type of vegetable grown in Barmer. Dried guar was turned into powder and could be stored for years. When pasting was required, powder was mixed with water and pasted onto the fabric. The preceding steps were completed by men.

After pasting the fabric was given to women for embroidery. Women fixed theses pated pieces of fabric onto the base fabric with button holes stitch or hemming.

Figure 3.5 Women Stitched Motif

Figure 3.6 Final Product

Finishing: The last stage involves final checking and finishing. The product is checked and corrected if required. The gums are removed using solvent.

After Finishing: The product was stitched by treadle sewing machine by men. Finally the product was ironed followed by visual inspection of the finished article.

Conclusion

During the field survey, it was observed that artisans still follow the traditional practises for appliqué craft. All the processes of appliqué are done manually by artisans. But in the past few decades, various changes in raw materials have been found. Earlier, appliqué was mainly categorised under cotton textile items, but now cotton fabric has been introduced, along with blended fabrics. In the past, no changes were found in the manufacturing process. However, in dyeing, various types of dyes are used instead of acid and direct dyes, which were used earlier. In modern times, machines have replaced crafts. Traditional tools and motifs are majorly used by women artisans.

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ABSTRACTS
OF
POSTER PRESENTATION

Smart Traffic Control System Using PLC

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*Abstract***:** Scope of this paper is to present the initial steps in the implementation of a traffic light control system using "PLC & SCADA". It used logic ladder for monitoring the system and helps in improving public transport services that also improve traffic guidance. The system developed by setting the appropriate duration for the traffic signals to react accordingly. In the rapid flourishing country like India, accidents occurred in the unmannered level crossings are increasingly day by day. When the wheels of the vehicle move over the lane and the sensor send the signal to the PLC. RED signal appears when there is no traffic on the lane and becomes GREEN signal according to density of the lane. Basic PLC functions such as timing, sequencing, controlling and relayıng were implemented. The basic programming logic and ladder programming was studied and implemented. In practical situation sensor are used to detect presence of vehicles in a lane and calculate the density and sends an interrupt signal to the control unit. In PLC the status of the sensors are checked and certain logical operations are performed to decide which lane is to be serviced first on the basis of priority. Under low density condition it would operate sequentially. Ladder diagram was developed for the implementation of the same in PLC which checks the priorities then provide output signal to the traffic light poles for ON or OFF the red, yellow or green lights & ON time is dependent on the specific priorities.

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Ethical Behaviour Supports in Organizational Outcome

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Abstract

The review analyzes the connection between authoritative moral way of behaving and hierarchical result. There is a developing acknowledgment all around the world that moral way of behaving is essentially significant for any business Organization and for the advancement of any general public. The investigation of examination proposes that hierarchical pioneers can involve authoritative moral way of behaving as a way to create positive hierarchical results. The idea of morals comes from the Greek word" Ethos" that implies both a singular's personality and a local area's way of life. Morals are standards and values singular purposes to oversee his exercises and choices. In an association, an overarching set of rules is a bunch of rules that guide the association in its projects, approaches and choices for the business. The moral way of thinking an association uses to lead business can influence the standing, efficiency and primary concern of the business. Morals in business matters since there is a lot of proof to demonstrate that exploitative way of behaving can cost the organization its standing, influence its portion cost, bring down its portion cost and lower its benefits. A portion of the embarrassments in business world have had their starting point in meager respect to profound quality. Morals have turned into a piece of business since it has been understood that morals and benefits go together. Over the long haul great morals is great business.
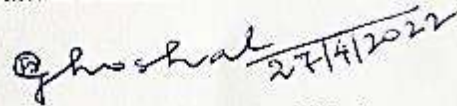
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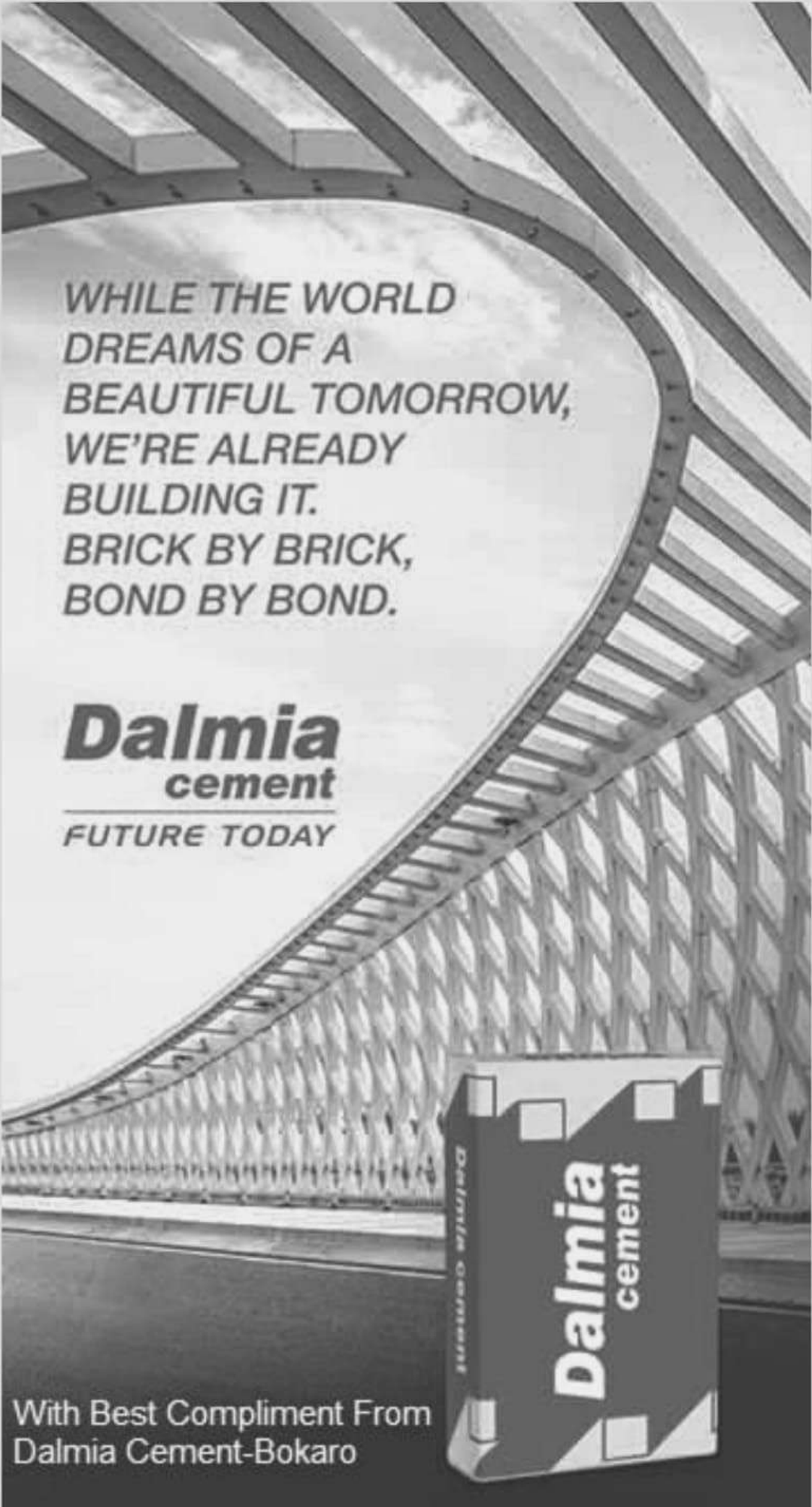
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