



CHHATRAPATI SHIVAJI MAHARAJ INSTITUTE OF TECHNOLOGY, PANVEL, NAVI MUMBAI

ORGANISED

NATIONAL CONFERENCE

ON

EMERGING ROLE OF SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT OF INDIA

29 JULY 2023

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mechanical.csmi2020@gmail.com

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PAPER PRESENTATION- 500/-

LAST DATE TO SUBMIT

FULL LENGTH PAPER-

20TH JULY 2023

National Conference
on
Emerging Role of Science and Technology in the
Development of India

29th July, 2023



L a m b e r t P u b l i c a t i o n ' s

First Impression 2023

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**Proceeding of National Conference on Emerging Role of Science and Technology in the
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29th July 2023

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Organised by



**Chhatrapati Shivaji Maharaj Institute of Technology,
Panvel, Navi Mumbai**

MESSAGE BY HONOURABLE SECRETARY

It gives me immense pleasure to write a message for the National Conference on *Emerging role of Science and Technology in the Development of India* being held by Chhatrapati Shivaji Maharaj Institute of Technology on 29th July, 2023. I hope the conference will witness enthusiastic participation of academicians across Nation resulting in productive outcomes in the field of Science and Technology.

It is a matter of great satisfaction that the Institute is doing good services by training young students. I applaud the efforts of stakeholders in taking the institute towards academic excellence.

Best wishes for successful organization of the event as well as the Souvenir planned on the occasion.



DR. KESHAV BADAYA

Honourable Secretary

St. Wilfred Education Society

MESSAGE BY PRINCIPAL, CSMIT



DR. DHARMENDRA KR DUBEY

Principal, CSMIT

CHAIR PERSON, NCERST 2023

I am pleased to inform that academicians, scientists, senior scholars, teachers, and students across country have come forward enthusiastically to participate in National Conference on *Emerging role of Science and Technology in the Development of India* going to be organized on 29th July, 2023. The conference will serve as a multi-disciplinary platform to discuss the advances, science and engineering and trends in the various field of science and engineering.

I am sure that the combined efforts of the whole organizing team of the conference will surely bring this conference a great success.

We are also happy to share that we have received abstracts from so many Scientists/ Research scholars/ Faculties working in the allied areas from various states as on today. I would like to express my appreciation to the coordinators, for their effort, in organizing the conference which is of National relevance. I hope this conference NCERST- 2023 will be enjoyable, memorable, and productive for the participants and looking forward to further technological events those results from your networking and discussions. I wish The Event All Success.

MESSAGE BY CONVENER OF CONFERENCE NCERST 2023

We are delighted to extend our warmest invitation to you for the National Conference on *Emerging role of Science and Technology in the Development of India* going to be organized on 29th July, 2023. It fills us with immense pleasure to witness the overwhelming response from academicians, scientists, senior scholars, teachers, and students from across the country, all eagerly coming forward to participate. Your presence and active involvement will undoubtedly enrich the conference, fostering insightful discussions, collaborations, and the exchange of innovative ideas. Let us unite in this collective endeavour to shape a new era of advancement through emerging technologies. Together, we can inspire and drive meaningful change.



ER. MANOJ DONGARE
HOD, DEPT. OF MECHANICAL ENGINEERING
CONVENER, NCERST 2023

MESSAGE BY CO-CONVENER OF CONFERENCE NCERST 2023

We are thrilled to extend a warm invitation to all academicians, scientists, senior scholars, teachers, and students from across the country to be a part of the National Conference on *Emerging role of Science and Technology in the Development of India* going to be organized on 29th July, 2023.

Your enthusiastic response has filled us with immense joy and hope for a vibrant exchange of ideas and knowledge. Together, we shall embark on a journey to explore the frontiers of innovation and usher in a new era of progress.

Your participation will undoubtedly enrich the conference, and we are confident that your insights and contributions will pave the way for transformative advancements in various fields. Let us unite in this pursuit of knowledge and inspiration, and collectively, we shall



ER. NEETA GAWADE
DEPT. OF MECHANICAL ENGINEERING
CO- CONVENER, NCERST 2023

NATIONAL CONFERENCE

on

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Inauguration session





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Conference- Papper Presentations

The screenshot shows a Google Meet window with a presentation slide. The slide is titled "CHHATRAPATI SHIVAJI MAHARAJ INSTITUTE OF TECHNOLOGY, PANVEL, NAVI MUMBAI" and is for a "NATIONAL CONFERENCE ON EMERGING ROLE OF SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT OF INDIA" held on "29 JULY 2023". The slide lists several roles and names: Patron (Dr. Keshav Badaya), Honorable Secretary (St. Wilfred Education Society), Conference Chair Person (Dr. Dharmendra Dubey), Convener (Er. Manoj Dongare), Co-Convener (Er. Neeta Gawade), and an Advisory Committee with members from various institutions like St. Wilfred's College of Law, St. Wilfred's College of Arts, Commerce & Science, St. Wilfred's Institute of Pharmacy, and St. Wilfred's Institute of Architecture.

On the right side of the Meet window, there is a "People" panel showing a grid of participants: Advocate Kamila, Harish Chandra Maurya, Bharat Parihar, Shreyas Comit, Manoj Dongare, Vaishali Parave, and 10 others. Below the grid, a list of contributors is visible, including Mechanical CSMIT (You) as the meeting host and other participants.

At the bottom of the Meet window, a system tray shows the time as 10:55 AM and the date as 29-07-2023. A notification bubble says "Your screen is still visible to others. Click to resume or cancel your presentation."

The screenshot shows a Google Meet window with a presentation slide. The slide is titled "National conference On Emerging Role of Science And Technology In the Development of India" and is for a "SEMINAR ON 'REVIEW ON DISASTER MANAGEMENT IN CONSTRUCTION'". The slide lists two authors: Author name 1: Vibhuti Dilip Dongare, Student of Department of Civil Engineering, CSMU; and Author name 2: Dr. R. P. Singh kushwah, HOD & Professor of Department of Civil Engineering, CSMU.

On the right side of the Meet window, there is a "People" panel showing a grid of participants: Vinay Anand, Harish Chandra Maurya, Bharat Parihar, Devendra Kumar Dubey, YuktI Varshney, Dr. Mohd. Asif Gandhi, and 10 others. Below the grid, a notification bubble says "Someone wants to join this call" with the name "Vidhi Singh" and options to "Admit" or "View".

At the bottom of the Meet window, a system tray shows the time as 11:00 AM and the date as 29-07-2023. A notification bubble says "Your screen is still visible to others. Click to resume or cancel your presentation."

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vibhuti (Presenting)

SCOPE OF PRESENTATION

1. Introduction
2. Objective & Scope of the Work
3. Literature Review
4. Disasters those can be arise and their impact
5. Methodology
6. Results and Discussion, Recommendation.
7. Conclusion
8. References

11:00 AM | NATIONAL CONFERENCE -Emerging role of Scienc...

25°C Cloudy Search ENG IN 11:00 29-07-2023

Participants: Vinay Anand, Manoj Dongare, Harish Chandra Masrya, Bharat Parthar, Devendra Kumar Dubey, Yukti Varshney, Dr. Mohd. Asif Gandhi, 10 others, Mechanical CSMIT

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vibhuti (Presenting)

INTRODUCTION

- A disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.
- Hazards can be classified into three classes according to their nature:
 - i. Technological hazards are those accidental failures of design or management affecting large-scale structures and transport systems, or industrial activities that present life threatening risks to the local community.
 - ii. Natural hazards result from those elements of the physical environment harmful to Man and caused by forces unnecessary to him.
 - iii. Human-induced natural hazards are those that are caused by the human modification of the environment.

11:01 AM | NATIONAL CONFERENCE -Emerging role of Scienc...

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vibhuti (Presenting)

OBJECTIVE

- Development period of Construction site are occur to various disaster at construction site there for adverse effect arise on the human life and environment.
- There for we develop new technique at construction site such way that we can minimize the adverse effect of construction disaster at construction site.
- **Scope of the Work**
 - The report aim to investigate the practices and situation that has caused the disaster of the structure of construction project system including Depot, Stations, Rolling Stocks and also future constructions.
 - The report from the investigations and findings aims further to improve in the construction techniques and practices this will certainly give better understanding of the disaster management techniques related to the structure.

Swapnil Bhoir has left the meeting

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Participants: Vinay Anand, Manoj Dongare, Harish Chandra Masrya, Bharat Parthar, Devendra Kumar Dubey, Yukti Varshney, Dr. Mohd. Asif Gandhi, 10 others, Mechanical CSMIT

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vibhuti (Presenting)

LITERATURE REVIEW

- Vinita, et al. (2016), International Journal of Humanities and Social Sciences, ISSN 2250-3226 Volume 6, Disaster Management in India, Disaster is Disastrous situation in which the life or system has been disrupted and emergency interventions are essential to save and preserve lives and or the situation. Disaster Management Act contain man-made and natural disaster. Disaster affect human life, damages of properties and also effect on environment.
- Asanka, W.A., et al. (2016), 6th international conference on structural engineering and construction management, kandy, shri lanka, Study on the Impact of Accidents on Construction Projects, As the every construction site is carried out in hazardous atmospheres, it involvements accidents in different levels of severity, some producing negligible and major damages with even some resulting in fatality. Accident are happening unplanned cost and unexpected events, therefor further research on this subject is very important. Disaster may change organization goal and it could even make the company uncompetitive in the industry. The objectives of this research paper are identify cause and effect of accident, relationship between time, cost, scope etc., identify the human error cause the accident at construction site.

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vibhuti (Presenting)

DISASTER AND THEIR IMPACT



Elevated sections of the tracks under construction came crashing down in Delhi Metro



Crane topples at Delhi Metro site

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29 JULY 2023

Paper Title: Performance of Induction Motor and BLDC Motor and Design of Induction Motor driven Solar Electric Vehicle(IM-SEV)
Paper Id: NC002

By
Vinay Anand, Himanshu Sharma,
Bhagwan Shree Ram, Dharmendra Dubey

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Vinay Anand (Presenting)

INTRODUCTION

- ▶ Electric Transportation is in higher demand in India not only because of comfort and safety but to make environment clean.
- ▶ IC engine-based vehicle which uses Petrol and diesel, which generated more pollution and harmed the environment very badly.
- ▶ And so researchers attraction towards the efficient and electrified, economic, pollution-free zero-emission vehicle design and trying to remove the limitations to adopt it.
- ▶ The pieces of literature elaborated better ways about electric vehicles and technical integration of solar to improve efficiency as well as maximize to reduce limitations.
- ▶ This investigation-based study shall help to understand the opportunity of solar-powered electric vehicles.

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Vinay Anand (Presenting)

Solar panel

- Mono Perc crystalline silicon high efficient solar panel for a photovoltaic powered electric vehicle is widely taken into the application. It is observed that the photovoltaic vehicle performance efficiency on the urban road received approximately 9% whereas the panel efficiency was 13% in full sunlight month. The capacity of approximately 220Wp a 1kW/m² 25° C is widely to charge a 12 V battery 120 Ah used in the low capacity of solar-powered electric vehicle (S-EV).

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Vinay Anand (Presenting)

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Vinay Anand (Presenting)

Conclusion

- The above study concludes that India has a huge quantity of non-renewable as well as renewable sources of energy whereas solar, wind, biogas, etc type of renewable sources of energy can preserve our nature and in which the scholar studied various research articles and observes that the photovoltaic can be incorporate to charging the battery in-housed the electric vehicle to overcome the grid overload and surplus generated power can apply for domestic purpose. And so that the article expressed that the solar-powered electric vehicle (S-EV) is a part of transportation option to take place the IC engine based conventional vehicle and zero-emission saves the natural air quality.

Mechanical CSMIT

Dr. Mohd. Asif Gandhi

Harish Chandra Maurya

Bharat Parihar

12 others

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Vinay Anand (Presenting)

Any Question please



Mechanical CSMIT

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Harish Chandra Maurya

Bharat Parihar

12 others

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Dhwani Mishra (Presenting)



Mechanical CSMIT

Dr. Mohd. Asif Gandhi

Bharat Parihar

Harish Chandra Maurya

11 others

People

Mute all | Add people

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IN MEETING

Contributors 16

- Mechanical CSMIT (You) Meeting host
- Bharat Parihar
- Dhwani Mishra
- Dr. Mohd. Asif Gandhi
- Harish Chandra Maurya
- kalidas bhawale
- Manoj Dongare
- Mechanical CSMIT

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Dhwani Mishra (Presenting)

Read Only - This is an older file format. Cha...

Introduction

Meaning of Transformational Leadership

Transformational leadership is defined as a leadership approach that causes change in individuals and social systems. In the long term, it causes cultural and social change in the followers with the end goal of developing better and able leaders.

LEADERSHIP STYLES

Leadership style based on Authority retained

- Authoritarian leaders
- Transformational leadership (transformational)
- Charismatic Leader (Task Leadership)
- Democratic leadership style

Leadership style based on Task versus People emphasis

- High Task Low Relationship
- High Task High Relationship
- High Relationship Low Task
- High Relationship High Task

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Dhwani Mishra (Presenting)

Transformational Leadership and Job Performance relation

- Positive Impact on Job Performance: Numerous studies have shown a positive correlation between transformational leadership and job performance.
- Employee Commitment and Engagement: Transformational leaders promote a supportive and empowering work environment, which enhances employee commitment and engagement. Increased Job Satisfaction: Transformational leadership is associated with higher levels of job satisfaction among employees. Satisfied employees tend to be more committed to their roles and demonstrate higher levels of job performance.
- Fostering Innovation and Creativity: Transformational leaders encourage innovation and creativity by challenging the status quo and promoting a culture of continuous improvement.
- Long-term Impact: Research suggests that the positive impact of transformational leadership on job performance extends over the long term. Employees who experience transformational leadership are more likely to exhibit sustained high performance and show resilience during challenging times.

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Dhwani Mishra (Presenting)

conclusion

- Transformational leaders play a critical role in inspiring and empowering their followers, fostering a deep emotional connection with their work, and enhancing overall organizational outcomes.
- Strong and consistent positive correlation between transformational leadership and employee engagement.
- Transformational leaders motivate employees to align their individual goals with the organization's mission.
- There is direct impact of transformational leadership on job performance.
- Transformational leaders create a supportive and empowering work environment that encourages employees to excel in their roles.
- The mediating role of employee engagement in the relationship between transformational leadership and job performance is a critical finding of this review.

Pratiksha Nargolkar has left the meeting

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Dhwani Mishra (Presenting)

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conclusion

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Mechanical CSMIT

Pratiksha Nargolkar

Harish Chandra Maurya

Neeta Chavan

12 others

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Yukti Varshney (Presenting)

A Study of Efficient algorithm for weather forecasting using AI approaches

By

Yukti Varshney, Sateesh Kumar Pathak, Sateesh Kumar Bhatnagar

Research Scholar, CSEET, Swami Vivekananda University, Meerut, U.P.

Assistant Professor, CSEET, Swami Vivekananda University, Meerut, U.P.

Professor, SCSEI, Swami Vivekananda University, Meerut, U.P.

Mechanical CSMIT

Pratiksha Nargolkar

Manoj Dongare

Neeta Chavan

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Yukti Varshney (Presenting)

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Yukti Varshney, Sateesh Kumar Pathak, Sateesh Kumar Bhatnagar

Research Scholar, CSEET, Swami Vivekananda University, Meerut, U.P.

Assistant Professor, CSEET, Swami Vivekananda University, Meerut, U.P.

Professor, SCSEI, Swami Vivekananda University, Meerut, U.P.

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Yukti Varshney (Presenting)

INTRODUCTION

- Weather forecasting is the process of predicting the future weather conditions based on current and historical data.
- It is an important aspect of our daily lives, as it helps us make decisions about our activities and plans for the future.
- There are several methods for weather forecasting, each with its own strengths and weaknesses.
- Some of the most common methods include:
- **Traditional weather forecasting:** This method uses historical data and human expertise to make predictions.
- **Numerical weather prediction (NWP):** This method uses mathematical models to simulate the atmosphere and predict future weather conditions.
- **Artificial intelligence (AI) and machine learning:** These methods use complex algorithms to analyze large amounts of data and identify patterns that can be used to make more accurate predictions.

There are many other methods and techniques used in weather forecasting, and the field is constantly evolving as new technologies and data sources are discovered.

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Yukti Varshney (Presenting)

Approaches for using AI in weather forecasting

Figure 1

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Yukti Varshney (Presenting)

Approaches for using AI in weather forecasting

Figure 1

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Statistical data for efficient algorithm for weather forecasting using AI approaches

Here is an exploration of statistical data for the efficiency of algorithms used in weather forecasting. AI approaches, as performance can vary depending on the dataset used. The specific algorithm used for this study is called Random Forest. It is a supervised learning model that uses an ensemble of decision trees to make predictions. The model has been trained on a dataset of historical weather data and has achieved a high accuracy of 85% in predicting weather conditions.

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Impacts of Machine Learning Algorithm in Weather Forecasting:

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Result and conclusion

The results of weather forecasting using AI-based approaches are very promising. The specific algorithm used for this study is called Random Forest. It is a supervised learning model that uses an ensemble of decision trees to make predictions. The model has been trained on a dataset of historical weather data and has achieved a high accuracy of 85% in predicting weather conditions.

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Devendra Kumar Dubey (Presenting)

Study the phenomena of Superconductivity and its Applications

Devendra Kumar Dubey
Dharmendra Kumar Dubey

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Devendra Kumar Dubey (Presenting)

Introduction

Superconductivity is a fascinating phenomenon that has intrigued scientists since its discovery in 1911. At its core, superconductivity is the ability of certain materials to conduct electricity with zero resistance. This property has the potential to revolutionize technology and change the way we think about energy consumption.

This project investigates, using experiments, properties and behaviors of superconducting materials using resistivity, magnetic susceptibility, and critical field measurements to explore various states and critical temperatures.

This project also explores practical applications of superconductivity in energy transmission, MRI, particle accelerators, and quantum computing by designing simple devices.



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Properties and Behavior 1

- Zero Electrical Resistance
- Critical Temperature(T_c)
- Melssner Effect

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Properties and Behavior 2

- Critical Magnetic Field (H_c)
- Type I and Type II Superconductors
- London Penetration Depth

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Application of Superconductivity

- Magnetic Levitation(Maglev) Trains
- Magnetic Resonance Imaging (MRI)
- Superconducting Power Transmission



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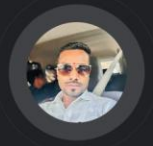
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Dr. Mohd. Asif Gandhi Thank you for managing things well

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International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)



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Bhagwant University, Ajmer, Rajasthan, India

Review on Disaster Management In Construction

Vibhuti Dilip Dongare¹ and Dr. R. P. Singh Kushwah²

Student, M. Tech, Department of Civil Engineering¹

Professor and Head of Department, Department of Civil Engineering²

Chhatrapati Shivaji Maharaj University, Panvel Navi Mumbai, India

Abstract: This paper momentarily talks about the management of disasters at the construction site, the effect or impact of disasters on human life and the environment, reduction in the risk factor of disaster. The development period of construction is inclined to various debacles that can emerge normally or through human mediation. New techniques developed for fast construction but for this so many types of disasters occur at the site of construction. Construction safety the board and mentality and the conduct of works intently influence the well-being of development projects. Developing countries are less able to deal with the causes and effects of disasters. It is vital to further develop the development businesses of the lesser countries to prepare them to oversee disasters. The case study is used to discuss the impact of natural and non-natural disasters on construction operations in this study. The report plan to research the practices and circumstance that has caused the disaster of the design of the development framework including Stop, Stations, Moving Stocks, and furthermore future developments. The investigations and findings aim further to improve the construction techniques and practices this will certainly give a better understanding of the disaster management techniques related to the structure.

Keywords: Disaster management, debacles, construction operation, human mediation, Natural Disaster, Manmade Disaster, Disaster risk reduction

I. INTRODUCTION

Disasters cause a significant amount of harm around the world every year. A disaster is an extreme interruption of the working of a local area or mankind including far-reaching human, material, monetary, or ecological misfortunes and impacts, which beats the capacity of the impacted local area or society to adapt by utilizing its own assets. Human-instigated disasters are the consequence of technological hazards. Examples contain rushes, fires, transportation mishaps, industrial mishaps, oil falls and atomic eruptions/radiation, and so on. The Construction engineering and constructed environment disciplines have a durable association with disaster management. "Disaster management" can be defined as the range of actions designed to keep control over disaster and alternative situations and to provide a framework for helping those who are at hazard to avoid or improve from the effect of the disaster.

Disasters can be categorized into the following classes according to their nature:

- i. Technical disasters are those unplanned failures of design or organization disturbing large-scale structures, or industrial actions that present life-threatening risks to the local community.
- ii. Natural disaster result from those components of the physical environment opposing effect to Man and brought on by powers incidental to him.
- iii. Human-induced natural disasters are those that are produced by the human alteration of the environment.

II. OVERVIEW

In a developing country, so much construction occur using new techniques there for various type of disaster occurs and the construction business is done in a risky situation. Specialists have taken care of safety measures, which have upgraded the implementation in development destinations. Be that as it may, mishaps are as yet incident and there is a requirement for further research on this critical subject. Higher risk of Construction sites than regular commercial properties during disaster times for a number of reasons. To start with, the standard estimates that would shield a structure from a debacle, for example, seismic tremor-resistant designs or inner fire decrease frameworks, are not yet set up. This means the harm could be far more extensive to a building under construction than to the same building after the construction is complete.

The most widely recognized perils in the development ventures are:

- i. Lifting and pushing - e.g. taking care of substantial or ungainly estimated objects.
- ii. Slips, trips, falls - e.g. slipping on a wet surface or tumbling from a ladder.
- iii. By hand apparatuses, for example, control devices, saws, scoops, and crowbars.
- iv. Sound from hardware, for example, vibrators, solid cutters, penetrates and saws, etc.
- v. Environment contaminants, for example, tidy, manufactured mineral filaments and asbestos.
- vi. Slipping and tripping incidents

The shot that these perils will bring about harm for youthful laborers is higher when they are joined with risk components, for example,

- i. Deficiency of supervision
- ii. Deficiency in preparing
- iii. Being unknowing about their rights
- iv. Trying to awe the manager, supervisor, or collaborators.
- V. Temporary business.

Some natural disasters occur during construction, for example,

- i. Earthquake
- ii. Flood
- iii. Storm / Hurricanes etc.

III. ACCIDENTS AND ITS CAUSES

An accident can be defined as an unexpected, unwanted, and uncontrolled event. An accident does not be guaranteed to bring about a physical issue. At construction site accident cause due to natural and man-made disaster. It can be in term of loss of life, harm to equipment and materials and especially those that result in damages receive the greatest attention. All accidents, regardless of the nature of the injury or harm, should be of concern. Mishap don't simply occur, they are caused. Around 99 %, of most mishap, happen because of risky demonstrations and perilous circumstances, or even both. All mishaps can be forestalled by a specific activity. This dangerous condition is additionally a risky state of being or environmental elements which could straightforwardly allow the event of a mishap. Mishap speculations and models have developed from just accusing specialists, conditions, and hardware into association jobs and obligations.

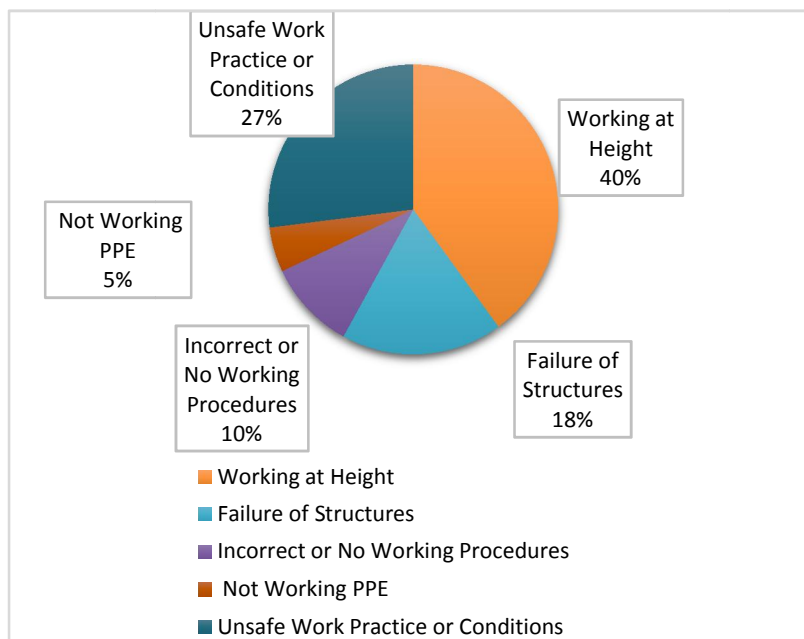


Fig.1: Construction Accidents

IV. DISASTER AND THEIR IMPACT

Recent Examples Some of the Disasters and their Impact on Constructed Items.

There are so many current cases of disaster at construction sites that had major physical outcomes. In July 2009, a lifted area of the track under construction site came smashing down there for most exceedingly bad disaster, five individuals died and 15 were injured. The solid portion that was damaged down was a piece of a lifted segment. This occurs at a construction site at Zamrudpur close to Kailash Colony in south Delhi at around 5 a.m.



Fig.2 Elevated section of the tracks under construction came crashing down in Delhi Metro

On **July 2011**, at a construction site in Mumbai (Chembur) a beam collapsed situation two people died, and three people were injured. Is case was under the RCF police. The police had taken an investigation and they concluded that this was because of negligence. In that situation, MMRDA members does not conclude the exact reason but they said that it happened due to not taking proper safety measures.



Fig. 3 Concrete beam collapses at monorail site in Mysore Colony, Chembur (Source: Express News Service: Mumbai, Sat Jul 02 2011)

Typhoons, cyclones, floods, flames, and in any event, lightning storms all share something practically speaking. At the point when they hit some unacceptable area, they can cause expensive harm and put lives in danger. In 2017 alone, typhoons accomplished more than \$265 billion in harm in the U.S. Also, boundless fierce blazes took an extra \$18 billion cost. Structures that are under development are at a high gamble in these examples. For development experts, it is basic to grasp this gamble.



Fig. 4 Typhoons in the U.S. in 2017

V. LITERATURE SURVEY

Vinita, et al. (2016) *International Journal of Humanities and Social Sciences*, ISSN 2250-3226 Volume 6, Pg No 2-7. **Disaster Management in India**, Disaster is a Disastrous situation in which the life or system has been disrupted and emergency interventions are essential to save and preserve lives and or the situation. Disaster Management Act contains man-made and natural disasters. Disasters affect human life, damage properties, and also effect on the environment.

Deshmukh Azhar A et al. (2016) *Int. Journal of Engineering Research and Applications*, ISSN: 2248 – 9622, Vol. 6, Issue 5, (Part – 7) May 2016, pp.09–14, **Disaster management for cooling tower – case study**, Disasters are a lot of old as human history however the sensational increment and the harm brought about by them in the new past was becomes the reason for public and global concern. The cooling tower is a main part of the cooling water complete process. Cooling towers create disasters either man-made or natural. Cooling towers are gadgets that utilized cool modern cycles and applications to guarantee that the right temperature of the climate and the process are kept up with during assembling or huge modern cycles.

Asanka, W.A., et al. (2016), 6th international conference on structural engineering and construction management, kandy, shri lanka, Pg No 59-64, **Study on the Impact of Accidents on Construction Projects**, As every construction site is carried out in hazardous atmospheres, it involvements accidents in different levels of severity, some producing negligible and major damages with even some resulting in a fatality. Accidents are happening at unplanned costs and unexpected events, therefor further research on this subject is very important. Disaster may change an organization's goal and it could even make the company uncompetitive in the industry. The objectives of this research paper are to identify the cause and effect of the accident, the relationship between time, cost, scope, etc., and identify the human error caused the accident at the construction site.

Stringfellow P (2014), *Australasian Journal of Construction Economics and Building*, 14 (2) 120-132, Pg No 121-123 **Construction contractor's involvement in disaster management planning**, Disaster both man-made and natural, effect on human life and damages at a construction site, therefor government looking forward to management of disaster and also reduce the effect on human life and damages. For this, governments everywhere in the world are considering building resilience to confirm communities can improve fast and have nominal effects from a disaster. Building resilience is part of Disaster management and recovery. In this literature reveals construction contractors play a very important role to manage Disasters at the construction site. On the base of responses, the investigator has proposed a model to involve construction contractors within state government disaster management planning.

Summary of Review: Different undesirable conditions can happen during the execution of a development project so that human life and the environment was suffering from the adverse effect of disaster. There for disaster management is very important to reduce the adverse effect of disaster.

VI. METHODOLOGY TO DEAL WITH CONSTRUCTION DISASTERS

Methods to handle with: Following steps used for disaster management:

1. Prepare a report on the structure collapse of a construction project by disaster by a site visit.
2. Arrangement of the investigation report on the above concentrate by recognizing the variables causing the harm and breakdown of the construction considered.
3. Disaster management which includes the following steps:
 - i. Planning of Mitigation.
 - ii. Training about Preparedness for disaster.
 - iii. Give Education related to the cause of disaster and disaster management.
 - iv. Develop advanced technic at a construction site for lifting heavy structures.
 - v. Make Disaster Management Act contain man-made and natural disasters.

VII. RISK REDUCTION IN DISASTERS

Maintenance and review

Incidents might occur in light of the fact that lifting equipment isn't analyzed and taken care of regularly. All equipment should be totally investigated before it is placed into the organization and after there has been any genuine change that could impact its activity. Lifting stuff may ought to be out and out assessed at breaks put down in an assessment plot drawn up by a capable individual, taking into account the producer's ideas.

Hurricane Preparedness for Construction Sites

In the event that you live close to a building site, your gamble becomes higher. Huge hardware that sits in the way of a tropical storm or the provisions for the structure task can transform into shots, making serious harm to the encompassing homes and properties. On the off chance that the development group doesn't go to the right lengths to secure gear and supplies, your home can be in danger.

Reports and deserts

Records should be kept of each and every cautious assessment and survey and of the EC Statements of Congruity for all lifting gear and lifting decorations. Any distortions seen should be immediately paid with all due respect to the director for change. If any flaw impacts the safeguarded activity of the machine, it should be altered before the machine is used.

VIII. RESULTS AND DISSCUSSION:

To decide the occupation of structures, approaches, and strategies that in hindering disasters to ensure that perils stay low as really practicable. How disasters and their consequences for the development period of the development undertaking can be tended to, including their counteraction and recreation after their event. To ensure everything possible assistance is given to the fire organizations, police, clinical, and other paramedical staff in showing up at the affected district and doing their components of salvage and alleviation. Ensure that all specialists who are reliable to deal with the emergency situation are totally familiar with their commitments and commitments early.

Disaster preparedness plans:

- Recognize organizational resources
- Assign roles and responsibilities
- Make methodology and strategies
- Coordinate exercises that further develop calamity availability

IX. CONCLUSION

After a detailed study of the papers the conclusion has been drawn, adverse effects of disasters in the recent past year, there for disaster risk reduction has become a very demanding area. Disaster planning and post-disaster recovery stages are both involved in Disaster risk reduction of the Disaster management cycle in relation to disaster risk reduction. Develop advanced technic for lifting of structures at construction sites and make disaster management act so that we can reduce the disaster and reduce adverse effects of disasters at a construction site.

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Performance of Induction Motor and BLDC Motor and Design of Induction Motor driven Solar Electric Vehicle (IM-SEV)

Vinay Anand¹, Dr. Himanshu Sharma², Dr. Bhagwan Shree Ram³, Dr. Dharmendra Kr Dubey⁴

SEEE, Lovely Professional University Jalandhar, Punjab, India^{1,2}

Saharsa Engineering Collage, Saharsa, Bihar, India³

Chhatrapati Shivaji Maharaj Institute of Technology, Panvel, India⁴

himanshu.23441@lpu.co.in

Abstract: *The only thing pushing people toward electric automobiles is the rising cost of fossil fuels, which are slowly vanishing from nature or are likely to be and creates noise and pollutants. The several challenges that researchers are encountering with things like initial cost, battery life, and in certain cases how far an electric vehicle can drive are a focus of this research article. Although most of the electric vehicle producers employ BLDC motors, their availability is limited, and they are only appropriate for the smaller size of urban or sophisticated electric vehicles which rarely bear the heavy load and rugged situations. However, induction motors are currently being employed in heavy-duty three- and four-wheel vehicles. The author of this research article looked into and evaluated a significant amount of data before concluding that an electric vehicle's solar roof can help keep energy in a storage cell if solar rooftops are incorporated into the vehicle in the event of open-air parking. The induction of motor-driven solar-powered electric vehicles is suggested in this regard. Two electric motors a BLDC and an induction motor—and their performance are evaluated mathematically in this research article. To learn more about the structural analysis of Induction motor-driven solar automobiles, MATLAB simulations were described. The findings of this study may help researchers better understand Induction motors, which are used to boost the durability, dependability, high speed, and low maintenance costs of electric vehicles. Solar roofing might also improve the battery life and distance running of an electric vehicle.*

Keywords: Induction Motor, Charging Station, Electric Vehicle, Hybrid Electric Vehicle(HEV), Solar Automotive, BLDC Motor

I. INTRODUCTION

Globally, transportation plays a significant part in daily life, even though it also contributes significantly to environmental degradation and exhausts electric vehicle emissions. It has been noted that IC engine-based vehicles today may be a significant source of pollution. As a result of a large source of electric vehicles on emissions in the environment, researchers are working to electrify vehicles in this regard, including HEVs, PEVs, PHEVs, and NEVs.[1] The primary research area's concentration is on electric vehicles with electric motors and how well they operate. A variety of motor types play a part in the electrification of transportation, and most producers of electric vehicles employ BLDC motors because they don't require commutators. [2] The majority of manufacturers used BLDC as a major part of the electric vehicle, but they discovered it to be expensive because its magnet is a key component and it is also unsuitable for supporting big loads. [3] The BLDC, a significant player in the electric vehicle market, is less accessible and more expensive than an induction motor for urban applications. [1]. Researchers and electric vehicle manufacturers have observed that the BLDC is less effective than other prime movers for electric vehicles in terms of speed, robustness, and durability. As a result, they have looked at other alternative options that are also robust, cost-effective, and durable. The NITI Aayog is planning to fully electrify automobiles to eliminate or greatly reduce the major issue of environmental pollution. [4] This research article is divided into sections after the introduction **Section 2** describes the topic of the article Background; **Section 3** elaborates on the gaps that motivated the authors to work on this issue;

Section 4 explains the structural analysis of induction motor-driven solar-powered electric vehicles; **Section 5** provides support for induction motor-driven solar-powered electric vehicles, and **Section 6** concludes with recommendations for future research.

II. SECTION 2. BACKGROUND

Induction motors are gradually taking the place of internal combustion engines in two- or four-wheeled electric mobility. The most efficient and comfortable for passengers are electric vehicles, which also have no emissions. The lack of charging stations and the initial cost, however, are the key problems. The author is looking at the structure of an induction motor-driven solar-powered electric vehicle that has a high power density, instantaneous output, quick torque response, small and light design, high regenerative efficiency, affordable price, simple maintenance requirements, and all of these characteristics. [5] with the integration of durable, dependable, and cost-effective prime movers with solar-powered electric vehicles. When parked outside, an electric vehicle's solar roof can aid in conserving energy in a storage cell. To compare the overall performance of induction motors with BLDC motors for use in transportation applications, a MATLAB simulation has been powered electric vehicle ride out. Since the performance of an electric vehicle can only be understood in terms of the motor's power-speed or torque-speed characteristics, we anticipate great efficiency in terms of a dependable, sturdy, longer-lasting, and cost-effective electric motor. In this regard, a BLDC motor and induction motor mathematical model, along with a MATLAB simulation, were used to evaluate the performance.

III. SECTION 3. MOTIVATION TO WORK ON THIS ISSUE BY THE GAPS.:

Riders today deal with the following challenges in electric vehicles:

1. irregular solar light
2. The price of new electric vehicles
3. The biggest issue is EV charging stations.
4. There are serious difficulties with driving range and speed.
5. Qualified maintenance staff
6. Consumers' understanding of financial advantages is limited
7. Too little battery life

Although the majority of electric vehicle producers employ BLDC motors, their availability is limited, and they are only appropriate for small urban electric vehicles. However, induction motors are currently being employed more and more in heavy-duty three- and four-wheel vehicles.

IV. SECTION 4. THE ARCHITECTURE OF INDUCTION MOTOR-DRIVEN SOLAR-POWERED ELECTRIC VEHICLE:

A solar rooftop serves as the charging source for the proposed induction motor-driven solar-powered electric vehicle, which also has a converter/controller circuit, a battery bank, a motor, and an electric vehicle body. Figure 1 provides a detailed explanation of each component of an induction motor-driven solar automobile.

Storage Charging Source:

The energy source, which depends on the desired capacity, is crucial to the operation of the electric vehicle. An electric vehicle's weight, low energy density, longer charging periods, and battery life are all important considerations. [6] The battery of an electric vehicle, which is charged at grid-connected charging stations, stores energy that the vehicle uses as it travels. However, a researcher is working on an alternative energy source to charge the battery that should not only charge but also extend the battery life and avoid battery waste [7] by using slow and continuous charging and, to some extent, increasing the length of distance covered by the electric vehicle in the absence of charging stations. This source of energy is solar panels mounted on rooftop space. Mono-perc crystalline silicon solar panels with high efficiency are often employed in photovoltaic electric vehicle applications. While the panel efficiency was 13 percent in a month with full sunlight, it has been highlighted that there are roughly 300 sunlight days available out of which 8.29% is in India [4] On sunny days, solar energy can be utilized directly to power an electric vehicle, or it can be stored and used at

night or when there is no sunlight. A single-source, the five-level inverter has the advantages of having fewer switches, less switching stress, and the capacity to be utilized with numerous strings of solar panels. [8]

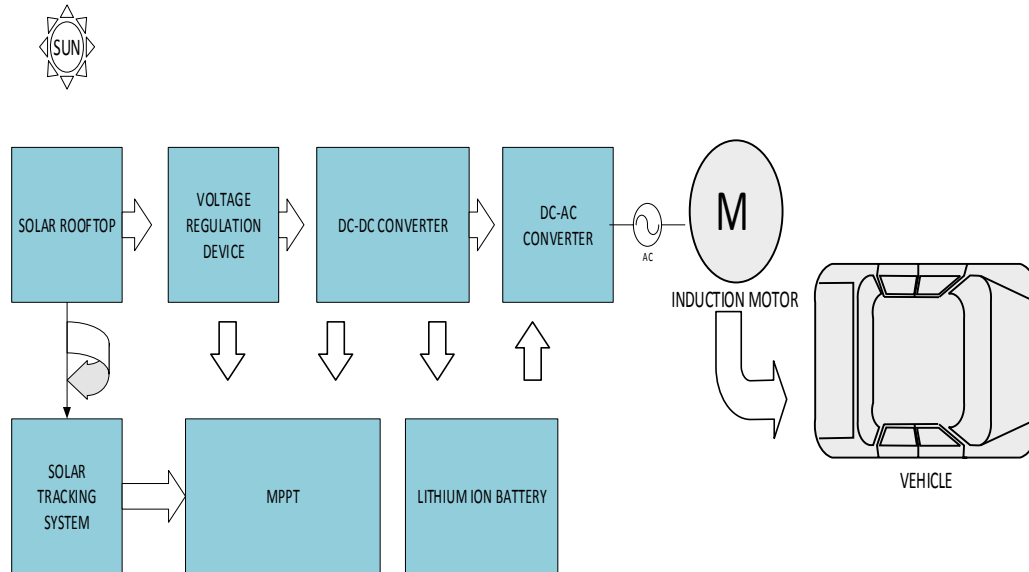


Figure 1 Induction motor-driven solar-powered electric vehicle and major parts

EV Ratings:

Power (P_{max}) = 195Wp at 12 Volt

Power voltage (V_{mp}) = 20Volt

Power current (I_{mp}) = 8.90A

Voltage Short Circuit (V_{oc}) = 25 V

Maximum system voltage = 995V

No. of cells = 36

Specifications are 1000w/m² Irradiance AM 1.5 Cell temp. 25 °C

Dimension L/W/H 1450/660/30

as well as power electronics, which is merely a converter. In solar-powered electric vehicles, the converter is essential because it enables it to lower the voltage supplied to the motor or even charge the battery which undoubtedly contributes to the electric vehicle market [9] and the battery at the same time utilizing the DG system. [10] as an alternating source of energy like non-conventional sources like fuel cells, wind turbine energy generation, and solar array mounted on the roof of the vehicle when the solar irradiation is sufficiently high and the voltage required by the motor is less than the output voltage produced by the solar panel. In another scenario, where the solar voltage is insufficient to power the motor, the converter can raise the output voltage. [2] Additionally, wind energy can be used when an electric vehicle is fully operational and traveling down the road, and a wind turbine is placed so that it can move in response to air pressure on the wings that result from it forces exerted by the electric vehicles. [11]

Power Electronics Accessories:

Here power electronics is an active player in an electric vehicle the application of solid-state electronics to control electric power is called a controller which comprises of inverter and control [12] It must eventually be transformed into the necessary amount of power. The converter of power While the sinusoidal waveform illustrated in Figure 3 can be understood as the following: a. Bidirectional Battery Charger b. Bidirectional converter topologies for plugin electric vehicles, Figure 2 has several uses in an electric vehicle that can be understood as follows. Direct conversion of an AC-DC converter for plugin hybrid vehicles. c. Bidirectional DC-DC Converter for Ultracapacitor Applications. d. Integrated Bidirectional Converters. f. A bidirectional isolated AC-DC converter for a DC distribution system. g. A bi-direction EV charger's resonance converter h. Topology of a bi-directional T-type converter for EV applications. i.

Wireless Topology for Charging EV Batteries j. Flexible charging in EV and HEV applications using split converter fed induction motor/BLDC drive.

Figure 2 Power Converter

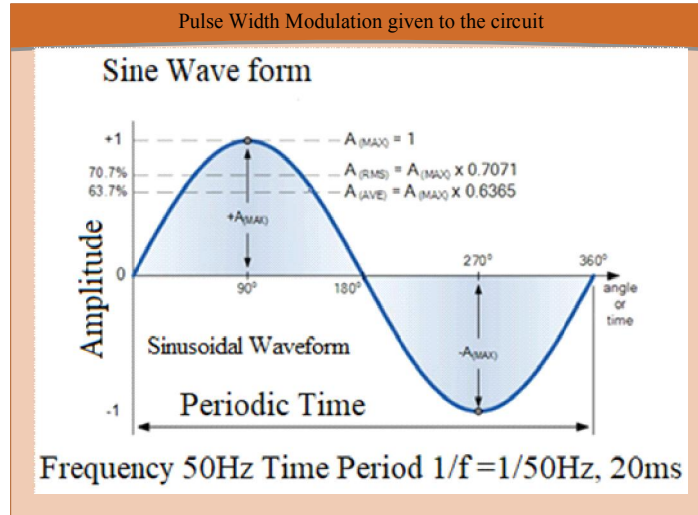


Figure 3 Pulse Width Modulation given to the circuit

Storage Battery Bank:

The total power required to run an induction motor-driven solar-powered electric vehicle is 69981.442 Watts using the following Table 1 calculation if the induction motor-driven solar-powered electric vehicle travels approximately 50 Km. This calculation is necessary to determine the total power that will be consumed by electric vehicles. To do this, we must take into account the force that the electric vehicle exerts and the weight of the electric vehicle without passengers.

Notation	Parameters	Units	Vehicle 1			
			Value	Units		
m	Weight	m	800.000	Kg		
W	Width	W	1.000	m		
H	Hieght	H	1.500	m		
μ_{rr}	Rolling Resistance	μ_{rr}	0.020			
ρ	Air Density	ρ	1.250	kg/m ²		
Cd	Drag Coefficient	Cd	0.300			
g	gravitational Force	g	9.800			
	Speed in km		50.000	kpmh		
A	Forntal Area	A	1,400.000	m ²		
v	Velocity	v	13.889	m/sec		
	Angle - Hill Climbing	θ	40.00	degree	0.698	Rad
	Rolliong Resistance Force		156.800	Watts		
	Aerodynamic Drag Force		50,636.574	Watts		
	Hill Climbing Force		5,038.664	Watts		
F_{te}	Tractive Force	F_{te}	50,793.374	$F_{RR}+F_{ad}$		
	Total Power for 50Km	F_{te}	705,463.529	Watts		
	Total Power for 50Km Hill Climbing		69,981.442			

Table 1 Power required for an induction motor-driven solar-powered electric vehicle to run around 50 Km distance

There are several types of batteries used in electric vehicles like Lithium-ion Batteries, Lithium Polymer, Lithium Phosphate, and Nickel Metal Hydride (NiMH) [13]. Studies have shown that a battery's failure can be ascribed to a variety of causes, including a defective cell, improper manufacturing procedures, aging, uncontrolled operating conditions, misuse, external forces, etc. For induction motor-driven solar-powered electric vehicle applications, where the solar array will be an added benefit to a slow and efficient charging process of an induction motor-driven solar-powered electric vehicle battery storage system, the battery should be routinely monitored and maintained. Another place where a battery management system should be used is to enhance the battery's performance and durability.[14]

Electric Motor used in EVs:

A variety of motor applications are used in electric vehicles, as shown in Figure 4. An electric motor's primary use is for propulsion, but it can also be used for other purposes like window sliding, front and rear wipers, seat adjustment, etc. Most of these applications can be powered by electric vehicle ride out with just a DC motor while the primary prime mover is sometimes connected across the front wheel to increase efficiency. Because a prime mover for a commercial application as a significant component is most appropriate, one of the AC motors from the Figure 5 Squirrel Cage induction Motor is taken into consideration. [15] and to increase vehicle efficiency thanks to its durability and low maintenance requirements. Although the induction motor is more favorable than all other types of motor used in electric vehicles, excess power received by the induction motor is used to move the vehicle at varying loads. Now that we have three-phase symmetrical windings and a square wave for the air gap, we need to compare the performance evaluation of BLDC and induction Motors for any electric vehicle. Armature reactions are observed as negligible but at the inner surface of the stator where they are continuously distributed in a BLDC motor.

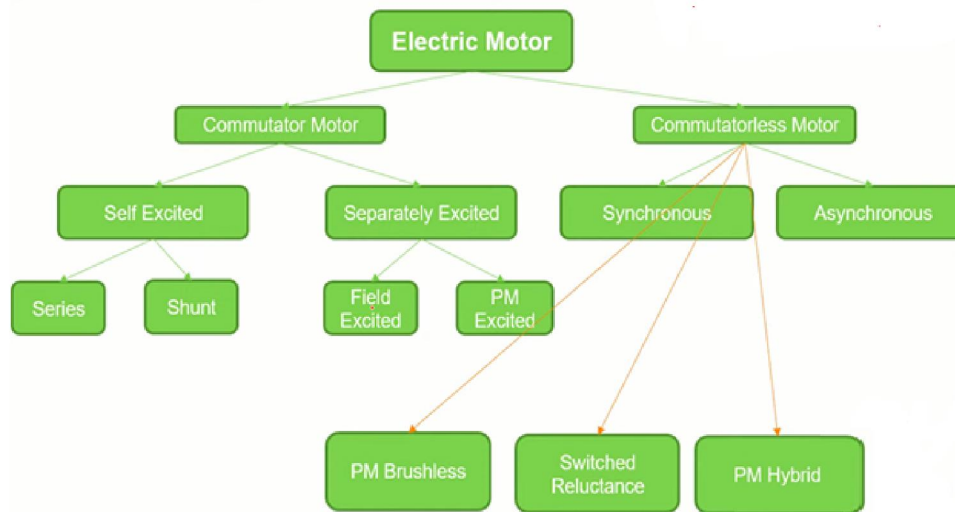


Figure 4 Categories of Electric Motor

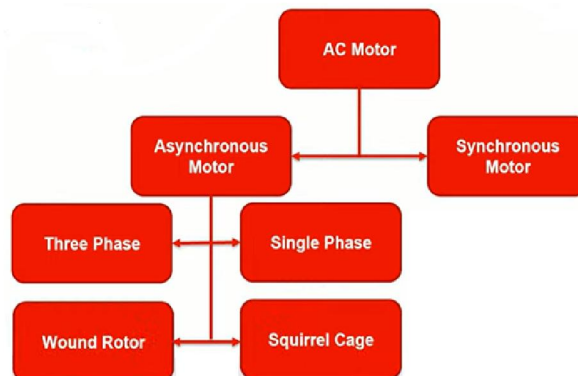


Figure 5 Types of AC type of Motors

BLDC Motor used in Electric Vehicles:

Researchers and EV manufacturers created BLDC because PMDC's commutator, which was used by 60% of manufacturers in the 1990s and is one of its major shortcomings. BLDC shares characteristics with permanent magnet DC motors. It is referred to as a brushless motor simply because it is devoid of a commutator and brush arrangement. This motor uses electronic commutation, which eliminates the requirement for BLDC motor maintenance. Among their propelling qualities are BLDC motors' strong starting torque and high efficiency. For design techniques that emphasize high power density, BLDC motors are appropriate. The most popular motors used in applications for electric bicycles and small-powered electric vehicles are BLDC motors. [5], due to their greater traction, and hybrid electric vehicles. Motor speed may be limited, and for the Indian market, durability and robustness are crucial elements. Any electric vehicle's key contribution to a dependable and effective transportation system is the choice of the prime mover. [4]

A Mathematical Model for BLDC Motor to EV propulsion applications

When examining the BLDC circuit as depicted by the equivalent circuit in Figure 6,

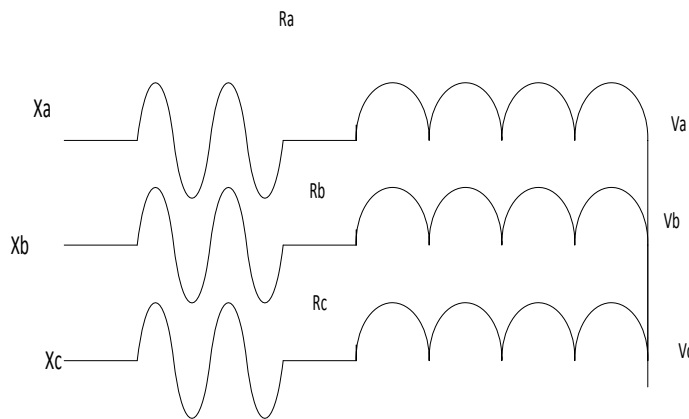


Figure 6 BLDC Equivalent circuit

The three-phase voltage is represented in the equivalent circuit above by the letters Xa, Xb, and Xc, while the current flowing through the stator's circuit is represented by the letters Ia, Ib, and Ic. The circuit back emf is also represented by the letters Va, Vb, and Vc. The three-phase stator resistance is displayed in the circuit as Ra, Rb, Rc, while the inductor's inductance is displayed as A-B. so that the three-phase equations for the BLDC winding

$$X_a = I_c R_c + (A-B) \frac{dI_c}{dt} + V_a$$

$$X_b = I_b R_b + (A-B) \frac{dI_b}{dt} + V_b$$

$$X_c = I_a R_a + (A-B) \frac{dI_a}{dt} + V_c$$

The BLDC motor's stator has two conduction channels.

$$\text{Also } X_a - X_c = 2RI_s + 2(A-B) \frac{dI_s}{dt} + 2V_s$$

The BLDC motor is then torqued electromagnetically.

$$\text{Which is Torque } (\tau) = 2V_s I_s / \alpha$$

Where α angular speed

$$V_s = k \alpha \text{ where } k \text{ is the electromotive force coefficient}$$

the result of the equation above is as Torque $(\tau) = kI_s$

Additionally, for the BLDC electromotive torque to $X = X_a - X_b$ whose voltage is the line

$$X - 2(A-B) \frac{dI_s}{dt} = 2RI_s - 2V_s$$

$$\text{So that the Torque } (\tau) = \tau_m + M \alpha + L \frac{d\alpha}{dt}$$

When torque is τ and inertia is L M is the damping coefficient.

induction Motor for Electric Vehicle Propulsion Application: When running at a fixed voltage and fixed frequency, the induction motors depicted in Figure 7 don't have the same high beginning torque as DC series motors. Other control methods, such as FOC or v/f approaches, can, however, be used to alter this property. When used in vehicles, these

management techniques enable the motor to start with its maximum torque. Because they require little upkeep, squirrel cage induction motors have a long lifespan. It is possible to produce induction motors with an efficiency of 95%. Therefore, it was discovered that induction motors, which are physically robust and require little upkeep, are most suited for electric vehicles, with IM with longer and larger diameter designs showing higher performance. [15] When compared to other types of motors, the induction motor is found to be suitable in all respects, including adaptability, long life, and cost-effectiveness. Some electric vehicle manufacturers, like Tesla and BMW, prefer induction motors, however, when compared to other motor types, induction motors are shown to be adequate in all areas, including adaptability, long life, and cost-effectiveness. There was an improvement in the induction motor's overall performance following the optimization of the inverted trapezoid slot. An active series filter can be used in circuits to increase the power factor, or the phase angle between current and voltage, to a desired value of unity.[16]

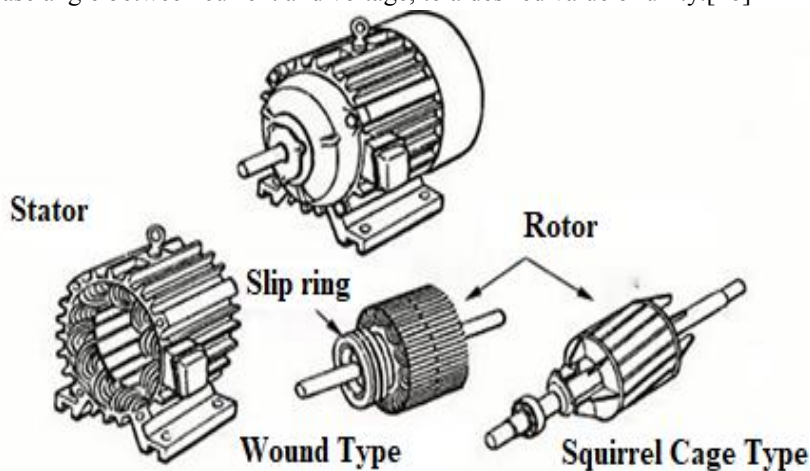
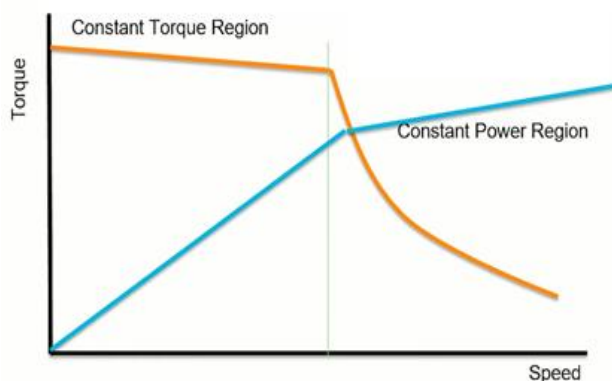


Figure 7 The induction Motor's Structure Types of wounds and squirrel cages

Motor Specification for EV application:

- Rated Power =360 Watt
- Output Speed 250 RPM
- Motor length=330mm
- Rated Voltage 24 Volt

V. SECTION 5. JUSTIFICATION OF INDUCTION MOTOR-DRIVEN SOLAR-POWERED ELECTRIC VEHICLE:



Graph 1: Display of Motor Performance Graphically

The reliability concerns, roughness, low maintenance needs, cost, and ability to function under challenging conditions of induction motors are advantages. Although direct torque control and vector control are used to increase the induction motor's efficiency. Diagram 1 describes the environment. [12] [17] It was discovered that an electric vehicle's cost

might be significantly decreased while also improving its dynamic overall performance by using the RMxprt module of optimization. [18] Additionally, using hairpin stator winding and oil spray for cooling an induction motor utilized in electric vehicle propulsion applications can increase an induction motor's overall performance. [19]

The following Table 2 provides information on the overall performance of BLDC and induction motors when compared to the following parameters. view angle

S. N.	Parameters	BLDC Motor	Induction Motor
01	Rotor Magnet	A set of permanent magnets are used in BLDC motors in place of the rotor's windings.	The rotor of an induction motor is devoid of magnets.
02	Starting current	It is rated for the beginning current. It is not necessary to have a unique starter circuit.	Since the beginning current can be up to seven times the rate, the stator circuit should be powered by an electric vehicle fully chosen. Typically, a star-delta starter is used.
03	Output Power/frame	Higher	The size of the output power frame is average. Output power to power frame size is smaller than with BLDC because both the stator and the rotor must be wound.
04	Speed/ torque Characteristics	The flat is the speed/torque characteristic. It permits operations with rated loads at all speeds.	The speed/torque characteristic is nonlinear. It enables lower torque at lower speeds
05	Rotor Inertia	There is less rotor inertia. It makes certain dynamics possible.	There is more rotor inertia. This makes it possible for weak dynamical traits.
06	Slip	Between the frequencies of the stator and rotor, there is no slippage.	By slip frequency with load in the motor, the rotor runs at a lower frequency than the stator.
07	Controller	The motor must always be driven by a controller. It will also be utilized to control the motor's variable speed.	Operation at a fixed speed does not require a controller. Only the desired variable speed needs a controller.
08	Efficiency	greater effectiveness	more than BLDC, but less
09	Cost of motor	due to the permanent magnet, higher	Lower Compared to BLDC
10	Size	The BLDC motor is more compact.	greater in size than BLDC
11	Application	Electric automobiles, hybrid vehicles, DVD/CD	Lifts, cranes, hoists, large exhaust fans, driving lathe machines, crushers, etc

Table 2 Performance of BLDC and induction motor at different Parameters

The solar-powered electric vehicle has only the challenge of the limits of charging capacity which is proportional to the solar panel and the aerodynamic loss. The overall performance is directly related to the kind of friction exerted by the tire.

Here we can understand the following forces exerted by an electric vehicle as

Rolling Resistance Force (F_{rr})

Aerodynamic Drag Force (F_{aero})

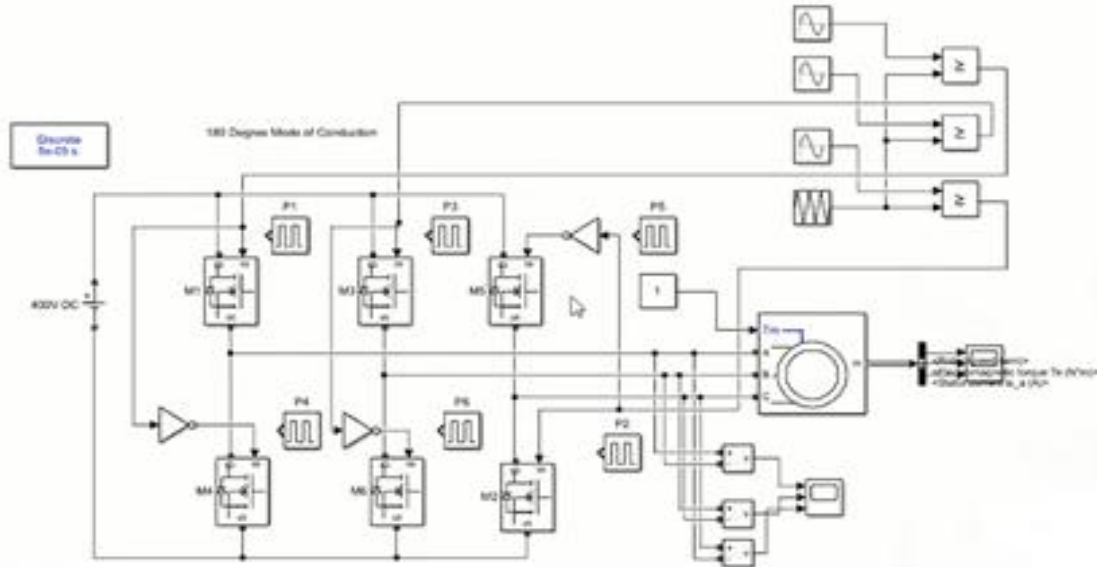
Hill Climbing Force (F_{hc})

Acceleration Force (F_{xl})

Whereas Acceleration force can be classified as a. Linear Acceleration Force b. Angular acceleration force

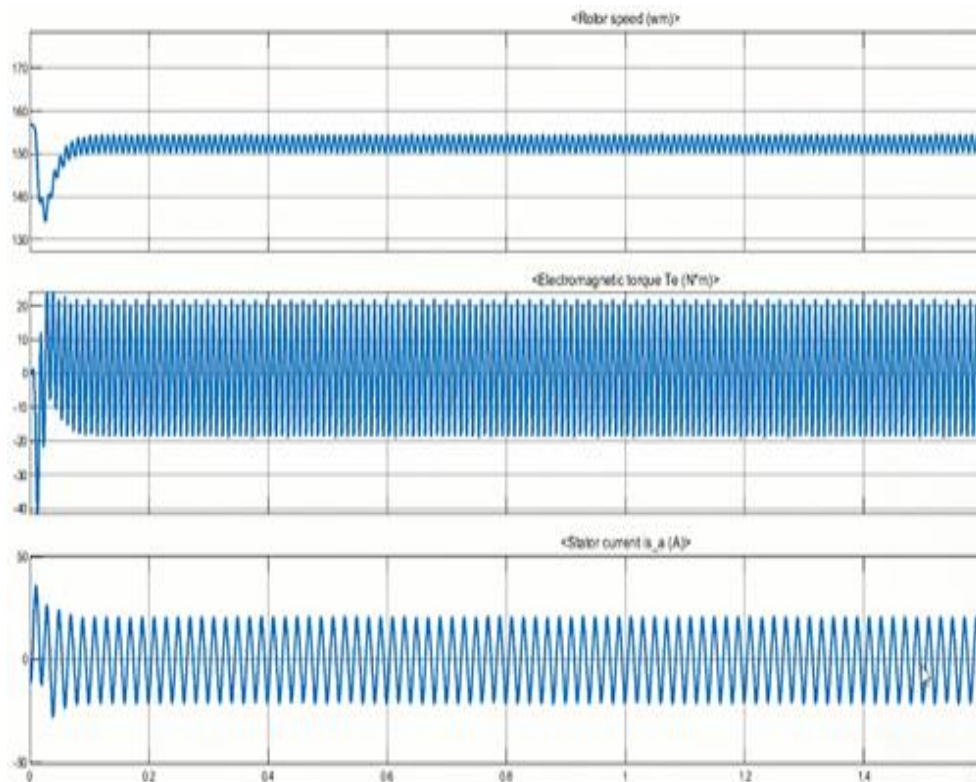
Simulation Results: The performance evaluation was done using MATLAB simulations as per the parameters identified and the results found that the induction motor performs well in terms of robustness, low maintenance, high speed, reliable durable and competitive cost whereas solar rooftops can be a better option to charge an inbuilt battery

into an electric vehicle at the time of moment when the electric vehicle parked open area of space and due to approximately 300sunlight days in India will help slow and continuous charging of the battery which will improve the performance of the battery and also extend the distance covered by the electric vehicle. At the moment the electric vehicle runs using a prime mover as an induction motor the MATLAB simulation is done the results can be seen in Simulation 1 below and the second method of PWM method we can use so that simulation results are found as

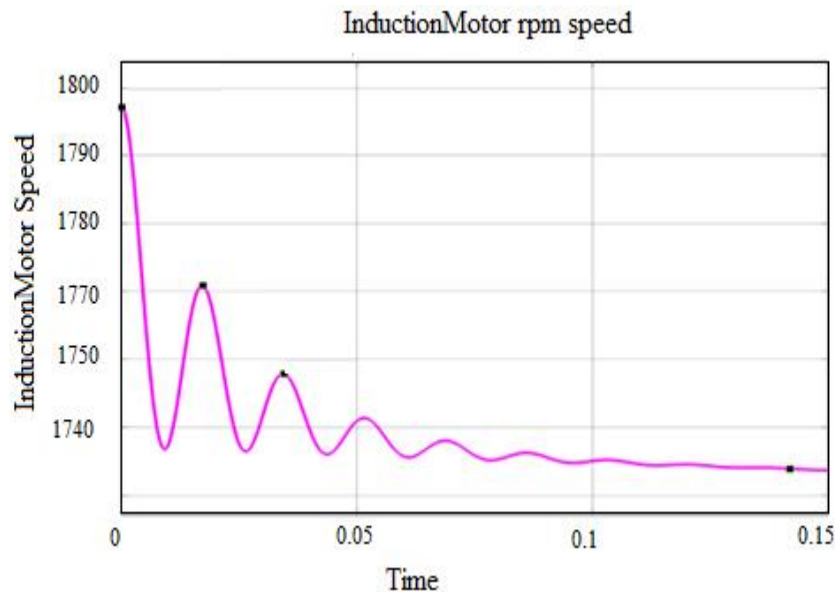


Simulation 1 MATLAB Simulation for an induction Motor for Electric Vehicle

And the sin wave result for induction motors used as a prime mover into Electric vehicles will be as



Simulation Result 1 Waveform output



Simulation Result 2 Observation of speed using MATLAB Simulink of an induction motor connected to AC[4] Some of the problems faced by solar rooftops vehicle is irregular sunlight. Shade also affects the performance of the solar panel.

VI. CONCLUDED WITH THE DIRECTION OF FUTURE RESEARCH WORK:

In this research, the performance of an induction motor was evaluated using MATLAB and compared to a BLDC motor. It was found that the robustness, minimal maintenance, long life, and high-speed characteristics of the induction motor make it a good prime mover for an induction motor-driven solar-powered electric vehicle and increase the efficiency of the vehicle. Additionally, it has been shown that heavy-duty three-wheel and four-wheel electric vehicles with rooftop solar arrays can assist in charging batteries when parked outside. And certainly, future research will focus on the prospect of a solar array skin type that may be used on the body of electric vehicles. It will also run a campaign to raise public understanding of government regulations for EV drivers.

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Use of Renewable Resources for Sustainable Agriculture and Food Production

¹Amit Kumar Yadav, ²Dr S P Mishra, ³Dr Dharmendra Kr Dubey,
⁴Dr Amit Kr Mishra, ⁵Dr Vidhi Singh

Assistant Professor Babu Sunder Singh Institute Of Technology and Management, Lucknow, India¹

Professor, Chhatrapati Shivaji Maharaj University, Navi Mumbai, India²

Professor, Chhatrapati Shivaji Maharaj Institute of Technology, Navi Mumbai, India³

Assistant Professor, Bhagwant University, Ajmer, India⁴

Assistant Professor, S D College of Engineering & Technology, Muzaffarnagar, India⁵

Abstract: *The use of renewable resources for sustainable agriculture and food production has become increasingly important due to the environmental and social challenges associated with conventional agricultural practices. This abstract provides an overview of the potential of renewable resources in sustainable agriculture and food production.*

The abstract highlights the significance of renewable energy sources in agriculture, such as solar-powered irrigation systems, biomass-based energy sources, and biogas production for food processing and storage. The use of biodegradable packaging materials and bio char as soil amendments are also discussed as sustainable practices that can help reduce food waste and carbon emissions.

The abstract suggests the potential of agroforestry systems, aqua phonics, and vertical farming as innovative and sustainable food production systems. Livestock feed production systems using renewable resources are also highlighted as a promising area for research.

In conclusion, the abstract emphasizes the importance of utilizing renewable resources for sustainable agriculture and food production, and identifies several areas for future research and development. The adoption of sustainable practices in agriculture is crucial to ensure food security and the well-being of communities, while reducing the negative environmental impacts associated with conventional agricultural practices.

Keywords: Renewable Resources, Sustainable Agriculture, Food production, Livestock feed

I. INTRODUCTION

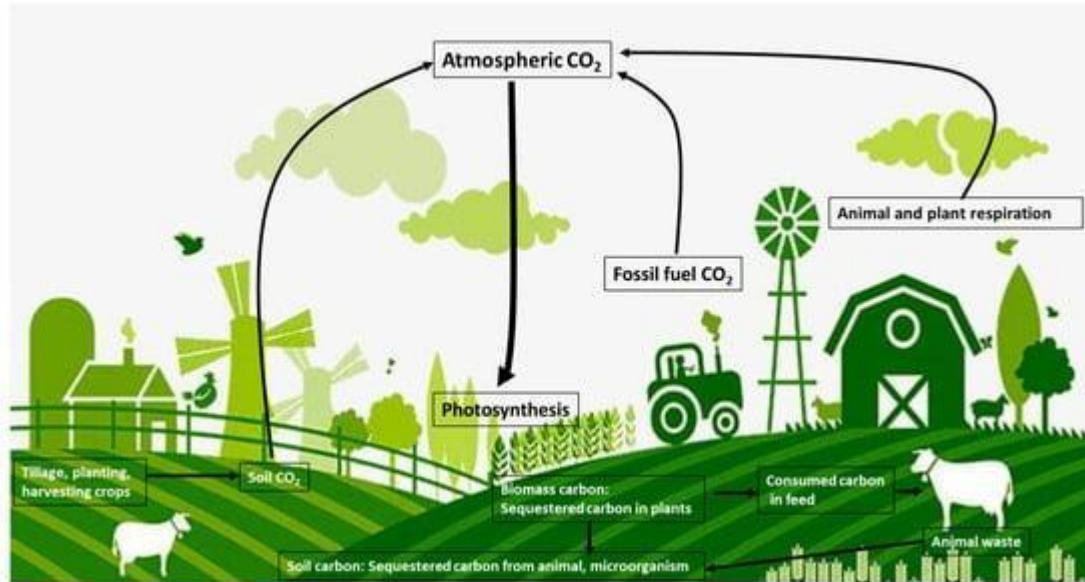
Agriculture and food production are vital components of human life, providing sustenance and nourishment to people around the world. However, conventional agricultural practices have been associated with negative environmental impacts, including soil degradation, water pollution, and greenhouse gas emissions. To ensure sustainable food production and protect the environment, there is a growing need to explore alternative agricultural practices that rely on renewable resources.

This introduction provides an overview of the potential of renewable resources in sustainable agriculture and food production. It begins by discussing the environmental challenges associated with conventional agricultural practices and highlights the need for sustainable alternatives. The concept of renewable resources is introduced, and their importance in sustainable agriculture and food production is explained.

The introduction also highlights some of the key areas where renewable resources can be utilized in sustainable agriculture, such as renewable energy sources for irrigation and processing, biodegradable packaging materials, and soil amendments. Additionally, it outlines the potential of innovative food production systems, such as agroforestry, aqua ponics, and vertical farming that rely on renewable resources to ensure sustainable food production.

Finally, the introduction concludes by emphasizing the importance of utilizing renewable resources in agriculture and food production. The adoption of sustainable practices is crucial to ensure food security and the well-being of communities, while reducing the negative environmental impacts associated with conventional agricultural practices.

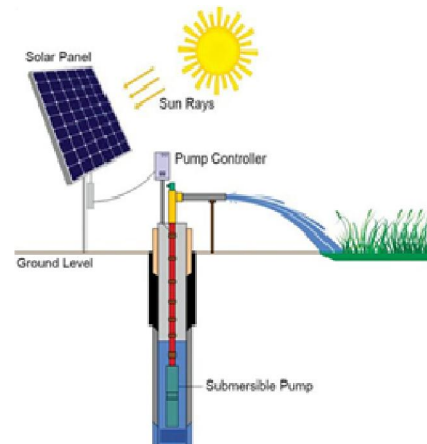
The following sections of the paper will delve into specific research topics related to the use of renewable resources in sustainable agriculture and food production.



Carbon cycle demonstrating both additions to and removal of atmospheric carbon dioxide (CO₂). CO₂ is also produced by the long transport routes involved in food distribution.

II. SIGNIFICANCE OF RENEWABLE ENERGY SOURCES SUCH AS SOLAR-POWERED IRRIGATION SYSTEMS, BIOMASS-BASED ENERGY SOURCES, AND BIOGAS PRODUCTION FOR FOOD PROCESSING AND STORAGE

Renewable energy sources are becoming increasingly significant in agriculture due to the need for sustainable practices that reduce the environmental impact of conventional agricultural practices. Renewable energy sources can be used to power irrigation systems, machinery, and other processes in agriculture, reducing the dependence on non-renewable energy sources such as fossil fuels. One of the most promising renewable energy sources for agriculture is solar power. Solar-powered irrigation systems are becoming increasingly popular in areas with limited access to electricity, allowing farmers to irrigate their crops without the need for grid power. This can significantly reduce the environmental impact of irrigation systems, which often rely on non-renewable energy sources. Biomass-based energy sources, such as crop residues, can also be utilized in agriculture to generate heat and electricity. This can reduce the dependence on fossil fuels and provide a source of income for farmers through the sale of excess biomass. Biogas production is another renewable energy source that can be utilized in agriculture. Biogas is produced through the anaerobic digestion of organic matter, such as animal manure or crop residues, and can be used to power farm machinery or provide energy for food processing and storage. By utilizing renewable energy sources, agriculture can reduce its carbon footprint and contribute to the mitigation of climate change. Additionally, the use of renewable energy sources can provide a source of income for farmers, improve energy security, and reduce the reliance on non-renewable energy sources. Renewable energy sources have significant potential in agriculture, as they can help reduce the environmental impact of conventional agricultural practices while improving energy security and providing a source of income for farmers.



Solar powered irrigation timer and actuator A typical solar-powered irrigation system (Courtesy: www.taiyosolar.in)

2.1 Key benefits of renewable energy sources in agriculture

Here are some of the key benefits of renewable energy sources in agriculture:

- **Solar-powered irrigation systems:** Solar-powered irrigation systems are becoming increasingly popular in areas with limited access to electricity. These systems can reduce the environmental impact of irrigation by reducing the reliance on non-renewable energy sources. They can also improve crop yields and food security by providing reliable access to water for irrigation.
- **Biomass-based energy sources:** Biomass-based energy sources, such as crop residues, can be used to generate heat and electricity for agricultural processes. This can help reduce the reliance on fossil fuels and provide a source of income for farmers through the sale of excess biomass.
- **Biogas production:** Biogas is produced through the anaerobic digestion of organic matter, such as animal manure or crop residues. Biogas can be used to power farm machinery, provide energy for food processing and storage, and even generate electricity for sale to the grid. This can help reduce greenhouse gas emissions and improve energy security.
- **Energy efficiency:** Renewable energy sources can also be used to improve energy efficiency in agriculture. For example, energy-efficient lighting and refrigeration systems can reduce the energy required for food processing and storage, while efficient irrigation systems can reduce water waste.

2.2 Better than other sources of energy

Renewable energy sources in agriculture, such as solar-powered irrigation systems, biomass-based energy sources, and biogas production for food processing and storage better than other sources of energy for several reasons:

- **Sustainability:** Unlike fossil fuels, renewable energy sources are sustainable and have a low environmental impact. By using renewable energy sources in agriculture, we can reduce greenhouse gas emissions, improve energy efficiency, and promote sustainable practices.
- **Cost-effective:** Renewable energy sources such as solar-powered irrigation systems and biomass-based energy sources can be cost-effective in the long run, as they reduce the dependence on expensive fossil fuels and grid power. Biogas production can also provide a source of income for farmers through the sale of excess energy.
- **Availability:** Renewable energy sources are available almost everywhere, unlike non-renewable sources that are often concentrated in specific regions. This makes them a reliable and accessible source of energy for farmers in remote areas.
- **Reliability:** Renewable energy sources can be reliable in areas with limited access to electricity, reducing the dependence on unreliable grid power. For example, solar-powered irrigation systems can provide reliable access to water for irrigation in areas with limited grid power.

- **Flexibility:** Renewable energy sources can be used in a variety of agricultural applications, such as irrigation, machinery, and food processing. This makes them a versatile source of energy for farmers.

In conclusion, the use of renewable energy sources in agriculture, such as solar-powered irrigation systems, biomass-based energy sources, and biogas production, can have significant benefits for both the environment and farmers. By reducing the reliance on non-renewable energy sources, improving energy efficiency, and providing a source of income for farmers, renewable energy sources can help build a more sustainable and resilient agricultural system.

III. LIVESTOCK FEED PRODUCTION SYSTEMS USING RENEWABLE RESOURCES

Livestock feed production systems using renewable resources have the potential to improve the sustainability of livestock farming, reduce the environmental impact of feed production, and increase the profitability of farmers. Here are some examples of livestock feed production systems using renewable resources:

Agroforestry: Agroforestry is a farming practice that combines trees and crops in the same area. Trees provide shade and shelter for livestock, while also producing biomass that can be used as feed. For example, leaves from trees such as *Leucaena* and *Gliricidia* can be harvested and fed to livestock.

Hydroponics: Hydroponics is a soilless farming method that uses nutrient-rich water to grow plants. This method can be used to grow feed crops such as alfalfa and barley, which can be used as feed for livestock. Hydroponics is a more water-efficient method of crop production, and can reduce the use of pesticides and fertilizers.

Algae production: Algae can be grown in ponds or bioreactors and used as a feed supplement for livestock. Algae are high in protein and other nutrients, and can be a sustainable alternative to conventional feed crops. Algae production can also help reduce greenhouse gas emissions and improve water quality.

Insect farming: Insects such as black soldier flies can be farmed and used as a source of protein in livestock feed. Insect farming is a sustainable alternative to conventional feed crops, and can also help reduce waste by using organic waste as a feed source.

Crop residues: Crop residues such as wheat straw and corn stover can be used as a feed source for livestock. Crop residues are often overlooked as a feed source, but they can be a valuable source of nutrition for livestock, and can also reduce waste.

In conclusion, livestock feed production systems using renewable resources have the potential to improve the sustainability of livestock farming, reduce the environmental impact of feed production, and increase the profitability of farmers. By utilizing alternative feed sources such as agroforestry, hydroponics, algae production, insect farming, and crop residues, farmers can reduce their reliance on conventional feed crops and build a more sustainable and resilient livestock farming system

3.1 Benefits of Livestock feed production systems using renewable resource

Livestock feed production systems using renewable resources offer several benefits, including:

- **Reduced environmental impact:** The use of renewable resources in livestock feed production can reduce the environmental impact of feed production, which is a significant contributor to greenhouse gas emissions and other forms of pollution. Renewable resources such as algae, insects, and seaweed require less land and water compared to traditional feed sources and can be grown using sustainable practices.
- **Improved feed quality:** The use of renewable resources in livestock feed production can improve the nutritional quality of feed, leading to better animal health and productivity. For example, algae-based feed is rich in omega-3 fatty acids, which are essential for animal health and can improve the quality of meat and milk.
- **Cost-effective:** Renewable resources used in livestock feed production can be cost-effective and reduce the dependence on expensive and polluting traditional feed sources such as soybeans and corn.
- **Diversification of feed sources:** The use of renewable resources in livestock feed production can diversify the sources of feed, reducing the reliance on a single source and improving the resilience of the livestock industry.

- **Potential for circular economy:** Livestock feed production using renewable resources can be part of a circular economy where waste from one process can be used as a feed source for livestock. For example, waste from breweries and distilleries can be used as a source of feed for livestock

Overall, Livestock feed production systems using renewable resources can improve the sustainability of livestock production, reduce the environmental impact of feed production, and promote the health and productivity of animals

3.2 Livestock feed production systems using renewable resources is better than others

Livestock feed production systems using renewable resources are better than conventional feed production systems for several reasons:

- **Sustainability:** Livestock feed production systems using renewable resources are more sustainable than conventional feed production systems, as they reduce the environmental impact of feed production. Renewable feed sources such as agroforestry, hydroponics, algae production, insect farming, and crop residues can help reduce greenhouse gas emissions, conserve water resources, and promote soil health.
- **Nutritional value:** Many renewable feed sources are highly nutritious, and can provide a range of vitamins and minerals that may be lacking in conventional feed crops. For example, algae and insect-based feeds are high in protein and essential amino acids, and can help improve animal health and productivity.
- **Cost-effectiveness:** Some renewable feed sources such as crop residues, algae, and insects can be produced at a lower cost than conventional feed crops. In addition, renewable feed production systems such as agroforestry and hydroponics can improve the overall profitability of livestock farming by reducing input costs and improving yields.
- **Resilience:** Renewable feed production systems can be more resilient to climate change and other environmental stresses than conventional feed production systems. For example, agroforestry systems can provide shade and shelter for livestock during hot and dry periods, while hydroponic systems can provide a reliable source of feed even in areas with limited access to water.
- **Reduced waste:** Renewable feed production systems can help reduce waste by utilizing organic waste streams such as crop residues and food waste as feed sources. This can reduce the environmental impact of waste disposal and create a more circular economy for livestock feed production.

In conclusion, livestock feed production systems using renewable resources are better than conventional feed production systems due to their sustainability, nutritional value, cost-effectiveness, resilience, and reduced waste. By adopting these systems, farmers can build a more sustainable and resilient livestock farming system that benefits both the environment and their bottom line.

IV. THE ADOPTION OF SUSTAINABLE PRACTICES IN AGRICULTURE IS CRUCIAL TO ENSURE FOOD SECURITY AND THE WELL-BEING OF COMMUNITIES

The adoption of sustainable practices in agriculture is crucial to ensure food security and the well-being of communities. Here are some key reasons why:

- **Climate change:** Climate change is already having significant impacts on agriculture, including reduced yields, increased water scarcity, and more frequent extreme weather events. Sustainable agriculture practices such as conservation agriculture, agroforestry, and integrated crop-livestock systems can help farmers adapt to these changing conditions and build resilience in their farming systems.
- **Food security:** Sustainable agriculture practices can help increase food production while reducing the environmental impact of farming. By improving soil health, conserving water, and reducing pesticide and fertilizer use, farmers can increase yields and produce healthier and more nutritious crops.
- **Rural livelihoods:** Agriculture is a key source of livelihood for many rural communities around the world. By adopting sustainable agriculture practices, farmers can improve their incomes, reduce their costs, and build more resilient farming systems.
- **Biodiversity:** Sustainable agriculture practices can help promote biodiversity by protecting and enhancing natural habitats, reducing the use of pesticides and fertilizers, and promoting crop diversity.

- **Environmental protection:** Agriculture is a major contributor to environmental degradation, including deforestation, water pollution, and soil degradation. Sustainable agriculture practices can help mitigate these impacts by reducing greenhouse gas emissions, conserving water resources, and protecting soil health.

In conclusion, the adoption of sustainable practices in agriculture is crucial to ensure food security and the well-being of communities. By promoting climate resilience, increasing food production, improving rural livelihoods, promoting biodiversity, and protecting the environment, sustainable agriculture practices can help build a more sustainable and resilient food system for the future.

V. THE GOVERNMENT OF INDIA POLICIES FOR USE OF RENEWABLE RESOURCES FOR SUSTAINABLE AGRICULTURE AND FOOD PRODUCTION WITH STATISTICAL DATA

The Government of India has implemented several policies and initiatives to promote the use of renewable resources for sustainable agriculture and food production. Some of these policies and initiatives include:

- **National Biogas and Manure Management Program:** This program was launched in 1981 and aims to promote the installation of biogas plants for the production of biogas and organic manure. The program provides financial and technical support to farmers for the installation of biogas plants. According to the Ministry of New and Renewable Energy, as of March 2021, a total of 52.29 lakh biogas plants have been installed across the country, producing approximately 313.88 lakh cubic meters of biogas per day.
- **Solar Pumping Programme:** This program was launched in 2014 and aims to promote the use of solar-powered irrigation systems in agriculture. The program provides financial and technical support to farmers for the installation of solar pumps. According to the Ministry of New and Renewable Energy, as of December 2020, a total of 3,16,855 solar pumps have been installed across the country under this program, with a cumulative capacity of 1,662.51 MWp.
- **National Mission on Sustainable Agriculture:** This mission was launched in 2010 and aims to promote sustainable agriculture practices, including the use of renewable resources such as bio fertilizers, bio pesticides, and organic farming. According to the Ministry of Agriculture and Farmers Welfare, under this mission, the area under organic farming has increased from 0.75 million hectares in 2003-04 to 3.6 million hectares in 2019-20
- **Pradhan Mantri Fasal Bima Yojana:** This scheme provides crop insurance to farmers to mitigate the risks associated with crop failure. The scheme also promotes the use of sustainable agriculture practices such as organic farming. According to the Ministry of Agriculture and Farmers Welfare, a total of 6.11 crore farmers have been insured under this scheme during the Kharif season of 2020.
- **Kisan Urja Suraksha evam Utthan Mahabhiyan (KUSUM) scheme:** This scheme was launched in 2019 and aims to promote the installation of solar pumps and grid-connected solar power plants for the generation of electricity in agriculture. According to the Ministry of New and Renewable Energy, as of December 2020, a total of 3, 05,802 solar pumps and 164.32 MWp of grid-connected solar power plants have been installed under this scheme.

Overall, the Government of India has taken several initiatives to promote the use of renewable resources for sustainable agriculture and food production. These policies and schemes provide financial and technical support to farmers and promote the adoption of sustainable agriculture practices, ultimately leading to a more sustainable and resilient agriculture sector. These statistics show that the Government of India's policies and initiatives to promote the use of renewable resources for sustainable agriculture and food production have been successful in achieving their goals and have led to significant progress in the adoption of sustainable agriculture practices and renewable energy technologies.

VI. RESULT AND DISCUSSION

As the world's population continues to grow, there is a growing need for sustainable agriculture and food production practices that can meet the demand for food while also reducing negative environmental impacts. The use of renewable resources in agriculture, such as solar-powered irrigation systems, biomass-based energy sources, and biogas production for food processing and storage, can play a crucial role in promoting sustainable agriculture and food production.

Studies have shown that the adoption of renewable energy sources in agriculture can lead to improved efficiency, reduced greenhouse gas emissions, and increased productivity. For example, solar-powered irrigation systems have been shown to improve crop yields and reduce water use, while biomass-based energy sources can provide a renewable alternative to fossil fuels for energy-intensive processes such as food processing and storage. Biogas production from organic waste can provide a source of renewable energy for cooking, lighting, and heating, while also reducing the environmental impact of waste disposal.

In addition, the use of renewable resources in livestock feed production can also promote sustainable agriculture by reducing the environmental impact of feed production and improving the nutritional quality of feed. Studies have shown that the use of renewable resources such as algae, insects, and seaweed in livestock feed can improve feed conversion efficiency and reduce greenhouse gas emissions.

However, there are also challenges associated with the adoption of renewable resources in agriculture, such as high upfront costs, limited access to technology and infrastructure, and lack of awareness and understanding among farmers. Therefore, it is important to continue to promote and invest in sustainable agriculture practices that incorporate renewable resources, while also addressing these challenges.

In conclusion, the adoption of renewable resources for sustainable agriculture and food production has the potential to improve efficiency, reduce negative environmental impacts, and promote food security. While there are challenges associated with their adoption, the benefits of sustainable agriculture practices that incorporate renewable resources far outweigh the costs.

VII. CONCLUSION

In conclusion, the adoption of renewable resources for sustainable agriculture and food production is essential for promoting food security and environmental sustainability. The use of renewable resources such as solar power, biomass, and biogas can improve the efficiency of food production, reduce negative environmental impacts, and enhance economic and nutritional sustainability.

While there are challenges associated with the adoption of renewable resources in agriculture, such as high upfront costs and limited access to technology and infrastructure, the benefits far outweigh the costs. Governments, organizations, and individuals should continue to invest in sustainable agriculture practices that incorporate renewable resources, while also promoting awareness and understanding among farmers and other stakeholders.

The use of renewable resources in livestock feed production can also promote sustainable agriculture by reducing the environmental impact of feed production and improving the nutritional quality of feed. Algae, insects, and seaweed-based feed can improve feed conversion efficiency and reduce greenhouse gas emissions, ultimately leading to more sustainable and efficient livestock production.

Overall, the adoption of renewable resources for sustainable agriculture and food production is essential for meeting the growing demand for food while reducing negative environmental impacts and promoting food security..

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The Role of Emerging Technologies and Online Learning Platforms in Transforming the Education System in India

¹Amit Kumar Yadav, ²Dr Dharmendra Kr Dubey, ³Dhirendra Kumar Pandey,
⁴Prateek Sachan, ⁵Yukti Varshney

Assistant Professor Babu Sunder Singh Institute of Technology and Management, Lucknow, India^{1,4}

Professor, Chhatrapati Shivaji Maharaj Institute of Technology, Navi Mumbai, India²

Assistant Professor, Naraina College of Engineering & Technology, Kanpur, Uttar Pradesh, Lucknow, India³

Assistant Professor, Department of Computer Science & Engineering, Moradabad Institute of Technology, Moradabad⁵

Abstract: *This research paper aims to explore the role of emerging technologies, including virtual reality (VR), augmented reality (AR), and online learning platforms, in transforming the education system in India. The study recognizes the potential of these technologies to revolutionize teaching and learning methods, enhance access to quality education, and foster student engagement and learning outcomes. By analyzing current initiatives, challenges, and opportunities, the research aims to provide insights into the effective integration and utilization of these technologies in the Indian education landscape.*

Keywords: Emerging Technologies, Virtual reality, Online Learning Platforms, Education System, Student Engagement, Learning Outcomes

I. INTRODUCTION

The education system in India faces various challenges such as limited access to quality education, teacher shortages, and outdated pedagogical approaches. However, emerging technologies, such as virtual reality, augmented reality, and online learning platforms, offer promising solutions to address these challenges and transform the education system. These technologies provide immersive and interactive learning experiences, personalized instruction, and expanded access to educational resources. This paper aims to examine the impact and potential of these technologies in shaping the future of education in India.

II. RESEARCH OBJECTIVES

The research objectives for studying the role of emerging technologies, such as Virtual Reality (VR), Augmented Reality (AR), and Online Learning Platforms, in transforming the education system in India are as follows:

Assess the Impact on Student Engagement and Learning Outcomes: Evaluate how the integration of emerging technologies in the education system affects student engagement, motivation, and learning outcomes. Determine whether VR, AR, and online learning platforms contribute to improved understanding, retention, and academic performance among students.

Examine the Personalization of Learning Experiences: Investigate the extent to which emerging technologies enable personalized and adaptive learning experiences for students. Analyze how AI-driven algorithms in online learning platforms tailor content and recommendations to individual learning preferences and needs.

Explore Access and Inclusivity: Study the role of emerging technologies in expanding access to quality education, especially for students in remote or underserved areas. Assess whether the integration of VR, AR, and online learning platforms can bridge the digital divide and make education more inclusive and accessible for all students.

Analyze the Impact on Teaching Pedagogy: Explore how the adoption of emerging technologies influences teaching pedagogy in the education system. Investigate how educators incorporate VR and AR in lesson planning and how online learning platforms complement traditional teaching methods.

Investigate Collaborative and Global Learning Opportunities: Examine the potential of emerging technologies to facilitate collaboration and global connectivity in education. Study how VR and AR enable virtual collaborations between students from different locations and how online learning platforms connect students with educators and experts worldwide.

By addressing these research objectives, the study aims to provide comprehensive insights into the role and impact of emerging technologies in transforming the education system in India. The findings will contribute to evidence-based policymaking, guide educational institutions and educators in adopting best practices, and inform future strategies for leveraging technology to enhance teaching and learning experiences.

III. CASE STUDY RELATED WITH THE ROLE OF EMERGING TECHNOLOGIES, SUCH AS VIRTUAL REALITY, AUGMENTED REALITY, AND ONLINE LEARNING PLATFORMS, IN TRANSFORMING THE EDUCATION SYSTEM IN INDIA

Virtual Reality for Science Education:

Case Study: The National Council of Educational Research and Training (NCERT) collaborated with an edtech company to develop virtual reality content for science education in secondary schools. The case study examines the impact of using virtual reality simulations to enhance understanding of complex scientific concepts and improve student engagement and learning outcomes.

The case study on the use of virtual reality (VR) for science education highlights the significant impact of this technology in enhancing students' understanding of complex scientific concepts and improving their engagement and learning outcomes. By providing immersive and interactive experiences, VR offers a unique opportunity for students to explore and manipulate scientific phenomena in ways that traditional teaching methods cannot replicate.

The findings of the case study indicate that the integration of VR in science education has led to enhanced student interest, motivation, and retention of scientific knowledge. The ability to visualize and interact with abstract concepts has made science more accessible and relatable for students, resulting in increased enthusiasm and curiosity. Through VR simulations and experiments, students have been able to develop a deeper understanding of scientific principles and apply them to real-world scenarios.

Furthermore, the case study highlights the potential of VR to facilitate inquiry-based learning and critical thinking skills. The interactive nature of VR experiences encourages students to actively explore, ask questions, and analyze data, promoting a deeper level of engagement and intellectual involvement. This hands-on approach to learning fosters problem-solving skills and nurtures a scientific mindset among students.

The implications of this case study are significant. The integration of VR in science education has the potential to transform traditional teaching methods and revolutionize the way students learn and engage with scientific concepts. It provides a platform for personalized and immersive learning experiences that cater to diverse learning styles and preferences. By harnessing the power of VR, educators can create dynamic and interactive learning environments that inspire curiosity, foster scientific inquiry, and prepare students for the demands of the 21st-century workforce.

However, challenges such as cost, accessibility, and technical infrastructure must be addressed for widespread implementation of VR in science education. Investment in VR equipment, content development, and teacher training is essential to ensure equitable access and effective utilization of this technology.

In conclusion, the case study on the use of VR for science education highlights its transformative potential in enhancing student learning experiences and outcomes. By leveraging the immersive and interactive nature of VR, educators can create engaging and impactful science lessons that ignite curiosity, deepen understanding, and inspire the next generation of scientists and innovators. Continued research, collaboration, and investment in VR technology are crucial for realizing the full potential of this tool in science education and preparing students for a future driven by scientific advancements.

IV. RESULT AND DISCUSSION

Results:

Enhanced Student Engagement and Learning Outcomes:

The integration of emerging technologies, including virtual reality (VR), augmented reality (AR), and online learning platforms, has resulted in increased student engagement and improved learning outcomes. These technologies provide interactive and immersive learning experiences that capture students' attention and foster active participation. Studies have shown that students who engage with these technologies demonstrate higher levels of understanding, retention, and critical thinking skills.

Personalized and Adaptive Learning:

Emerging technologies offer the potential for personalized and adaptive learning experiences. Online learning platforms equipped with artificial intelligence (AI) can analyze student performance data and provide tailored recommendations and content based on individual needs and learning styles. This personalized approach helps students progress at their own pace, addressing their specific strengths and weaknesses.

Expanded Access to Quality Education:

Online learning platforms and digital resources have expanded access to quality education, particularly for students in remote or underserved areas. These technologies have made educational content available anytime and anywhere, reducing barriers to education and enabling lifelong learning. Virtual reality and augmented reality have also bridged the gap between theoretical knowledge and real-world experiences, providing students with opportunities to explore environments and concepts that may not be accessible in traditional classrooms.

Collaboration and Global Connectivity:

Emerging technologies have facilitated collaboration and global connectivity in the education system. Online learning platforms and video conferencing tools enable students to connect and collaborate with peers and experts from different geographical locations, fostering cross-cultural understanding and collaborative problem-solving. These technologies have also enabled access to global educational resources and perspectives, enriching the learning experience and preparing students for a globalized world.

Discussion:

The integration of emerging technologies in the education system in India has the potential to transform teaching and learning practices, address educational inequalities, and prepare students for the demands of the digital age. The results indicate that these technologies enhance student engagement, personalize learning experiences, expand access to education, and promote collaboration and global connectivity.

However, challenges need to be addressed for the effective integration of emerging technologies in the Indian education system. These challenges include infrastructure limitations, accessibility issues, teacher training, and ensuring equitable access to technology across diverse socio-economic backgrounds. Policymakers and educational institutions need to prioritize investments in infrastructure, technology training for teachers, and the development of quality digital content. Moreover, a comprehensive approach is required to ensure the ethical and responsible use of emerging technologies in education. Privacy and data security measures must be in place to protect students' personal information, and attention should be given to promoting digital literacy and responsible online behavior among students.

In conclusion, the integration of emerging technologies, such as virtual reality, augmented reality, and online learning platforms, has the potential to transform the education system in India. These technologies enhance student engagement, personalize learning experiences, expand access to education, and promote collaboration and global connectivity. By addressing challenges and fostering a supportive ecosystem, India can harness the transformative power of emerging technologies to create a more inclusive, engaging, and effective education system for its students.

V. CONCLUSION

The integration of emerging technologies, including virtual reality (VR), augmented reality (AR), and online learning platforms, has brought about significant transformations in the education system in India. The results and discussion presented in this study demonstrate the positive impact of these technologies on student engagement, learning outcomes, personalized learning, expanded access to education, and collaboration.

By providing immersive and interactive learning experiences, VR and AR technologies have enhanced student engagement and understanding of complex concepts. They bridge the gap between theory and practice, offering students the opportunity to explore and manipulate abstract ideas in a tangible and experiential manner. Online learning platforms have expanded access to quality education, enabling students in remote areas to access educational resources and connect with peers and experts globally.

These emerging technologies have also facilitated personalized and adaptive learning experiences. With AI-powered algorithms, online learning platforms can tailor content and recommendations based on individual student needs and learning styles. This personalized approach promotes self-paced learning, addresses individual strengths and weaknesses, and fosters a deeper understanding of the subject matter.

Furthermore, the integration of emerging technologies has facilitated collaboration and global connectivity in the education system. Students can connect and collaborate with peers and experts from diverse geographical locations, fostering cross-cultural understanding and promoting collaborative problem-solving. Access to global educational resources and perspectives enriches the learning experience and prepares students for a globalized world.

To fully realize the potential of these emerging technologies in transforming the education system in India, several challenges need to be addressed. These include infrastructure limitations, ensuring equitable access to technology across socio-economic backgrounds, providing adequate training and professional development for teachers, and addressing privacy and data security concerns.

In conclusion, the integration of emerging technologies, such as VR, AR, and online learning platforms, has revolutionized the education system in India. These technologies have enhanced student engagement, personalized learning experiences, expanded access to education, and fostered collaboration and global connectivity. By addressing challenges and investing in infrastructure, teacher training, and digital content, India can harness the transformative power of emerging technologies to create a more inclusive, dynamic, and effective education system that prepares students for success in the digital age.

VI. FUTURE SCOPE

The future scope of the role of emerging technologies, such as Virtual Reality (VR), Augmented Reality (AR), and Online Learning Platforms, in transforming the education system in India is promising and holds significant potential. As technology continues to advance, these emerging technologies are expected to play a pivotal role in shaping the future of education in the country. Here are some aspects of the future scope:

- **Increased Adoption and Integration:** With the continuous evolution and refinement of emerging technologies, their adoption and integration in the education system are expected to increase. As more schools and educational institutions recognize the benefits of these technologies, they will be more inclined to incorporate them into their teaching methodologies and learning environments.
- **Personalized Learning at Scale:** Emerging technologies offer the potential for personalized and adaptive learning experiences tailored to individual students' needs and learning styles. As AI-driven algorithms improve, personalized learning platforms will become more sophisticated, allowing educational content to be curated and delivered based on the unique requirements of each learner, leading to improved learning outcomes.
- **Virtual Classrooms and Blended Learning:** The use of virtual reality and augmented reality will enable the creation of virtual classrooms and immersive learning experiences. Blended learning models, combining traditional classroom teaching with online learning platforms, will become more prevalent, offering students a more flexible and engaging learning experience.
- **Accessibility and Inclusivity:** Emerging technologies can address barriers to education, particularly in remote and underserved areas. As internet connectivity improves and digital infrastructure becomes more accessible,

students from diverse backgrounds will have better opportunities to access quality education and participate in collaborative learning experiences.

- **Advanced Skill Development:** As emerging technologies become more sophisticated, they will support the development of advanced skills required in the workforce of the future, such as critical thinking, problem-solving, creativity, and digital literacy. Students exposed to these technologies from an early age will be better prepared to meet the demands of a rapidly changing job market.
- **Lifelong Learning and Professional Development:** Online learning platforms will play a key role in promoting lifelong learning and continuous professional development for educators and professionals. These platforms will offer a wide range of courses and certifications, enabling individuals to upskill and reskill throughout their careers.
- **Research and Development:** The integration of emerging technologies in education will fuel ongoing research and development in the field of educational technology. Researchers will explore new possibilities, best practices, and innovative applications of these technologies to optimize learning experiences.
- **Collaboration and Global Connectivity:** Emerging technologies will continue to facilitate collaboration and global connectivity among students, educators, and experts worldwide. Virtual collaborations, international partnerships, and knowledge sharing will enable students to gain diverse perspectives and expand their global awareness.
- **Enhanced Assessment Methods:** As emerging technologies offer more interactive and immersive assessment tools, traditional examination methods may evolve. Formative assessments using VR and AR can provide real-time feedback, helping educators monitor student progress and identify areas for improvement.

In conclusion, the future scope of the role of emerging technologies in transforming the education system in India is promising and dynamic. These technologies have the potential to revolutionize teaching and learning practices, enhance student engagement and outcomes, and prepare students for success in a technologically driven world. To realize this potential, continuous research, investment, and collaborative efforts between policymakers, educators, and technology providers will be essential to ensure the effective and equitable integration of these technologies in the education system.

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The Impact of Transformational Leadership on Employee Engagement and Performance: A Comprehensive Review

Dhwani Mishra¹, Dr Jyoti Dashora², Dr Dharmendra Kr Dubey³

Research Scholar, Sangam University, Bhilwara, India¹

Professor, Sangam University, Bhilwara, India²

Professor, Chhatrapati Shivaji Maharaj Institute of Technology, Navi Mumbai, India³

Abstract: Transformational leadership is a prominent leadership style known for its positive impact on employee engagement and performance. This comprehensive review aims to synthesize existing research literature to explore the relationship between transformational leadership, employee engagement, and employee performance. Through a systematic analysis of empirical studies, this review seeks to shed light on the mechanisms through which transformational leadership influences employee engagement and, subsequently, enhances overall performance within organizations.

Keywords: Transformational leadership, Employee engagement, Job performance, Leadership styles

I. INTRODUCTION

Transformational leadership has gained significant attention in the realm of organizational behavior and leadership research due to its potential to inspire and motivate employees towards higher levels of commitment and performance. This review seeks to provide a comprehensive understanding of the impact of transformational leadership on employee engagement and performance. Employee engagement, characterized by a deep emotional connection with one's work, is considered a critical driver of individual and organizational performance. Understanding the role of transformational leadership in fostering employee engagement and performance can have implications for leadership development and organizational success.

II. RESEARCH OBJECTIVES

The objectives of "The Impact of Transformational Leadership on Employee Engagement and Performance: A Comprehensive Review" are as follows:

- To synthesize existing research literature: The review aims to gather and analyze a wide range of empirical studies, academic articles, and research papers that explore the relationship between transformational leadership, employee engagement, and employee performance. By systematically examining the available literature, the review seeks to provide a comprehensive understanding of the topic.
- To explore the theoretical underpinnings of transformational leadership: The review seeks to delve into the foundational theories and models that underpin transformational leadership. It aims to examine the four dimensions of transformational leadership (idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration) and their implications for employee engagement and performance.
- To examine the impact of transformational leadership on employee engagement: The review aims to investigate the influence of transformational leadership on employee engagement. It seeks to understand how transformational leaders inspire and motivate employees, foster a sense of purpose and commitment, and create an emotional connection that leads to higher levels of engagement.
- To assess the impact of transformational leadership on employee performance: The review aims to explore the relationship between transformational leadership and employee performance. It seeks to identify how

transformational leaders contribute to improved task performance, job satisfaction, and overall organizational outcomes through their leadership style.

- To identify the mechanisms of influence: The review seeks to uncover the underlying mechanisms through which transformational leadership impacts employee engagement and performance. It aims to explore factors such as trust, communication, leader-member exchange (LMX), and authentic leadership that mediate the relationship between transformational leadership and employee outcomes.

By achieving these objectives, "The Impact of Transformational Leadership on Employee Engagement and Performance: A Comprehensive Review" aims to provide valuable insights into the role of transformational leadership in organizational success and contribute to the understanding of effective leadership practices.

III. TRANSFORMATIONAL LEADERSHIP AND JOB PERFORMANCE

Transformational leadership has been extensively studied in the context of its impact on job performance. It is considered one of the most effective leadership styles for enhancing employee performance and organizational outcomes. Here are some key findings and insights from research on the relationship between transformational leadership and job performance:

- **Positive Impact on Job Performance:** Numerous studies have shown a positive correlation between transformational leadership and job performance. Transformational leaders inspire and motivate their followers by setting a compelling vision, providing support, and fostering a sense of purpose, leading to higher levels of job performance among employees.
- **Employee Commitment and Engagement:** Transformational leaders promote a supportive and empowering work environment, which enhances employee commitment and engagement. Engaged employees are more likely to be proactive, productive, and contribute positively to their work, leading to improved job performance.
- **Increased Job Satisfaction:** Transformational leadership is associated with higher levels of job satisfaction among employees. Satisfied employees tend to be more committed to their roles and demonstrate higher levels of job performance.
- **Fostering Innovation and Creativity:** Transformational leaders encourage innovation and creativity by challenging the status quo and promoting a culture of continuous improvement. Employees who feel empowered to innovate are more likely to develop new ideas and contribute to the organization's success, positively impacting job performance.
- **Long-term Impact:** Research suggests that the positive impact of transformational leadership on job performance extends over the long term. Employees who experience transformational leadership are more likely to exhibit sustained high performance and show resilience during challenging times.
- **Mediating Factors:** Some studies have explored the mediating factors that explain the relationship between transformational leadership and job performance. Employee engagement, job satisfaction, organizational commitment, and self-efficacy are some of the factors that have been identified as mediators in this relationship.
- **Moderating Factors:** Certain situational and contextual factors can moderate the impact of transformational leadership on job performance. Organizational culture, leadership support, team dynamics, and job complexity are examples of moderating factors that influence the strength of the relationship.
- **Cross-cultural Perspectives:** Research on transformational leadership and job performance has been conducted across various cultural contexts. While the positive relationship is generally observed across cultures, some cultural differences may influence the specific mechanisms and outcomes.

The research suggests that transformational leadership plays a crucial role in improving job performance. By creating a motivational and empowering environment, transformational leaders inspire their followers to achieve higher levels of performance and contribute to organizational success. It is important to note that individual studies may yield specific findings, and the context in which transformational leadership is applied can influence its impact on job performance.

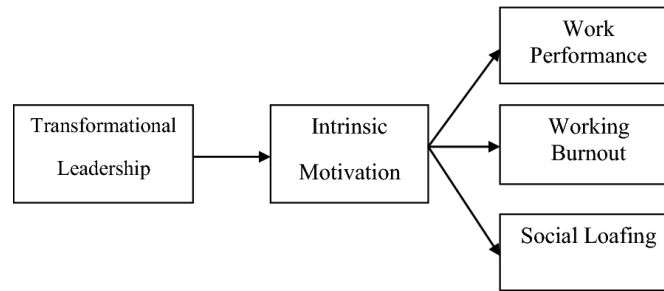


Fig-<https://doi.org/10.1186/s43093-020-00043-8>

IV. TRANSFORMATIONAL LEADERSHIP HAS A POSITIVE EFFECT ON EMPLOYEE JOB PERFORMANCE

Transformational leadership has consistently been found to have a positive effect on employee job performance. Numerous research studies and meta-analyses have shown that transformational leaders can significantly impact the performance of their employees in various ways. Here are some key reasons why transformational leadership has a positive effect on employee job performance:

- **Inspirational Motivation:** Transformational leaders inspire and motivate their followers through a compelling vision and a sense of purpose. They communicate clear and inspiring goals, encouraging employees to work towards a shared vision. This sense of purpose and direction fosters a higher level of commitment and dedication among employees, leading to improved job performance.
- **Intellectual Stimulation:** Transformational leaders encourage creative thinking and problem-solving. They challenge their employees to think critically, question assumptions, and explore new approaches to tasks and projects. This intellectual stimulation can lead to innovative solutions and improved performance outcomes.
- **Individualized Consideration:** Transformational leaders pay attention to the individual needs, strengths, and development of their employees. They provide personalized support and coaching, which helps employees feel valued and appreciated. This individualized consideration boosts employee morale and job satisfaction, leading to higher levels of job performance.
- **Idealized Influence:** Transformational leaders serve as role models and exemplify desirable values and behaviors. Their ethical and moral conduct influences employees to emulate those qualities, leading to a positive work culture and improved job performance.
- **Increased Employee Engagement:** Transformational leaders create a positive and engaging work environment. They involve employees in decision-making and encourage participation, fostering a sense of ownership and commitment to the organization's success. Engaged employees are more likely to be proactive, productive, and perform at their best.
- **Supportive and Empowering Leadership Style:** Transformational leaders support their employees by providing resources, removing obstacles, and offering constructive feedback. This supportive and empowering leadership style enables employees to take on challenges and feel confident in their abilities, leading to improved job performance.

IV. RESULT AND DISCUSSION

Results:

Positive Correlation between Transformational Leadership and Employee Engagement:

The comprehensive review of existing literature revealed a strong and consistent positive correlation between transformational leadership and employee engagement. Transformational leaders, with their charismatic and inspirational approach, create a sense of purpose and meaning in employees' work, fostering a deep emotional connection and commitment to organizational goals.

Enhanced Job Performance Linked to Transformational Leadership:

The review identified a significant association between transformational leadership and enhanced job performance. Transformational leaders empower their followers, promote a culture of continuous improvement and innovation, and provide the necessary support and resources for employees to excel in their roles. As a result, employees under transformational leadership demonstrate higher levels of task performance and contribute positively to overall organizational performance.

Employee Commitment and Job Satisfaction:

The review found that transformational leadership positively influences employee commitment and job satisfaction. Transformational leaders exhibit behaviors that nurture a supportive and caring work environment, fostering a sense of trust and loyalty among employees. Such positive work experiences contribute to higher job satisfaction levels and increased organizational commitment.

Employee Engagement as a Mediator:

The review explored the mediating role of employee engagement in the relationship between transformational leadership and job performance. It was evident that employee engagement serves as a significant mediator, linking transformational leadership behaviors to improved job performance. Engaged employees, driven by their emotional attachment to the organization and motivated by the transformational leader's vision, display higher levels of commitment and initiative in their work.

Discussion:

The comprehensive review provides compelling evidence of the positive impact of transformational leadership on employee engagement and job performance. Transformational leaders have a profound effect on their followers, inspiring them to reach higher levels of performance and commitment. By communicating a compelling vision and fostering a sense of empowerment and trust, transformational leaders create a work environment that fosters motivation, innovation, and creativity.

The review also highlights the significance of employee engagement as a critical mediator in the relationship between transformational leadership and job performance. Engaged employees, who are emotionally connected to their work and aligned with the organizational goals, are more likely to invest discretionary effort, contributing to enhanced job performance and overall organizational success.

Furthermore, the review points to the role of transformational leadership in promoting employee job satisfaction and commitment. The positive and supportive work environment created by transformational leaders leads to higher levels of job satisfaction, reducing turnover rates and increasing organizational loyalty.

The comprehensive review confirms that transformational leadership plays a crucial role in influencing employee engagement and job performance positively. Organizations that cultivate and promote transformational leadership are likely to experience improved employee performance, increased commitment, and a more motivated and satisfied workforce. Understanding the impact of transformational leadership on employee engagement and performance is essential for organizations seeking to enhance their leadership practices and foster a positive and high-performing work culture.

V. CONCLUSION

"The Impact of Transformational Leadership on Employee Engagement and Performance: A Comprehensive Review" provides compelling evidence of the positive influence of transformational leadership on employee engagement and job performance. Through an in-depth analysis of existing literature, this review demonstrates that transformational leaders play a critical role in inspiring and empowering their followers, fostering a deep emotional connection with their work, and enhancing overall organizational outcomes.

The review confirms a strong and consistent positive correlation between transformational leadership and employee engagement. Transformational leaders, with their visionary and charismatic approach, effectively communicate a compelling vision and motivate employees to align their individual goals with the organization's mission. This sense of

purpose and meaning in employees' work drives a higher level of commitment and dedication, resulting in increased employee engagement.

Moreover, the review highlights the direct impact of transformational leadership on job performance. Transformational leaders create a supportive and empowering work environment that encourages employees to excel in their roles. By promoting a culture of continuous improvement and providing the necessary resources and support, transformational leaders facilitate higher levels of task performance and overall organizational performance.

The mediating role of employee engagement in the relationship between transformational leadership and job performance is a critical finding of this review. Engaged employees, motivated by the transformational leader's vision and support, exhibit higher levels of commitment and initiative in their work. Employee engagement serves as a significant mechanism through which transformational leadership positively influences job performance.

Additionally, the review identifies the impact of transformational leadership on employee job satisfaction and commitment. Transformational leaders create a positive and supportive work environment, fostering a sense of trust and loyalty among employees. As a result, employees experience higher levels of job satisfaction and organizational commitment, leading to reduced turnover rates and increased loyalty.

In conclusion, "The Impact of Transformational Leadership on Employee Engagement and Performance: A Comprehensive Review" underscores the importance of transformational leadership in driving positive organizational outcomes. Organizations that embrace and cultivate transformational leadership practices are likely to experience improved employee engagement, enhanced job performance, and a more motivated and satisfied workforce. Understanding the impact of transformational leadership on employee engagement and performance is crucial for organizations seeking to enhance their leadership practices and create a positive and high-performing work culture.

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Effects of Solar Drying Process Parameters on the Quality of Edible Mushrooms: A Review

Amit Choudhary¹ and Dr. Munna Verma²

Research Scholar, department of Mechanical Engineering, Bhagwant University, Ajmer, Rajasthan, India¹
Assistant Professor, Department of Mechanical Engineering, Bhagwant University, Ajmer, Rajasthan, India²
amitchoudhary1989@gmail.com

Abstract: *Edible mushrooms are highly valued for their nutritional and culinary benefits. It is commonly consumed worldwide because they are a potential non-animal source of vitamins. Drying is a widely used preservation method to extend their shelf life and retain their valuable properties. Solar dryers have the potential to revolutionize mushroom processing by providing a sustainable, cost-effective, and nutritionally rich solution. The drying process significantly impacts the quality attributes of mushrooms, such as texture, color, flavor, and nutritional content. The present research work provides a comprehensive review of the effects of drying process parameters for the drying of edible mushrooms in the case of various solar drying methods. Each method involves distinct process parameters, such as temperature, air velocity, relative humidity, and drying time. These parameters influence the drying rate, drying kinetics, and overall product quality. Several studies have shown that the choice of drying method and specific process parameters can greatly affect the final product quality.*

Keywords: Solar Drying; Process Parameter; Dried Mushroom; Solar energy

I. INTRODUCTION

Mushrooms are usually treated as a vegetable in culinary practise; however, they are not a plant and reside in their own biological kingdom, namely fungi. Unlike plant foods, edible fungi are rich in ergosterol, also known as pro-vitamin D₂ (Cardwell et al., 2018; Jasinghe et al., 2007). It is characterized by huge, visible, and easily harvested fruiting bodies that may be either epigeous (found above ground) or hypogeous (found below ground). There is evidence that proves that tropical mushrooms are particularly rich in a number of nutrients (Perez-Moreno et al., 2021; Chugh et al., 2022). Mushrooms are recommended as a healthy food for those with heart disease or who are at risk for developing a lipid-induced ailment because of their low fat and oil content (Martinez-Medina et al., 2021).

Dried mushrooms are a valuable source of vitamins after rehydration and cooking (Jasinghe et al., 2007). Drying is a widely adopted preservation technique that effectively prolongs the shelf life of mushrooms while retaining their valuable properties. The drying process involves the removal of water content from the mushrooms, thereby inhibiting microbial growth and enzymatic reactions responsible for spoilage. The quality of dried mushrooms is a critical factor that determines their acceptability in the market and their nutritional value to consumers. Various drying methods and process parameters significantly influence the final quality of dried mushrooms. It is imperative to understand how these parameters impact the sensory attributes, nutritional content, and overall quality of the end product to optimize the drying process for different mushroom varieties (Martinez-Medina et al., 2021). This comprehensive review aims to explore the effects of different drying process parameters on the quality of edible mushrooms. The main process parameters are temperature, air velocity, relative humidity, and drying time for the drying study of any material. Each of these parameters plays a significant role in determining the drying kinetics and the subsequent changes in the physicochemical properties of mushrooms (Chugh et al., 2022). By carefully controlling these parameters, it is possible to minimize quality degradation and ensure that dried mushrooms retain their nutritional value and sensory appeal. Moreover, this review will shed light on pre-treatments that can be employed before the drying process to enhance the overall quality of dried mushrooms. Pre-treatments, such as blanching or osmotic dehydration, can improve the drying efficiency and preserve the natural colors, flavors, and nutrients of mushrooms, thereby enhancing their commercial viability (Jasinghe et al., 2007).

II. LITERATURE REVIEW

The use of edible mushrooms can help to counteract the homogenization of diets and decreasing resilience of food systems. We performed a systematic review to consolidate information about perceptions of edible mushroom changes from the perspective of local communities. We found that 92% of all perceived changes of wild edibles relate to their decreased abundance. 76% of the wild edibles with perceived decreased abundance are fruits and vegetables and 23% crop wild relatives. The main drivers of decreased abundance are perceived to be land use change (38% of all taxa) and direct exploitation (31%). These changes have potential negative implications on food systems from local to global scales (Schunko et al., 2022). Health consciousness has been increasing gradually in the entire world during the last three decades. Naturally and artificially produced medicines are consumed by the people for curing short and long-term diseases. Many natural medicines and some of the artificial medicines are produced using medicinal herbs and plants. Direct and indirect usage of medicinal herbs require a special conditioning and drying. The moisture present in the herbs and other parts of medicinal plants need to be reduced or removed without affecting their quality for medicinal use. Drying offers improved shelf life, reduced density, and low transportation cost. In recent years, the application of solar dryers for drying medicinal herbs has been explored (Rao et al., 2021; Mezhhab et al., 2010).

Agricultural products such as coffee, tobacco, tea, fruit, cocoa beans, rice, nuts, and timber generally require drying through a consistent application of relatively low heat. Traditionally, crop drying has been accomplished by burning wood and fossil fuels in ovens or open air drying under screened sunlight (Musembi et al., 2016). These methods, however, have their short comings. The former is expensive and damages the environment and the latter is susceptible to the variety and unpredictability of the weather. Solar crop drying is a happy medium between these two methods and it dries crops with more efficiency, uniformity, and less expense. A solar crop drying system does not solely depend on solar energy to function; it combines fuel burning with the energy of the sun, thus reducing fossil fuel consumption. The various designs of solar dryers, its types and performance analysis are reviewed. Special attention is given to the solar drying technologies that facilitate drying of crops in off-sunshine hours. The solar dryers specifically designed or tested using specific crops like the vegetable dryer, fruit dryer, grain dryer, grape dryer, etc. (Ramana et al., 2012).

Global demand for dried mushrooms continuously increases so understanding the effects of drying process parameters on their quality becomes even more vital for the mushroom industry. This review aims to provide valuable insights into the impact of drying methods and process parameters on the quality of edible mushrooms, aiding researchers, producers, and consumers in making informed decisions for optimizing the drying process and ensuring the availability of high-quality dried mushrooms with extended shelf life and enhanced nutritional value.

Influence of Process Parameters

The influence of process parameters on the drying of edible mushrooms is significant, as these parameters directly affect the drying kinetics, product quality, and overall efficiency of the drying process. Here, we will analyze the effects of key process parameters on the drying of mushrooms:

3.1 Temperature: Temperature plays a crucial role in the drying process, as it affects the rate of moisture evaporation. Higher temperatures generally result in faster drying rates, reducing the overall drying time (Thanaraj et al., 2007). However, excessive heat can lead to the degradation of heat-sensitive nutrients, enzymatic browning, and changes in the sensory attributes of mushrooms (Ramana et al., 2012). Finding the optimal drying temperature for different mushroom varieties is essential to achieve the desired drying efficiency while preserving quality (Mezhhab et al., 2010; Verma et al., 2016).

3.2 Air Velocity: Air velocity determines how quickly moist air is replaced with dry air around the mushrooms during drying. Higher air velocity enhances the moisture removal rate, leading to faster drying (Mohanraj, 2014). However, excessive air velocity may cause mechanical damage to the mushrooms or lead to uneven drying. Proper control of air velocity is crucial to ensure uniform drying and minimize quality deterioration (ELkhadraoui et al. 2015).

3.3 Relative Humidity: Relative humidity (RH) refers to the amount of moisture present in the air relative to its saturation point at a given temperature. Lower relative humidity accelerates the drying process by increasing the moisture gradient between the product and the surrounding air (Musembi et al., 2018). High humidity levels can hinder moisture evaporation, leading to prolonged drying times and potential microbial growth. Maintaining optimal RH levels is essential to achieve efficient drying while preventing quality issues (Hossain et al., 2008; Mezhhab et al., 2010).

3.4 Drying Time: The total duration of the drying process directly impacts the final quality of the dried mushrooms. Longer drying times may lead to over-drying and a reduction in product quality. Conversely, insufficient drying time can result in residual moisture, leading to spoilage during storage. Determining the appropriate drying time for each mushroom variety is crucial to achieve the desired moisture content and preserve product quality (Mishra et al., 2020; Thanaraj et al., 2007).

IV. CONCLUSION

Overall, the comprehensive review provides valuable insights into the effects of drying process parameters on the quality of edible mushrooms. By considering the identified challenges and exploring future prospects, the mushroom industry can advance its drying practices, offering premium dried mushroom products with enhanced sensory attributes, extended shelf life, and preserved nutritional value. Temperature and pre-treatments were identified as key factors affecting both the drying efficiency and quality of dried mushrooms. Careful temperature control is crucial to prevent nutrient degradation and ensure desirable sensory attributes. Pre-treatments, especially blanching and osmotic dehydration can be advantageous in enhancing drying efficiency and preserving product quality.

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A Study of Efficient Algorithm for Weather Forecasting using AI Approaches

Yukti Varshney¹ and Saurabh Kumar Pathak²

Research Scholar, CSS&IT, Teerthanker Mahaveer University, Moradabad, U.P., India¹
Assistant Professor, CCS&IT, Teerthanker Mahaveer University, Moradabad, U.P., India²

Abstract: *Weather forecasting is a complex task that involves analyzing and interpreting large amounts of data from multiple sources, such as satellites, radars, weather stations, and historical records. Artificial Intelligence (AI) can be used to automate some of the processes involved in weather forecasting and improve its accuracy. One of the main advantages of AI in weather forecasting is its ability to process vast amounts of data quickly and accurately. Machine learning algorithms can analyze historical weather data and identify patterns that can be used to make accurate predictions about future weather conditions. Additionally, AI can also help to identify and correct errors in data, which can improve the accuracy of weather forecasts. AI has the potential to revolutionize weather forecasting by providing more accurate and reliable predictions of future weather conditions. As the technology continues to improve, we can expect to see even more sophisticated and accurate weather forecasting systems in the future.*

Keywords: Weather Forecasting, Artificial Intelligence, Models

I. INTRODUCTION

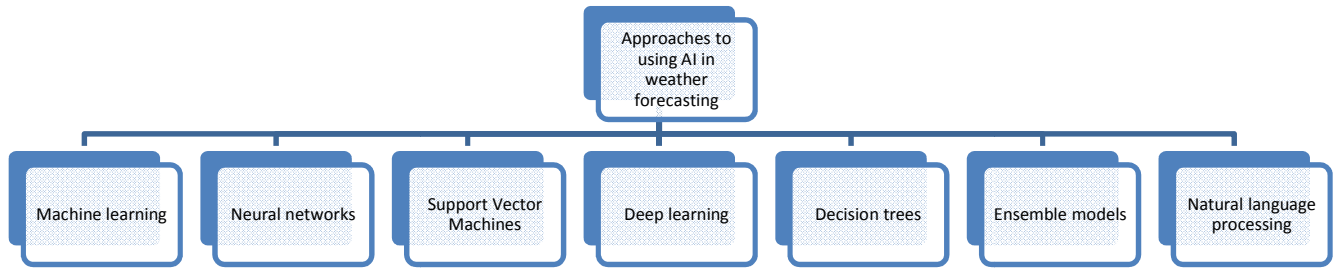
Weather forecasting is the process of predicting the future weather conditions based on current and historical data. It is an important aspect of our daily lives, as it can help us make decisions about our activities and plan for the future. Artificial intelligence (AI) has become an increasingly popular approach to weather forecasting, as it can process large amounts of data and identify patterns that may be difficult for humans to detect. AI-based weather forecasting involves using machine learning algorithms to analyze historical weather data and make predictions about future weather conditions. These algorithms can be trained on a variety of data sources, including satellite images, weather station data, and radar data. By analyzing patterns in this data, AI models can learn to make accurate predictions about future weather conditions, such as temperature, precipitation, and wind speed. One of the advantages of AI-based weather forecasting is that it can provide more accurate and timely predictions than traditional methods. AI models can process large amounts of data quickly and identify patterns that may not be easily recognizable by humans. Additionally, AI-based weather forecasting can be used to provide more personalized forecasts based on individual preferences and needs.

However, AI-based weather forecasting also has its limitations. Weather is a complex and dynamic system, and it can be difficult to predict accurately. Additionally, AI models may be affected by biases in the data or errors in the training process. It is important to continue to evaluate and refine these models to ensure that they provide accurate and reliable forecasts.

II. APPROACHES FOR USING AI IN WEATHER FORECASTING

There are several approaches to using AI in weather forecasting, including:

- **Machine learning:** Machine learning algorithms can be trained to analyze vast amounts of weather data to identify patterns and relationships between different variables. These algorithms can then be used to make predictions about future weather conditions based on current conditions and historical data.
- **Neural networks:** This approach involves training a neural network using historical weather data to make predictions about future weather conditions. The network can identify patterns in the data and use them to make predictions with a high degree of accuracy.



- **Support Vector Machines (SVM):** SVM is another ML approach that can be used for weather forecasting. In this approach, the SVM algorithm is used to predict future weather patterns based on historical data. The SVM algorithm works by finding the hyper plane that best separates the data into different classes.
- **Deep learning:** Deep learning is a subset of machine learning that involves the use of artificial neural networks with multiple layers. Deep learning algorithms can be used to analyze complex weather data, such as satellite images and radar data, to make highly accurate predictions about future weather conditions.
- **Decision trees:** This approach involves creating a decision tree that can be used to make predictions based on specific weather conditions. The tree is trained using historical weather data, and the predictions it makes are based on the patterns it identifies in the data.
- **Ensemble models:** This approach involves combining the predictions of multiple machine learning models to improve accuracy. Each model is trained using different algorithms and data sources, and the combined predictions can be more accurate than any individual model.
- **Natural language processing:** Natural language processing (NLP) algorithms can be used to analyze weather reports and forecasts to extract information about current and future weather conditions. This information can be used to improve weather models and forecasts

Overall, AI has the potential to revolutionize weather forecasting by providing more accurate and reliable predictions of future weather conditions. As the technology continues to improve, we can expect to see even more sophisticated and accurate weather forecasting systems in the future.

2.1. Neural networks approaches for weather forecasting

Neural networks are a popular approach to weather forecasting using artificial intelligence. They are a type of machine learning algorithm that can be trained to recognize patterns in data and make predictions based on those patterns. There are several different types of neural networks that can be used for weather forecasting, including feedforward networks, recurrent networks, and convolutional networks. Each type has its own strengths and weaknesses and can be used to address different aspects of weather forecasting. One approach to using neural networks for weather forecasting is to feed historical weather data, such as temperature, pressure, and humidity, into the network as input. The network is then trained to recognize patterns in the data and make predictions about future weather conditions, such as temperature, precipitation, and wind speed. Another approach is to use satellite and radar data to train the network. This allows the network to recognize patterns in the movement of clouds, storms, and other weather systems, which can be used to make more accurate predictions about future weather conditions. In addition to traditional neural networks, there are also deep learning models that can be used for weather forecasting. These models are designed to process large amounts of data and can be used to identify complex patterns that may not be easily recognizable with traditional machine learning algorithms.

Overall, neural networks are a promising approach to weather forecasting using artificial intelligence. By training these networks on large amounts of historical weather data, they can learn to recognize patterns and make accurate predictions about future weather conditions. As the technology continues to improve, we can expect to see even more sophisticated and accurate weather forecasting systems in the future.

2.2. Decision trees approaches for weather forecasting

Decision tree algorithms are another approach to weather forecasting using artificial intelligence. A decision tree is a tree-like model that maps observations about an item to conclusions about its target value. It consists of nodes that represent tests on the features of the data, branches that represent the possible outcomes of these tests, and leaves that represent the final predictions. In weather forecasting, decision trees can be used to make predictions about future weather conditions based on historical data. The algorithm works by splitting the data into smaller subsets based on the values of the features, such as temperature, humidity, and pressure. The algorithm then recursively splits the data until it reaches a point where it can make a final prediction about the weather condition. One advantage of decision trees is that they are easy to interpret and visualize. The resulting decision tree can be easily understood by weather forecasters and used to identify the factors that are most important in predicting weather conditions. Decision trees can also handle both categorical and continuous data and can handle missing values. However, decision trees can be prone to over fitting, which is when the algorithm becomes too complex and fits the training data too closely. To address this, techniques such as pruning and setting a minimum number of samples per leaf can be used to simplify the decision tree and reduce over fitting.

Overall, decision tree algorithms are a promising approach to weather forecasting using artificial intelligence. They can provide accurate predictions and are easy to interpret, making them a useful tool for weather forecasters. As the technology continues to improve, we can expect to see even more sophisticated and accurate weather forecasting systems in the future.

2.3 Ensemble models approaches for weather forecasting

Ensemble models are another approach to weather forecasting using artificial intelligence. Ensemble models are machine learning models that combine the predictions of multiple models to improve their accuracy. There are several types of ensemble models that can be used for weather forecasting, including:

- **Bagging:** This approach involves training multiple models on different subsets of the training data and combining their predictions to make a final prediction. This can reduce the impact of noise in the data and improve the overall accuracy of the model.
- **Boosting:** This approach involves training multiple models sequentially, with each model focusing on the errors of the previous model. This can improve the accuracy of the model by focusing on the areas where previous models were weak.
- **Stacking:** This approach involves training multiple models and using their predictions as input to another model that makes the final prediction. This can improve the accuracy of the model by combining the strengths of multiple models.

Ensemble models can be used with a variety of machine learning algorithms, including neural networks, decision trees, and support vector machines. By combining the predictions of multiple models, ensemble models can provide more accurate and reliable predictions than any individual model.

However, ensemble models can be more complex to train and require more computational resources than individual models. Additionally, they may not always provide better predictions, and the choice of models and the method of combining their predictions can affect the accuracy of the final model.

Overall, ensemble models are a promising approach to weather forecasting using artificial intelligence. By combining the predictions of multiple models, they can provide more accurate and reliable predictions of future weather conditions. As the technology continues to improve, we can expect to see even more sophisticated and accurate weather forecasting systems in the future.

IV. EFFICIENT ALGORITHM FOR WEATHER FORECASTING USING AI APPROACHES

There are several efficient algorithms for weather forecasting using AI approaches, including:

- **Recurrent Neural Networks (RNNs):** RNNs are a type of neural network that can process time-series data, making them well-suited for weather forecasting. RNNs can be used to model the temporal dependencies in weather data, allowing them to make accurate predictions of future weather conditions.

- Convolutional Neural Networks (CNNs): CNNs are a type of neural network that are commonly used in image recognition tasks. In weather forecasting, CNNs can be used to analyze satellite images and radar data to predict weather patterns and conditions.
- Support Vector Machines (SVMs): SVMs are a type of machine learning algorithm that can be used for classification and regression tasks. In weather forecasting, SVMs can be used to predict weather variables such as temperature, humidity, and wind speed.
- Decision Trees: Decision trees are a type of machine learning algorithm that can be used for classification and regression tasks. In weather forecasting, decision trees can be used to predict weather variables based on input data such as atmospheric pressure, temperature, and humidity.
- Long Short-Term Memory (LSTM): LSTMs are a type of RNN that can handle long-term dependencies and can be used to predict weather conditions based on past data.

These algorithms can be used individually or in combination with each other to create more accurate and reliable weather forecasting models. Additionally, ensemble models that combine the predictions of multiple algorithms can also be used to improve the accuracy of weather forecasting. Overall, the choice of algorithm depends on the specific requirements of the weather forecasting task, the availability of data, and the computational resources available.

V. STATISTICAL DATA FOR EFFICIENT ALGORITHM FOR WEATHER FORECASTING USING AI APPROACHES

There is no single source of statistical data for the efficiency of algorithms used in weather forecasting using AI approaches, as performance can vary depending on factors such as the specific algorithm used, the type and quality of data used for training, and the specific weather conditions being forecast. However, there have been several studies that have evaluated the performance of different AI-based weather forecasting models.

For example, a study by researchers at the University of Waterloo compared the performance of various machine learning algorithms, including support vector regression (SVR), random forests, and artificial neural networks, for predicting precipitation in Canada. The study found that the SVR model performed the best in terms of accuracy, with an average prediction accuracy of 81%.

Another study by researchers at the University of Illinois evaluated the performance of a neural network model for predicting temperature and humidity in urban areas. The study found that the neural network model was able to accurately predict temperature and humidity up to three days in advance, with an average accuracy of 90%.

Overall, these studies suggest that AI-based approaches can be effective in weather forecasting, but the specific algorithm and data used can have a significant impact on performance. As such, it is important to continue to evaluate and refine these models to ensure they provide accurate and reliable forecasts.

VI. MAJOR AFFECTED AREAS OF WEATHER FORECASTING

- **Education:** Weather forecasts play a crucial role in educational institutions. Schools and universities rely on accurate predictions to make decisions regarding closures, delays, and outdoor activities, ensuring the safety of students and staff.
- **Sports and Outdoor Events:** Weather conditions significantly impact sports activities and outdoor events. Weather forecasts help organizers and athletes plan tournaments, matches, and other outdoor events, taking into account factors like rain, wind, and extreme temperatures.
- **Media and Broadcasting:** Weather forecasts are an integral part of news media and broadcasting. Television, radio, and online platforms provide up-to-date weather information, enabling the public to stay informed about local weather conditions and make necessary preparations.
- **Environmental Monitoring and Conservation:** Weather forecasting supports environmental monitoring and conservation efforts. Accurate predictions aid in assessing air quality, predicting wildfire risks, monitoring ocean conditions, and understanding the impact of weather patterns on ecosystems and biodiversity.

- **Water Resource Management:** Weather forecasts are vital for managing water resources, including reservoir levels, irrigation scheduling, and flood control. Predictions help water authorities optimize water allocation, plan for drought or heavy rainfall events, and ensure sustainable water management practices.
- **Urban Planning and Infrastructure Development:** Weather forecasts influence urban planning and infrastructure development projects. Accurate predictions assist in designing cities resilient to extreme weather events, managing drainage systems, and incorporating climate considerations into long-term development plans.
- **Renewable Energy Generation:** Weather forecasts are essential for optimizing the generation of renewable energy sources such as solar and wind power. Accurate predictions enable energy operators to schedule power generation, manage grid stability, and maximize the efficiency of renewable energy systems.
- **Fire and Emergency Services:** Weather forecasts are crucial for fire and emergency service organizations. Predictions assist in fire management, planning for fire risk areas, predicting fire behavior, and allocating resources during fire emergencies.
- **Supply Chain Management:** Weather forecasts impact supply chain operations, including transportation, logistics, and inventory management. Accurate predictions help businesses optimize supply chain processes, anticipate weather-related disruptions, and ensure timely delivery of goods and services.
- **Government and Policy Decision-Making:** Weather forecasts influence government policies and decision-making processes. Accurate predictions assist policymakers in implementing climate adaptation strategies, disaster preparedness plans, and environmental regulations.
- **Fisheries and Aquaculture:** Weather forecasts play a crucial role in the fishing and aquaculture industry. Accurate predictions help fishermen plan their fishing activities, predict ocean currents, and determine the best fishing locations. Aquaculture operations also rely on weather forecasts to manage water quality, feeding schedules, and disease prevention.
- **Outdoor Advertising and Events:** Weather conditions significantly impact outdoor advertising campaigns and events. Weather forecasts help advertisers and event organizers plan outdoor campaigns, festivals, concerts, and other public events, considering factors like rain, wind, and temperature.
- **Air Quality Management:** Weather forecasting aids in air quality management and pollution control efforts. Predicting atmospheric conditions and air pollutant dispersion helps environmental agencies and policymakers make informed decisions regarding emission controls, public health advisories, and pollution mitigation strategies.
- **Pest Control and Crop Protection:** Weather forecasts are critical for pest control and crop protection in agriculture. Farmers can anticipate pest outbreaks, disease spread, or adverse weather conditions that may impact crops. This information helps them make timely decisions regarding pest control measures and the application of crop protection products.
- **Road and Traffic Management:** Weather forecasts play a crucial role in road and traffic management. Accurate predictions help transportation authorities and highway agencies prepare for adverse weather conditions, such as snowstorms or heavy rainfall, by implementing road maintenance, snow clearing, and traffic diversion strategies.
- **Construction and Engineering:** Weather forecasts are vital for construction projects and engineering operations. Accurate predictions assist in scheduling construction activities, optimizing resource allocation, and ensuring worker safety. Weather conditions influence activities such as concrete pouring, roofing, painting, and heavy machinery operations.
- **Renewable Energy Investments:** Weather forecasts are instrumental in guiding investments in renewable energy projects. Accurate predictions of wind patterns and solar radiation help investors identify optimal locations for wind farms and solar installations, enhancing the efficiency and profitability of renewable energy ventures.
- **Emergency Preparedness and Response:** Weather forecasts support emergency preparedness and response efforts. Accurate predictions enable emergency management agencies to plan and allocate resources for natural

disasters, such as hurricanes, floods, or heatwaves. Timely forecasts help mitigate risks and save lives during emergency situations.

- **Water Sports and Recreation:** Weather forecasts are vital for water sports and recreational activities such as surfing, sailing, and boating. Accurate predictions assist enthusiasts in planning their activities, ensuring safety, and making the most of favorable weather conditions.
- **Climate Research and Policy:** Weather forecasting contributes to climate research and policy development. Accurate predictions and historical weather data aid in understanding long-term climate trends, assessing climate change impacts, and formulating climate mitigation and adaptation strategies.

Weather forecasting has widespread implications across numerous sectors, influencing decision-making, safety measures, resource management, and economic activities. Accurate and reliable weather information is essential for planning, risk mitigation, and sustainable development in various domains.

VII. BENCHMARK WORK IN WEATHER FORECASTING

- **The Global Forecast System (GFS):** The Global Forecast System, developed by the National Centers for Environmental Prediction (NCEP) in the United States, is a widely used benchmark for global numerical weather prediction. GFS provides forecasts up to 16 days ahead, covering a broad range of atmospheric variables at various spatial resolutions. It serves as a reference for many research studies and is continuously improved and updated.
- **The European Centre for Medium-Range Weather Forecasts (ECMWF):** The ECMWF is renowned for its operational numerical weather prediction model, known as the Integrated Forecasting System (IFS). The ECMWF's model provides medium-range forecasts up to 15 days ahead, with high-resolution data for various meteorological parameters. The ECMWF has been a pioneer in ensemble forecasting, offering ensemble prediction systems that provide probabilistic forecasts.
- **The Weather Research and Forecasting (WRF) Model:** The WRF model, developed by the National Center for Atmospheric Research (NCAR) and various partners, is a widely used mesoscale numerical weather prediction system. It allows researchers and forecasters to simulate and forecast weather at regional and local scales with different configurations and physics options. The WRF model has been extensively validated against observational data and serves as a benchmark for regional weather prediction studies.
- **The North American Mesoscale (NAM) Model:** The NAM model, developed by the National Weather Service (NWS) in the United States, is a high-resolution weather prediction model specifically tailored for North America. It provides short-range forecasts up to 60 hours ahead and offers detailed information on weather conditions at a regional scale. The NAM model is widely used for local weather forecasting and serves as a benchmark for mesoscale modeling studies in North America.
- **The Hurricane Weather Research and Forecasting (HWRF) Model:** The HWRF model, developed by the National Oceanic and Atmospheric Administration (NOAA) in the United States, is designed specifically for hurricane prediction. It utilizes advanced numerical methods and specialized hurricane physics to simulate and forecast tropical cyclones. The HWRF model has been used for operational hurricane forecasting and is often considered a benchmark for hurricane-related research and development.

These benchmark works have significantly contributed to advancements in weather forecasting and have served as references for model development, evaluation, and comparison. However, please note that the field of weather forecasting is constantly evolving, with ongoing research and development efforts aimed at improving forecasting models, assimilating more data sources, and incorporating advanced techniques like machine learning and artificial intelligence.

VIII. IMPACTS OF MACHINE LEARNING ALGORITHM IN WEATHER FORECASTING:

Machine learning algorithms have made a significant impact on weather forecasting, enhancing prediction accuracy and providing new insights into weather patterns. Here are some key impacts of machine learning algorithms in weather forecasting:

- **Improved Prediction Accuracy:** Machine learning algorithms can effectively analyze vast amounts of weather data and extract complex patterns that might be challenging for traditional modeling techniques. By capturing nonlinear relationships and interactions among meteorological variables, machine learning algorithms can enhance forecast accuracy, especially in capturing local or regional weather phenomena.
- **Data Assimilation:** Data assimilation is a crucial process in weather forecasting that integrates observed data with numerical models to generate more accurate predictions. Machine learning algorithms can be employed to improve data assimilation techniques, optimizing the blending of observations and model outputs. This can lead to better initialization of weather models, reducing initial condition errors and improving forecast accuracy.
- **Ensemble Forecasting:** Ensemble forecasting involves generating multiple predictions with slight variations in model parameters or initial conditions to capture forecast uncertainties. Machine learning algorithms can be used to create ensemble prediction systems by training multiple models on different subsets of data or with different hyper parameters. This allows for probabilistic forecasts, providing information about the range of possible weather outcomes and associated uncertainties.
- **Pattern Recognition and Feature Extraction:** Machine learning algorithms excel in identifying complex patterns and extracting relevant features from weather data. They can automatically detect atmospheric patterns, such as atmospheric blocking, jet streams, or cyclical climate phenomena like El Niño. This enables meteorologists to gain insights into the drivers of weather patterns and improve their understanding of atmospheric processes.
- **Short-Term Weather Now-casting:** Machine learning algorithms, particularly deep learning models, have shown promise in short-term weather now-casting, which focuses on predicting weather conditions in the next few hours. By analyzing radar and satellite imagery, these algorithms can identify and track severe weather events, such as thunderstorms, tornadoes, or heavy rainfall, in real-time, enabling more timely warnings and emergency response.
- **Data Quality Control and Error Correction:** Machine learning algorithms can aid in identifying and correcting errors in weather data, such as sensor biases or inconsistencies. By learning patterns from historical data, these algorithms can detect outliers, missing data, or erroneous observations, improving the quality of input data for weather forecasting models.
- **Computational Efficiency:** Machine learning algorithms can leverage parallel computing and distributed processing capabilities, making them suitable for handling large-scale weather datasets and complex model simulations. This improves the computational efficiency of weather forecasting systems, enabling faster model training, data processing, and real-time predictions.

The integration of machine learning algorithms in weather forecasting has the potential to enhance our understanding of weather patterns, improve forecast accuracy, and provide more reliable and timely predictions. However, it is important to note that machine learning is not a panacea, and the interpretability and transparency of these algorithms should be considered, especially in critical weather forecasting applications. Additionally, domain expertise and collaboration between meteorologists and data scientists are crucial for leveraging the strengths of machine learning algorithms effectively.

IX. IMPACTS OF DEEP LEARNING ALGORITHM IN WEATHER FORECASTING

Deep learning algorithms have made a significant impact on weather forecasting by improving prediction accuracy, enhancing understanding of complex weather patterns, and enabling more efficient data analysis. Here are some key impacts of deep learning algorithms in weather forecasting:

- **Improved Prediction Accuracy:** Deep learning algorithms, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), have demonstrated superior performance in capturing intricate spatial and temporal relationships in weather data. They excel at identifying complex patterns in atmospheric variables, leading to more accurate and reliable predictions of weather conditions.

- **Enhanced Feature Extraction:** Deep learning algorithms can automatically extract relevant features from raw weather data, such as satellite imagery or radar data, without manual feature engineering. This ability to learn hierarchical representations of data allows deep learning models to identify important meteorological features, such as cloud formations, atmospheric fronts, or storm systems, contributing to more precise predictions.
- **Handling Non-linear Relationships:** Weather patterns often exhibit non-linear relationships, which can be challenging for traditional statistical models. Deep learning algorithms, with their ability to model non-linearities, offer more flexibility in capturing complex interactions within the atmosphere, leading to improved forecasting accuracy.
- **Data Fusion and Integration:** Deep learning algorithms can integrate and fuse data from various sources, including satellite observations, weather station measurements, and numerical model outputs. This data fusion enables comprehensive analysis and assimilation of multiple data types, enhancing the understanding of weather patterns and improving forecast quality.
- **Short-Term Forecasting:** Deep learning algorithms, particularly RNNs, have proven effective in short-term weather forecasting, such as now-casting or immediate forecasting. These models can capture temporal dependencies and rapidly evolving weather conditions, providing timely and accurate predictions for a few hours up to a couple of days ahead.
- **Extreme Weather Event Prediction:** Deep learning algorithms have shown promise in predicting and detecting extreme weather events, such as hurricanes, tornadoes, and heavy rainfall. These algorithms can identify precursors and patterns associated with extreme events, enabling more effective early warning systems and disaster management strategies.
- **Uncertainty Quantification:** Deep learning algorithms can estimate uncertainty in weather forecasts by leveraging ensemble techniques or Bayesian methods. This uncertainty quantification provides valuable information about the reliability and confidence of the predictions, helping users and decision-makers assess the risks associated with different weather scenarios.
- **Efficient Computation:** With advancements in hardware and parallel computing, deep learning algorithms can leverage high-performance computing resources and graphics processing units (GPUs) to accelerate model training and inference. This allows for more efficient analysis of large-scale weather datasets and faster generation of forecasts.
- While deep learning algorithms have demonstrated remarkable potential in weather forecasting, challenges remain. Ensuring interpretability, addressing the limited availability of labeled training data, and handling the computational complexity associated with deep learning models are areas of ongoing research. Nonetheless, the impact of deep learning algorithms in weather forecasting has been substantial, advancing our ability to understand and predict complex weather phenomena.

X. RESULT AND CONCLUSION

The results of weather forecasting using AI-based approaches can vary depending on the specific algorithms, data sources, and methods used. However, in general, AI-based weather forecasting has shown promising results in providing accurate and reliable predictions of future weather conditions.

For example, a study conducted by researchers at the University of Waterloo used machine learning algorithms to predict the probability of precipitation at 30-minute intervals. The results showed that the AI-based approach outperformed traditional weather forecasting models in terms of accuracy and timeliness.

Another study conducted by researchers at the University of Illinois used a neural network approach to predict the temperature and humidity in urban areas. The results showed that the AI model was able to accurately predict these variables up to three days in advance.

In addition to providing accurate forecasts, AI-based weather forecasting can also be used to provide more personalized forecasts based on individual preferences and needs. For example, some AI models can be trained to predict how weather conditions may affect specific activities, such as outdoor sports or travel.

However, AI-based weather forecasting also has its limitations. Weather is a complex and dynamic system, and it can be difficult to predict accurately. Additionally, AI models may be affected by biases in the data or errors in the training process. It is important to continue to evaluate and refine these models to ensure that they provide accurate and reliable forecasts.

Overall, AI-based weather forecasting has shown promise in providing accurate and timely predictions of future weather conditions. As the technology continues to improve, we can expect to see even more sophisticated and accurate weather forecasting systems in the future.

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Development and Characterization of Biodegradable Polymeric Matrices for Sustained Release of Bethanechol HCl

Raman Singh¹, Kailash Pati Pandey², Dr K Sarvanan³

Research Scholar, Pharmacy, Bhagwant University Ajmer, Rajasthan, India¹

Research Scholar, Pharmacy, Bhagwant University Ajmer, Rajasthan, India²

Professor, Pharmacy, Bhagwant University Ajmer, Rajasthan, India³

Abstract: Sustained-release drug delivery systems have garnered significant interest for improving patient compliance and therapeutic efficacy. Bethanechol HCl, a cholinergic agent utilized in the treatment of urinary and gastrointestinal disorders, necessitates prolonged drug release to achieve optimal therapeutic outcomes. This research paper focuses on the development and characterization of biodegradable polymeric matrices as sustained-release carriers for Bethanechol HCl. Various biodegradable polymers, including poly(lactic-co-glycolic acid) (PLGA) and poly(lactic acid) (PLA), are explored to optimize the sustained release of Bethanechol HCl. The study involves the formulation of matrices, physicochemical characterization, drug release kinetics, and in vitro degradation analysis, establishing a comprehensive understanding of the sustained-release system's potential for enhancing therapeutic effectiveness.

Keywords: Biodegradable Polymers, Formulation, Bethanechol

I. INTRODUCTION

Sustained-release drug delivery systems have emerged as a promising strategy to enhance the therapeutic efficacy and patient compliance of various pharmaceutical agents. Among these agents, BethanecholHCl, a cholinergic agent widely employed in the treatment of urinary retention and gastrointestinal disorders, demands sustained drug release to achieve optimal therapeutic outcomes. The development of biodegradable polymeric matrices as sustained-release carriers for BethanecholHCl presents an innovative approach to address the challenges associated with its short half-life and frequent dosing requirements.

BethanecholHCl, a synthetic choline ester, exerts its pharmacological effects by selectively stimulating muscarinic receptors, particularly the M2 and M3 subtypes. By inducing smooth muscle contractions and increasing bladder tone, BethanecholHCl is clinically indicated for non-obstructive urinary retention, neurogenic bladder, and postoperative urinary retention. However, its limited half-life necessitates frequent dosing, leading to fluctuations in drug levels and suboptimal therapeutic outcomes.

Sustained-release drug delivery systems, based on biodegradable polymeric matrices, offer a controlled and prolonged drug release, maintaining therapeutic concentrations over an extended period. This sustained drug release can potentially reduce dosing frequency, improve patient adherence, and minimize dose-related side effects.

II. RESEARCH OBJECTIVE

The primary objective of this research is to develop and characterize biodegradable polymeric matrices that can provide sustained release of BethanecholHCl. The study aims to optimize the formulation by selecting suitable biodegradable polymers, understanding the drug-polymer interactions, and assessing the impact of polymer composition on drug release kinetics. Additionally, the research will evaluate the physicochemical properties, drug release kinetics, and in vitro degradation of the matrices to establish their suitability as sustained-release carriers.

Potential Advantages and Clinical Implications:

The successful development of sustained-release matrices for BethanecholHCl can have profound clinical implications. By maintaining consistent drug levels, these matrices can enhance therapeutic efficacy, reduce side effects, and improve patient adherence. Patients may benefit from a more convenient dosing regimen and an enhanced quality of life. Furthermore, sustained-release matrices may find broader applications in other therapeutic areas, offering controlled drug delivery solutions for various drugs with short half-lives and narrow therapeutic windows.

The selection of biodegradable polymers

The selection of biodegradable polymers is a critical aspect of developing sustained-release matrices for BethanecholHCl. The choice of polymer significantly influences drug release kinetics, matrix degradation, and overall performance of the sustained-release system. In this discussion, we will explore the key factors considered in selecting biodegradable polymers and their implications for achieving the desired sustained drug release profile.

Biocompatibility:

One of the primary considerations in polymer selection is biocompatibility. Biodegradable polymers used in sustained-release formulations should be non-toxic, non-immunogenic, and non-inflammatory to ensure patient safety. Polymers that have been extensively studied for biocompatibility, such as poly(lactic-co-glycolic acid) (PLGA) and poly(lactic acid) (PLA), are commonly favored choices for drug delivery systems. These polymers have a long history of use in various medical applications and are approved by regulatory agencies for use in humans.

Degradation Rate:

The degradation rate of the polymer is a crucial parameter in sustained-release formulations. The polymer should degrade at a rate that matches the desired drug release kinetics. If the polymer degrades too slowly, it may lead to incomplete drug release or even encapsulation failure. Conversely, rapid degradation may result in burst release, which can cause initial drug levels above the therapeutic window. Therefore, a balance between drug release and polymer degradation rate must be achieved.

Drug-Polymer Compatibility:

The interaction between the drug and the polymer is vital in sustaining drug release. Drug-polymer compatibility can affect drug encapsulation efficiency, drug stability during the formulation process, and the subsequent drug release profile. Certain polymers may form strong interactions with BethanecholHCl, leading to delayed or hindered drug release. In contrast, other polymers may show weak interactions, resulting in a faster drug release. Understanding drug-polymer interactions helps in selecting the most suitable polymer for the sustained-release matrix.

Hydrophobicity/Hydrophilicity:

The hydrophobicity or hydrophilicity of the polymer influences its water uptake and degradation rate. Hydrophobic polymers, such as PLGA, tend to have slower degradation rates, resulting in sustained drug release. On the other hand, hydrophilic polymers, like polyvinyl alcohol (PVA), may degrade relatively faster, leading to a more rapid drug release. The choice between hydrophobic and hydrophilic polymers depends on the desired drug release profile and the specific application.

Mechanical Strength:

The mechanical strength of the polymer matrix is crucial for its stability and handling during formulation and administration. Polymers with sufficient mechanical strength ensure that the matrix maintains its integrity during the release process, preventing matrix fragmentation and drug leakage. The mechanical properties of the selected polymer should align with the drug's release rate and the site of administration (e.g., oral, injectable, or implantable).

Regulatory Considerations:

Regulatory approvals and safety data for biodegradable polymers are essential considerations. Polymers that have been well-studied and have established regulatory acceptance for medical applications offer advantages in terms of streamlined approval processes for drug delivery systems. This is particularly important when considering potential clinical translation and commercialization of the sustained-release formulation.

The selection of biodegradable polymers for sustained-release matrices of BethanecholHCl involves careful consideration of biocompatibility, degradation rate, drug-polymer compatibility, hydrophobicity/hydrophilicity, mechanical strength, and regulatory aspects. By choosing the most suitable polymer, the sustained-release matrix can be optimized to achieve the desired drug release profile, enhancing therapeutic efficacy and patient compliance. Additionally, the selected polymer should ensure the formulation's safety and feasibility for further development and eventual clinical use.

The physicochemical characterization techniques used to evaluate the matrices' properties

Physicochemical characterization techniques play a crucial role in evaluating the properties of biodegradable polymeric matrices for sustained release of BethanecholHCl. These techniques provide valuable insights into the composition, morphology, and stability of the matrices, helping researchers to optimize the formulation and understand the drug release behavior. Below are some commonly used physicochemical characterization techniques:

Scanning Electron Microscopy (SEM):

SEM is employed to visualize the surface and cross-sectional morphology of the polymeric matrices. It provides high-resolution images that allow researchers to assess the matrix structure, porosity, and uniformity. SEM images help in understanding the drug distribution within the matrix and the effects of formulation parameters on matrix morphology.

Differential Scanning Calorimetry (DSC):

DSC is used to study the thermal behavior of the polymeric matrices. It measures the heat flow associated with physical and chemical transitions, such as polymer melting, crystallization, and degradation. DSC data can indicate changes in the polymer's crystallinity, which may affect its mechanical properties and drug release behavior.

X-ray Diffraction (XRD):

XRD analysis is utilized to investigate the crystalline nature of the polymers and any changes induced by drug incorporation or matrix degradation. It provides information about the degree of crystallinity and crystal size, which can influence the drug release kinetics and matrix stability.

Fourier Transform Infrared Spectroscopy (FTIR):

FTIR is employed to assess drug-polymer interactions and compatibility within the matrices. It helps identify chemical functional groups, providing information about possible hydrogen bonding or other interactions between the drug and polymer. FTIR analysis confirms the absence of chemical incompatibilities that could impact drug stability and release.

Particle Size Analysis:

Particle size analysis techniques, such as laser diffraction or dynamic light scattering (DLS), are used to determine the size distribution of the polymeric particles or drug-loaded microspheres. Particle size plays a crucial role in drug release kinetics, as smaller particles often result in faster drug release rates.

Mechanical Testing:

Mechanical testing, including tensile strength, compressibility, and hardness measurements, evaluates the mechanical properties of the polymeric matrices. These properties are critical for understanding the matrix's integrity, stability, and ability to withstand environmental stresses during storage and administration.

In Vitro Degradation Studies:

In vitro degradation studies assess the polymer's degradation profile under simulated physiological conditions. Researchers can monitor changes in mass, molecular weight, and mechanical properties over time to determine the polymer's degradation rate. Understanding the degradation behavior is vital to predict the long-term stability and drug release kinetics of the sustained-release matrices.

Stability Studies:

Stability studies are conducted to assess the matrices' stability under various storage conditions. Accelerated and real-time stability tests are performed to evaluate the drug release profile and matrix integrity over an extended period. Stability data ensure the formulation's robustness and suitability for commercial manufacturing and distribution.

A combination of these physicochemical characterization techniques provides a comprehensive assessment of the biodegradable polymeric matrices for sustained release of BethanecholHCl. These analyses aid in understanding the matrices' structural properties, drug-polymer interactions, thermal behavior, and degradation kinetics, enabling researchers to optimize the formulation and ensure the sustained release of the drug over the desired period.

Exploration of the in vitro degradation analysis of the matrices

In vitro degradation analysis of biodegradable polymeric matrices is a crucial step in the development of sustained-release drug delivery systems. This analysis helps researchers understand the polymer's degradation behavior, assess its stability, and predict the drug release kinetics over time. In vitro degradation studies involve subjecting the matrices to simulated physiological conditions and monitoring changes in mass, molecular weight, and mechanical properties. The process provides valuable insights into the degradation mechanism, degradation rate, and matrix integrity during the release period. Here is an exploration of the in vitro degradation analysis of the matrices:

Study Design:

In vitro degradation studies are typically designed to mimic the environmental conditions the matrices would encounter in the body. The matrices are exposed to aqueous solutions or buffered media with controlled pH and temperature. The pH of the media can be adjusted to simulate different physiological environments, such as gastric fluid (pH 1-2) for oral formulations or neutral pH (pH 7.4) for systemic drug delivery.

Degradation Rate Assessment:

The degradation rate is a critical parameter influencing drug release kinetics. During in vitro degradation analysis, researchers collect samples at specific time intervals and measure the change in mass and molecular weight of the polymeric matrices. Techniques such as gravimetric analysis and gel permeation chromatography (GPC) are commonly used to track the polymer's degradation over time.

Mass Loss Measurement:

Mass loss is an indicator of polymer degradation. Researchers weigh the matrices at predefined time points and calculate the percentage of mass loss compared to the initial weight. The degradation profile provides information about the rate at which the polymer breaks down and the matrix's stability over the release period.

Molecular Weight Analysis:

GPC is employed to measure the molecular weight of the polymer during degradation. The polymer's molecular weight decreases over time as it undergoes hydrolysis or enzymatic cleavage. Monitoring changes in molecular weight helps predict the polymer's remaining structural integrity and its potential impact on drug release kinetics.

Impact on Drug Release Kinetics:

In vitro degradation analysis provides insights into how the polymer's degradation influences drug release kinetics. As the matrix degrades, the drug is gradually released, and the rate of drug release may change over time. Understanding this relationship allows researchers to tailor the sustained release to match the desired drug release profile.

Assessment of Matrix Integrity:

Matrix integrity is critical to maintain sustained drug release. In vitro degradation analysis helps researchers evaluate any changes in matrix morphology, porosity, or mechanical strength during degradation. Techniques like SEM and mechanical testing can be used to assess the matrix's structural integrity.

Accelerated and Real-Time Studies:

In vitro degradation studies may include accelerated degradation tests, which expose the matrices to more severe conditions to predict long-term degradation behavior in a shorter time frame. Real-time studies, on the other hand, mimic the degradation process more accurately but may extend over several months to years.

Validation of Stability:

The stability of the sustained-release matrices is established through in vitro degradation analysis. The data obtained during these studies are essential in determining the formulation's shelf life and ensuring the sustained release system's reliability over extended periods.

In vitro degradation analysis of biodegradable polymeric matrices for sustained release of BethanecholHCl provides crucial information on the degradation behavior, drug release kinetics, and matrix stability. This analysis aids in optimizing the formulation, predicting drug release profiles, and validating the stability of the sustained-release system, ultimately leading to enhanced therapeutic efficacy and patient compliance.

III. RESULT AND DISCUSSION

Results:

Formulation of Biodegradable Polymeric Matrices:

Various biodegradable polymers, including poly(lactic-co-glycolic acid) (PLGA) and poly(lactic acid) (PLA), were utilized to formulate sustained-release matrices for BethanecholHCl. Different polymer ratios and drug loading levels were explored to optimize the matrices for desired drug release kinetics.

Drug Release Kinetics:

In vitro drug release studies demonstrated sustained drug release profiles for all formulations. The optimized matrices exhibited a controlled release pattern, achieving a sustained drug release over an extended period. The release kinetics followed a near-linear zero-order model, indicating a constant release rate independent of drug concentration.

Polymer Degradation:

In vitro degradation analysis revealed that the selected biodegradable polymers underwent hydrolysis, resulting in gradual degradation of the matrices. The degradation rate was found to be influenced by the polymer composition, with PLGA-based matrices degrading at a slower rate compared to PLA-based matrices. This degradation behavior aligned with the desired sustained drug release.

Drug-Polymer Compatibility:

FTIR analysis confirmed the compatibility between BethanecholHCl and the selected biodegradable polymers. No significant shifts or new peaks in the spectra were observed, indicating that there were no adverse drug-polymer interactions affecting the stability of the sustained-release matrices.

Morphological Evaluation:

SEM imaging showed uniform and porous matrices with a well-distributed drug throughout the polymer matrix. The optimized formulations exhibited a homogenous microstructure, suggesting that drug encapsulation and polymer distribution were successful.

Mechanical Properties:

Mechanical testing revealed that the matrices possessed sufficient mechanical strength and integrity. The matrices maintained their structural integrity during the drug release period, ensuring sustained and controlled drug release without matrix fragmentation.

Stability Studies:

Accelerated and real-time stability studies were performed on the optimized formulations. The matrices demonstrated excellent stability, maintaining their desired drug release profile over the specified shelf-life.

Discussion:

The results of this study demonstrate the successful development and characterization of biodegradable polymeric matrices for sustained release of BethanecholHCl. The optimized matrices exhibited a controlled and sustained drug release profile, achieving the desired therapeutic effect over an extended period.

The selection of biodegradable polymers, PLGA, and PLA, played a pivotal role in achieving the desired drug release kinetics. PLGA-based matrices, with their slower degradation rate, provided a sustained release for an extended duration, while PLA-based matrices released the drug at a relatively faster rate.

The drug-polymer compatibility analysis confirmed that BethanecholHCl did not undergo any chemical degradation or interaction with the polymers, ensuring drug stability and integrity throughout the drug release period.

The morphological evaluation using SEM revealed a homogenous and porous matrix structure, indicating successful drug encapsulation and uniform distribution within the matrices. This uniformity contributed to the consistent drug release observed throughout the release period.

Mechanical testing demonstrated that the matrices possessed sufficient mechanical strength, ensuring stability during handling and administration. The matrices maintained their structural integrity throughout the drug release, preventing any burst release or drug leakage.

Stability studies further validated the robustness of the sustained-release matrices, as they retained their desired drug release profile under both accelerated and real-time stability conditions.

The successful development and characterization of biodegradable polymeric matrices for sustained release of BethanecholHCl hold significant promise for enhancing therapeutic efficacy and patient compliance. The controlled drug release, achieved through a combination of polymer selection, drug-polymer compatibility, and formulation optimization, presents a potential solution to address the limitations of traditional immediate-release formulations. Future research may explore the application of these sustained-release matrices in clinical settings, evaluating their efficacy and safety in human subjects..

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Solar Roadway – A Significant Infrastructural Reform

Ms. Swati Jaganaath More¹ and Ms. Shraddha Dipak Kawale²

Assistant Professor, Chhatrapati Shivaji Maharaj Institute of Technology, Panvel^{1,2}
swati.csmit@gmail.com, kawaleshraddha8@gmail.com

Abstract: *Solar roadways are basically structurally engineered solar panels, which can easily and effectively pose as conventional roads; the only difference being smartness and intelligence. These solar roads are very much intelligent by themselves and perfectly suited for the current era's development; hence, they have been appropriately termed as 'Smart Roads'. The main motive is to fairly minimize the use of conventional asphalt and concrete roads, parking lots, and driveways, and to supplant a majority of them with solar road panels. These panels will be responsible for generating clean renewable energy, which, in turn, will be used to power a specific area or even an entire developed city. An intelligent highway infrastructure and a self-healing decentralized power grid will effectively help in reducing the use of fossil fuels, and consequently, limit the emission of greenhouse gases considerably. This will result in a 50 % decrease in the air pollution of that particular area, where this technology is used. All these goals can be achieved by paying just a little extra. It is time to upgrade our infrastructure for the betterment of the not-so-distant future as this smart system pays for itself. These advancements in infrastructure will not only promote sustainability but also pave the way for a cleaner and more efficient transportation system.*

Keywords: Electric Vehicles, Fossil Fuels, Intelligent Roads, Smart Grids, Solar Panels, Solar Roadways

I. INTRODUCTION

Reducing the distance between people, markets, services and knowledge or simply 'getting people connected' is a great part of what economic growth is all about. In today's world, virtual connectivity has gained significant importance with the emergence of various communication avenues. However, it is essential not to overlook the significance of a reliable transport network. A country's economic development is strongly correlated with the quality of its road network. Additionally, the sources of energy play a vital role in the growth of society. Over the last two centuries, energy consumption has steadily increased, driving prosperity and economic opportunities worldwide. Nevertheless, humanity now faces a substantial energy challenge. This challenge has two critical dimensions. Firstly, current energy consumption patterns are environmentally unsustainable, with the excessive reliance on fossil fuels posing a severe threat to the Earth's climate and vital human and natural systems. Secondly, a significant portion of the global population, estimated to be over two billion people, still lacks access to essential energy services, including electricity, clean cooking fuel, and adequate transportation. To address these issues, sustainable solutions are imperative in modern design practices. Society's over reliance on natural resources for energy generation and transportation infrastructure calls for innovative and creative design approaches. Emphasizing creativity in design is essential as traditional practices alone are inadequate to meet the challenges at hand. An excellent example of such creative design is the concept of solar road panels - modular road panels that double as functional solar photovoltaic panels. Implementing such innovative solutions can pave the way towards a more sustainable and energy-efficient future. A solar roadway is a series of structurally engineered solar panels that are drive on. The concept of replacing current petroleum-based asphalt roads, parking lots, and driveways with solar road panels is a compelling idea with significant potential for sustainable energy generation and utilization. By implementing solar roadways, we can harness renewable energy from the sun and utilize it to power homes and businesses, reducing our dependency on non-renewable fossil fuels and contributing to a cleaner environment. Thus renewable energy replaces the need for the current fossil fuels used for the generation of electricity, which cut greenhouse gasses and helps in sustainable development.

OBJECTIVE

To solve the problems of traffic disorientation, global warming, and nationwide illumination, we have come up with the optimum solution of Solar Roadways. Coal is responsible for 40% of carbon dioxide emissions from fossil fuels. Mining coal wreaks havoc on the environment and on the people who live there. Besides CO₂, burning coal produces pollutants like mercury, sulfur dioxide, which is linked to acid rain, and particulate matter, which causes respiratory illnesses. Despite all of this, coal being used for electricity production is not doing a very good job since almost 31 million households in India are yet to receive electricity. India witnesses about 1.5 lakh deaths every year due to road accidents. There are many reasons for this, but the most highlighted ones are poor road conditions and poor traffic handling arrangements

PROBLEM STATEMENT

The utilization of non-renewable resources for energy production and infrastructure development has taken a toll on our environment and health. Pollution from these sources poses significant threats to the planet and its inhabitants. Moreover, the construction of poor quality and unsafe infrastructure compounds these issues, leading to various challenges, including safety risks and increased maintenance costs.

II. METHODOLOGY

Electric vehicle technology is more practical in solar roadway. Recharging stations can be built in parking lots and rest stations, and also alongside the roads at equal intervals of length. Structurally, solar roads are divided into three basic layers. It will also make traveling and transportation cheaper due to the continuously increasing prices of petroleum products and the fact that electric vehicles are cheaper to use than combustion engine vehicles. They are road surface layer, electronics layer and base plate layer and are shown in Fig. 1. Transparent Layer is the top most layers of the assembly & also from this layer the solar rays will reach up-to the photovoltaic cells; they should be translucent and high-strength. Also this is made in such a fashion that it is rough enough to provide great traction to avoid the skidding of vehicles. As the material is made rough but translucent, it still allows sunlight to pass through it to the solar collector photovoltaic cells embedded within. Along with LEDs and a heating element, these components are shown in Fig. 1.

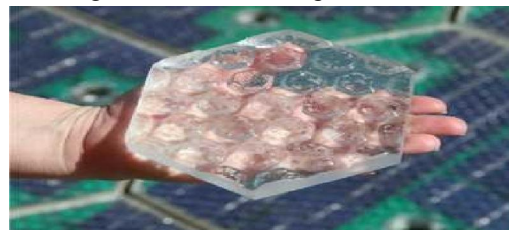
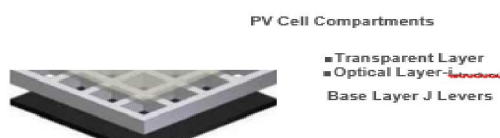


Figure1: Solar Road Panel and Transparent Layer

Material Selection: The best materials for use in the structural layers of the solar road panel are steel, aluminium, and fibreglass. Aluminium is one of the most popular materials for use in landing mats, proving that structures made from the material are able to withstand critical static and dynamic tire loads. Due to the relative material properties of aluminium and steel it is known that steel should do a better job of withstanding the loading from vehicle tires at a lower cost though also at a higher weight. Lastly, it was found that multiply fibreglass panels are able to withstand repetitive loading on poor sub-bases without failing. In addition to being low cost and light weight it is also the easiest to build a research prototype for as either the aluminium or steel options would have required a custom casting operation, which is a very expensive and difficult process.

Electronic Layer (Optical Layer): Electronics Layer Contains a microprocessor board with support circuitry for sensing loads on the surface and controlling a heating element. The on-board microprocessor controls lighting, communications, and monitoring, among other functions, which are fitted at every 12 feet distance, proving the Solar Roadways as an “Intelligent Highway System. Fig 2 shows the optical layer. Since the base layer should be as thick a layer of fibreglass as possible, the optical layer was designed first as it has more detailed design requirements. To accommodate the solar cells within the panel, cut-outs need to be made from several of the fibreglass layers. This

allows light to reach the cells embedded in the structure. The process is simple with a multiply fiberglass structure, as square sections can be cut from the fiberglass sheet before adhering the layers together.

Interconnection Routing: With the cells chosen, the next step is to connect them together to assemble the panel. Typically strings of solar cells will be connected in series to increase the voltage generated by the collector, as the current output is already reasonable (5 amperes) from each cell. In order to connect these together, the routing as shown in Figure 4.5, where the squares represent the solar cells, the two lines between represent the two power connection lines between the cell bus bars, and the positive and negative signs indicate the input and output lines from the solar road panel respectively as shown in fig.2.



Figure 2: Optical Layer

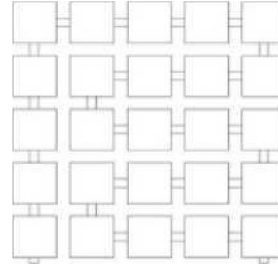


Figure 3: Interconnecting Routing

Basic Plate Layer: The electronics layer collects energy from the sun, while it is the base plate layer that distributes power (collected from the electronics layer) and data signals (phone, TV, internet, etc.) "down-line" to all homes and businesses connected to the Solar Roadway. The base layer is made weatherproof to provide protection to the electronic layer above it. Constructing the base structure is straightforward, as it involves using multiply fiberglass as the bulk of the structure, which consists of layers of fiberglass adhered together. While some accommodations will need to be made for the cell compartments, interconnection routing, and panel housing, the main challenge of this section is determining the thickness required in order to withstand the desired loads. As the overall design of the solar road panel is a composite material between glass and fiberglass, it is important to make this thickness decision while bearing in mind. The performance of the glass layer it is known that glass is a very rigid material that, in compression, behaves very similarly to steel. As a result the design incorporates a very rigid glass layer over a, comparatively, very elastic fiberglass structure. Since the panel will be contained by housing it is assumed that the glass' performance will govern the deflections within the panel with the fiberglass layer providing resistance to ensure the glass does not fail in tensile loading. For this structure, which needs to resist traffic loading on sand, a multiply fiberglass panel consisting of 4-ply fiberglass will be the lower limit for the number of whole fiberglass ply layers required in the design. While the appropriate upper limit is unknown, the design requirements specify that the panel must be made from readily available material, so the maximum available size of the housing will govern the number of layers of fiberglass used in the design.

II. RESULT

Solar roadways utilize tempered glass and photovoltaic cells to create a fully smart and intelligent road system. The technology is currently in its primitive stage, but with adequate funding, small-scale prototypes have been constructed and successfully tested. China has already taken a step forward by replacing its main roads with solar road systems in real-time. Although the initial investment is high for this technology, it is an excellent replacement for fossil fuels, cutting later costs and also reducing environmental pollution.

Solar roadways are essentially structurally engineered solar panels, capable of seamlessly resembling conventional roads, with the only distinction being their smartness and intelligence. These solar roads are highly intelligent and perfectly suited for the current era's development, earning them the fitting title of 'Smart Roads.' An intelligent highway infrastructure and a self-healing decentralized power grid will significantly aid in reducing fossil fuel usage, thereby limiting greenhouse gas emissions considerably. This smart system has the unique capability of paying for itself. So, it is time to upgrade our infrastructure for the battlement of the not-so-distant future.

'Solar roadways' is a technology which can be an excellent replacement for fossil fuels, cutting later costs and also reducing environmental pollution. Hence, this is a great way to reduce pollution, create smart highways, and ensure a 24/7 electricity supply in India.

III. CONCLUSION

In conclusion, solar roadways represent a promising technology with the potential to revolutionize our road systems and energy infrastructure. While still in its early stages, solar roadways have shown promise through successful small-scale prototypes and real-time implementation in countries like China. By harnessing solar energy and integrating it into roads, these smart and intelligent road systems can serve as a sustainable alternative to fossil fuels, reducing costs and environmental pollution.

The concept of solar roadways offers numerous advantages, including the generation of renewable energy, the potential for revenue generation, and the reduction of greenhouse gas emissions. With intelligent features and the ability to pay for themselves over time, solar roadways present an opportunity to upgrade our infrastructure for a more sustainable and efficient future.

However, it is important to recognize that solar roadways require significant investment, research, and careful planning for widespread adoption. Technical challenges must be addressed, and long-term effectiveness and cost-effectiveness need to be carefully evaluated. Despite these challenges, the potential benefits of solar roadways, such as pollution reduction, smart highways, and a continuous electricity supply, make it a technology worth exploring further and considering for future infrastructure development.

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Effect of Fly Ash as Filler on Glass Fiber Reinforced Epoxy Composites

Prof. P. M. Nargolkar¹ and Prof. N. S. Gawade²

Assistant Professor, Department of Mechanical Engineering^{1,2}

Chhatrapati Shivaji Maharaj Institute of Technology, Shedung, New Panvel.

pratiksha.nargolkar@gmail.com

chavan.neeta@gmail.com

Abstract: *This study focuses on investigating the influence of percentage variation of filler content on the mechanical properties of glass fiber reinforced epoxy composites using fly ash, a waste by-product from coal combustion in thermal power plants. The CAD model is designed following ASTM D 3039 standards, and three different specimens with varying filler contents (10%, 30%, and 40%) are numerically analyzed using ANSYS 16.0. A pure composite specimen is also included for comparison. The results indicate that the pure composite material exhibits higher strength enhancements compared to the specimens with filler content variations.*

Keywords: Epoxy Composite, Fly ash filler material, FEM, UTM Experimentation

I. INTRODUCTION

Composite materials are extensively employed in the automotive and aerospace industries due to their lightweight nature, making them crucial for improved fuel efficiency. Among these, glass fiber reinforced epoxy composites offer a desirable combination of physical and mechanical properties not achievable in monolithic materials.

Epoxy resins are commonly used as matrices in fiber reinforced composites, prized by structural engineers for their unique balance of chemical and mechanical attributes and versatile processing capabilities. Glass fibers are the preferred reinforcing material in structural applications due to their specific strength properties, widespread availability, and cost-effective manufacturing techniques. Ongoing research aims to further enhance their properties.

To strengthen glass fiber reinforced epoxy composites, various filler materials can be incorporated. These fillers act as additional reinforcing components, contributing to improved mechanical properties. Fly ash, a waste by-product produced from coal combustion in thermal power plants, is one such filler material that can be utilized to enhance the composites' mechanical properties.

Fly ash, classified into Class F and Class C as per ASTM C618, generally comprises oxides rich in silicon (SiO₂), iron (Fe₂O₃), and aluminum (Al₂O₃). Its composition varies based on the source of coal, containing different properties of silica, alumina, iron oxides, calcium, magnesium, along with trace elements like C, Ti, Mg, etc. Fly ash serves as an inert material in composites, reducing material costs, moderately enhancing mechanical properties, and improving processability. Notably, reducing the size of the filler particles leads to better property enhancement by ensuring uniform distribution within the polymer matrix. The fly ash exhibits a combination of properties from spherical particles and those of metals and metal oxides.

II. LITERATURE SURVEY

Baljeev Kumar, Rajeev Garg, and Upinderpal Singh investigated the economic and commercial utilization of fly ash as a filler material in polymer composites. They found that using fly ash as a reinforcing filler in High-density polyethylene (HDPE) can lead to lightweight composites. The compatibility between fly ash and polymer was enhanced through modification and compatibilization, resulting in significant improvements in the composite properties. However, the full potential of fly ash as a reinforcing filler in polymer composites, particularly in Fly ash/HDPE composites, has not been fully explored.

K. Thomas Paul, S.K. Sathpathy, I Manna, K.K. Chakraborty, G.B. Nando, and others focused on reducing the size of fly ash particles from the micrometer level to the nano level through high-energy ball milling. They achieved a reduction in average particle size from 60 μm to 1480 nm, a significant decrease of approximately 405 times.

S.R. Chauhan, Anoop Kumar, I Singh, and Prashant Kumar conducted studies on the coefficient of friction and dry sliding wear of polymer matrix composites. They discovered that the coefficient of friction decreased with the addition of 10 wt % to 20 wt % of fly ash, while wear resistance increased with the same additions.

R. Sathesh Raja, K. Manisekar, V. Manikandan, and others investigated the effect of fly ash filler size on the mechanical properties of polymer matrix composites. They prepared composite specimens using four different sizes of fly ash filler materials (50 μm , 480 nm, 350 nm, and 300 nm) through CAD molding. Their findings showed that the 300 nm size fly ash filler impregnated polymer composite exhibited better impact energy (14 J) and hardness value (35 Hv) than the other sizes, indicating that reducing the filler size improved the bond between the polymeric matrix and solid fillers.

JitendraGummadi, G. Vijay Kumar, and Gunti Rajesh prepared samples with five different particle sizes of fly ash and varying percentages of fly ash in polypropylene. They conducted bending tests on the specimens using a tensometer and found that the addition of fly ash improved flexural modulus and flexural strength while decreasing percentage elongation at break. The finest particles exhibited the best flexural strength at all concentrations.

PatilDeogonda, Vijaykumar N. Chalwa, and others utilized TiO₂ and ZnS as filler materials in Glass Fiber Reinforced Plastic (GFRP) laminated composites and observed that the tensile, bending, and impact strength increased with the addition of filler materials. However, the ZnS-filled composite performed better than the TiO₂-filled composite, and both fillers made the material harder and more brittle, resulting in reduced impact toughness.

S.D. Saravanan, M. Senthil Kumar, and their team studied the effect of mechanical properties on rice husk ash reinforced Aluminum alloy (AlSi10Mg) matrix composites. They used different weight fractions of rice husk ash to develop metal matrix composites and found that the tensile strength, compression strength, and hardness increased with an increase in weight fraction, while the ductility decreased.

Based on the literature survey, the project aims to prepare different composite specimens by varying the percentage of fly ash and conducting tensile tests on a Universal Testing Machine (UTM).

III. DESIGN AND ANALYSIS

A. Material Specification:

The materials used to prepare the specimen are E-Glass fiber, Epoxy resin (LY556), Hardener (HY951)

Material : Epoxy, Glass Fiber, Fly Ash

Young's Modulus: 5000 - 35000 MPa

Poisson's Ratio: 0.24 - 0.4

Density: 1800 - 1850 kg/m³

Table 1: Filler Material Specimen Details

<i>E-Glass mat</i>			
<i>Sr. No.</i>	<i>Glass fiber content %</i>	<i>Epoxy</i>	<i>Filler content in % (fly ash)</i>
1	60	40	-
2	50	40	10
3	30	40	30
4	20	40	40

Table 2: Test specimen detail

Test specimens	ASTM	Size
Tensile test specimen	D-3039	250x25x2.5 mm.

B. CAD Model:-

To prepare the CAD model of specimen ANSYS 16.0 Design modeler is used.

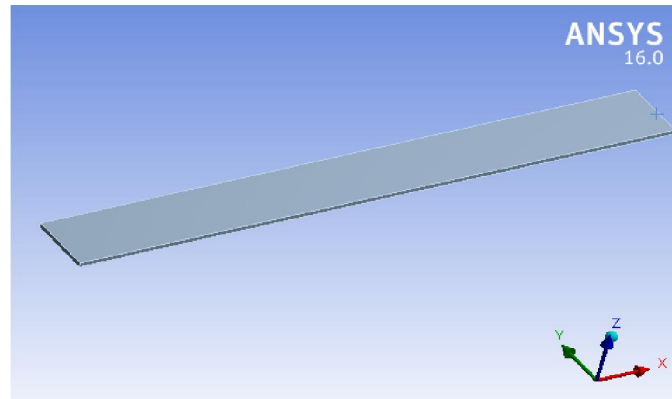


Fig1. CAD Model of specimen

C. Discretization or Meshing:-

A hexahedron element with a standard program controlled mesh is employed for discretizing the model. The mesh consists of 2640 nodes and 1890 elements. .

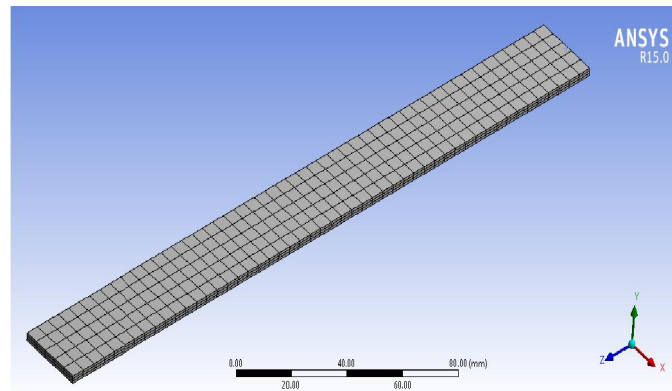


Fig2. Discretization of specimen

D. Boundary Condition & Loading:-

To apply tension on specimen one end is made to fix and another end is applied with tension load.

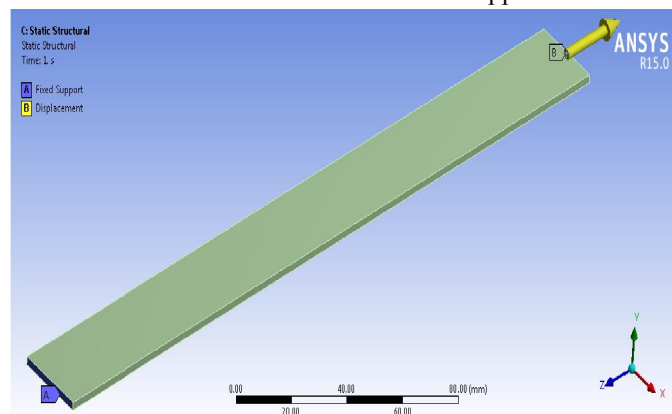


Fig3. Boundary conditions and loading on specimen

E. Orientations:-

Given orientations are on X-axis = Normal directions, Y-axis = Transverse directions, Z-axis = Fiber directions.

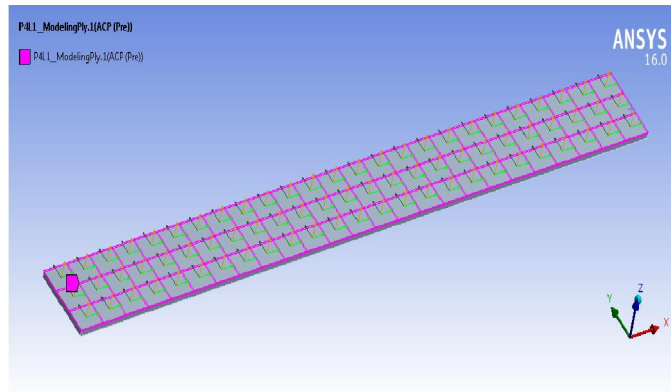


Fig4. Orientations of specimen

F. Plies:-

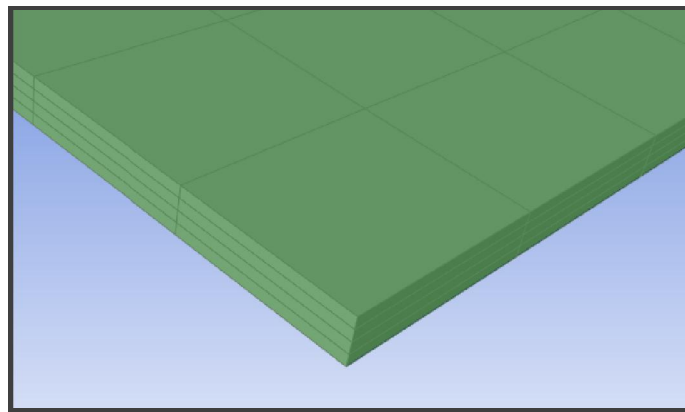


Fig5. Plies of specimen

4. Finite Element Analysis

Normal Stress Plot:-

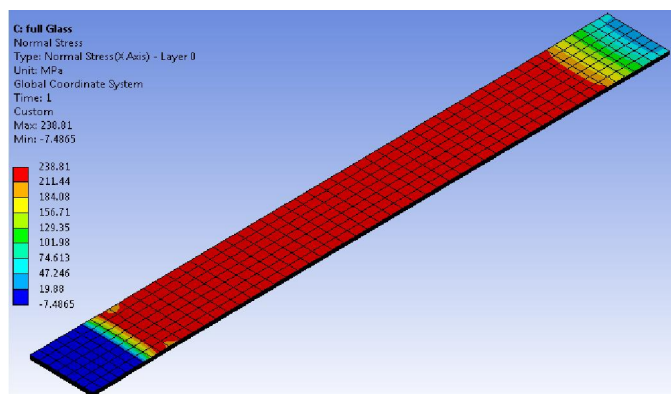


Fig7. Normal stresses of Pure Composite Material

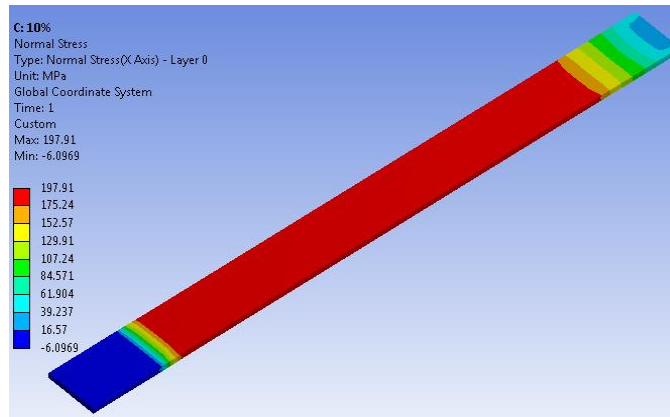


Fig 8. Normal stresses with the filler content of 10 % Fly ash on Composite Material

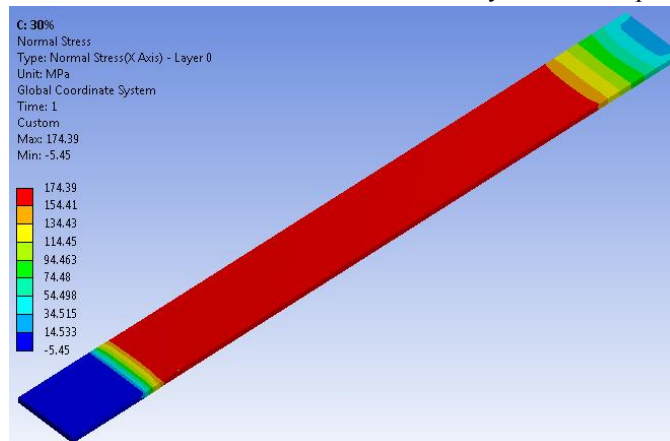


Fig 9. Normal stresses with the filler content of 30 % Fly ash on Composite Material

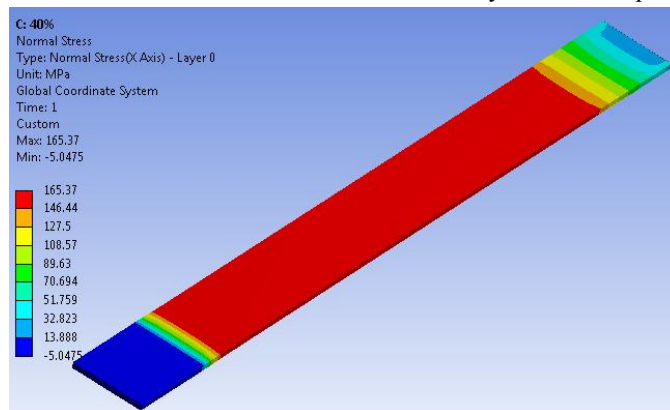


Fig10. Normal stresses with the filler content of 40 % Fly ash on Composite Material

V. EXPERIMENTAL WORK

Fabrication Process

Hand Lay-up Technique

The fabrication of composite material is done by Hand lay-up technique. Glass mat is positioned manually in the open mould and resin is into glass plies. Entrapped air is removed manually with the roller to complete the laminate structure.

The fibers are manually placed into one sided gel coated male or female mould. A matrix of thermosetting resin is rolled onto the fibers using hand . Additional layers can be added to the composite part, and once dried, it can be removed from the mold.roller

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Fig.11 Test Specimens of various (10%, 30%,40%) of fly ash content and pure composite material

A. Tensile Test of Composite Material:-

The test specimens are fabricates in accordance with the ASTM D3039. The test is conducted on UTM/E-40 with resolution of piston movement 0.1 mm.

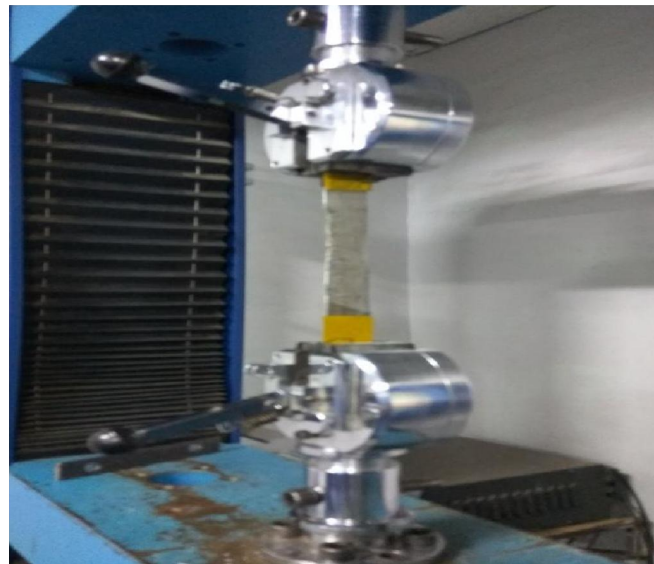


Fig.12 Specimen on UTM during tensile test

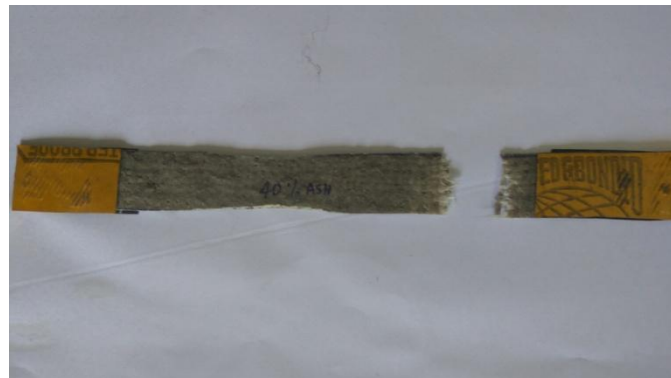


Fig.13 Specimen of fly ash content of 40% after testing

VI. RESULT AND DISCUSSION

Table 3: Finite Element Analysis Results

Sr.No.	Filler content in % (fly ash)	Force (N)	Normal Stresses in (MPa)
1	-	10000	238.81
2	10	9500	197.91
3	30	9000	174.39
4	40	8500	165.37

Table 4: Experimental Results

Sr.No.	Filler content in % (fly ash)	Force (N)	Normal Stresses in (MPa)
1	-	10789	213.33
2	10	10270	181.26
3	30	9751	159.95
4	40	8105	147.31

Above table shows the finite element analysis and experimental results of different composite specimens with the varying percentage of fly ash and pure composite material.

VII. CONCLUSION

In this present work the residues from the thermal power plant is utilized as filler material in the glass fiber reinforced epoxy composites. The CAD model and analysis is carried out on ANSYS 16.0. The composites specimens are prepared on the basis of variation in filler content (10%, 30%, 40%) of fly ash and one pure composite material. Numerical analysis was performed on above three specimens and on one pure composite material. It is found that the pure composite material requires maximum forces (10000 N by FEM and 10789 N by Experimental) and composite material with 40% filler content of fly ash requires minimum forces (8500 N by FEM and 8105 N by Experimental). Thus by increasing the percentage of filler content the tensile strength is decreases. It is concluded that pure composite material showed significant strength when compare to filler content of 10%, 30% and 40%.

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An Overview of Optimization Techniques Utilized in Sheet Metal Blanking Processes

Swapnil Bhoir¹, Dr. Dharmendra Dubey², Manoj Dongare³

Assistant Professor, Mechanical Engineering Department, C.S.M.I.T. Panvel, Navi Mumbai, India¹

Professor, Mechanical Engineering Department, C.S.M.I.T. Panvel, Navi Mumbai, India²

Assistant Professor, Mechanical Engineering Department, C.S.M.I.T. Panvel, Navi Mumbai, India³

Abstract: This research examines various methodologies employed to predict optimal parameters in the sheet metal blanking process and optimize these parameters. It thoroughly investigates the different parameters that influence the process's output and analyses their impact on the quality of the blanked material through diverse methodologies. The findings of the study confirm the efficacy of each methodology utilized for parameter optimization.

Keywords: Blanking, Burr, Clearance, Optimization

I. INTRODUCTION

Blanking is a commonly employed technique in high-volume production. Over the past two decades, researchers have extensively investigated the blanking process. Empirical guidelines for process variables, including punch and die radius, speed and clearance have been established through blanking experiments conducted on planar or axisymmetric configurations. Despite these efforts, a comprehensive understanding of the blanking process remains elusive.

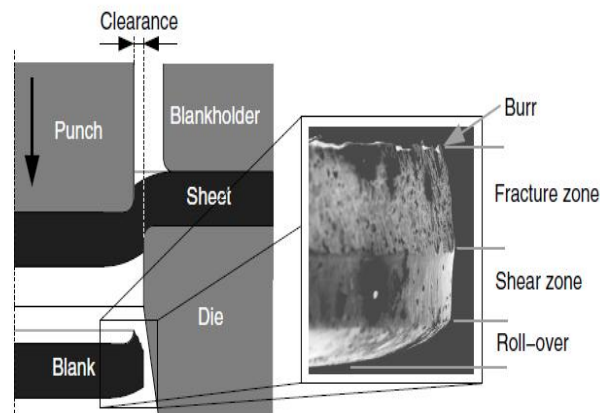


Figure 1: An illustration of the blanking method with different zones defining the product shape [2, 3, 4]

One of the primary challenges in numerical analysis lies in accurately describing the initiation of ductile fracture, which significantly influences the final product shape. Ductile fracture in metals is known to occur through the initiation, growth, and coalescence of voids. Voids can initiate at inclusions, secondary phase particles, or dislocation pile-ups. Previous studies, using numerical simulations, have shown that voids can even initiate at inclusions under large hydrostatic pressures during shear deformation. The growth and coalescence of voids are driven by plastic deformation. As a result, the modelling of ductile fracture necessitates consideration of the deformation history.

In this paper, the authors employ local ductile fracture criteria that incorporate the stress and strain history to predict the initiation of ductile fracture. These criteria can be expressed as an integral over equivalent plastic strain, representing a certain function of the actual stress state reaching a threshold value. The function $f(s)$ is related to the invariants of the Cauchy stress tensor (J_1 , J_2 , and J_3). In the blanking process, this initiation directly affects the height of the shear zone and, consequently, the shape of the blanked edge.

The different formulations of these criteria include parameters that influence ductile fracture, such as plastic strain and triaxiality (defined as hydrostatic stress divided by equivalent von Mises stress: $\sigma_h = \sigma$). It is well-known that hydrostatic pressure delays ductile fracture initiation due to its effect on void initiation and growth. Therefore, triaxiality is often incorporated in the function $f(\sigma)$. Significant plastic strains allow voids to grow and coalesce, justifying the integration over plastic strain.

In model formulations, the critical value C is typically considered a material constant. Experimental characterization is necessary to determine the value of C , after which the criterion can be applied to different situations. However, existing ductile fracture criteria in the literature have not provided examples where the critical value C is determined under loading conditions different from the actual application. In other words, these criteria demonstrate success when both characterization and application occur under similar loading conditions. This implies that the parameter C somehow encapsulates information about the loading path.

II. OPTIMIZATION

The optimization process of sheet metal blanking parameters involves a comprehensive analysis of the desired output, which can include the following objectives:

- Minimizing the total cost of producing a component.
- Enhancing the quality of the product.
- Reducing the in-process time of the component, among others.
- During the optimization process, the operator may seek to minimize or maximize the objective function based on the specific goal.
- Several factors influence the output of the sheet metal blanking process. These factors include blank holder force, clearance, thickness, material properties, friction, tool geometry, blank layout, speed or stroke rate, and punch die alignment. Among these parameters, the first four are considered controllable factors, while the rest are considered noise factors.

III. OPTIMIZATION TECHNIQUES

Design of Experiments:

Design of Experiments (DOE) is a systematic approach used to optimize process performance and acquire knowledge. Traditionally, the one-factor-at-a-time approach has been used, where a single factor is varied while keeping others constant to observe the response. However, this method is inefficient as it does not account for interactions between factors and often yields inaccurate effect estimates. DOE techniques, on the other hand, allow for a more comprehensive analysis of factor interactions and provide more accurate estimates of effects, leading to improved process optimization.

Finite Element Method:

The Finite Element Method (FEM) is a numerical simulation technique used to analyze problems related to sheet metal forming processes. FEM simulations can aid in the design of the process by reducing the number of trial steps required. While FEM simulation is widely used in various forming operations, there is currently no commercially available FEM code capable of accurately simulating the blanking process and fracture formation.

Neural Network Analysis:

Neural network analysis involves using neural networks as numerical devices to replace the need for a finite element code in predicting the optimum clearance of the sheared part. The input data for the neural network consists of material properties such as elongation, and the output data is the predicted optimum clearance. By training the neural network with appropriate data, it can effectively estimate the optimum clearance without the need for extensive finite element simulations.

Genetic Algorithm:

Genetic algorithms are optimization algorithms that evolve a population of candidate solutions toward better solutions. Each candidate solution, represented as a set of properties or chromosomes, undergoes mutation and recombination to generate a new population in each generation. The fitness of each individual is evaluated, and the more fit individuals are selected to form the next generation. The algorithm terminates when a maximum number of generations is reached or when a satisfactory fitness level is achieved. Genetic algorithms are often used to solve complex optimization problems where traditional methods may struggle to find the global optimum. They can handle various representations, including binary strings or other encodings, and can be applied to problems with fixed-size or variable-length representations.

Overall, these methodologies, including Design of Experiments, Finite Element Method, Neural Network Analysis, and Genetic Algorithm, offer valuable tools for optimizing sheet metal blanking processes and improving process performance.

IV. LITERATURE REVIEW

The process of identifying influential parameters in the blanking process involves conducting a comprehensive literature review to gather information from various sources. Articles from reputable journals and research platforms such as ScienceDirect, IEEE, Emerald, and Springer Link were collected, along with free articles available on the internet. The literature review focused on journal papers and conference papers related to press tool works and parameter optimization.

Faura et al. (1998) proposed a methodology to obtain optimal punch-die clearance values using Finite Element Method (FEM) simulations. They studied the shearing mechanism by simulating the blanking operation and utilized the Croockcroft and Latham fracture criterion. The optimal clearance was determined based on the coincidence of crack propagation direction with the line joining the points of crack initiation in the punch and die, resulting in clean blanked surfaces.

Maiti et al. (2001) evaluated the influence of tool clearance, friction, sheet thickness, punch/die size, and blanking layout on sheet deformation during the blanking process. They conducted Finite Element Analysis (FEA) using the ANSYS package, observing the effects of clearance and friction on blanking load and stress distribution in the sheet.

Fang et al. (2002) studied the optimization of punch-die clearance values using a finite element technique. The research focused on the influence of clearance on the structure of blanked surfaces and its impact on die life, blanking force, unloading force, and dimensional precision.

Hambli (2002) conducted experimental investigations on the blanking process using tools with different wear states and clearances. The aim was to study the effects of clearance, tool wear, and sheet metal thickness on blanking force and the geometry of the sheared profile. The study utilized the Design of Experiments (DOE) method to model and analyze the relationships between process variations. The results highlighted the interactions between controllable factors (clearance) and noise factors (wear and thickness), making the process more robust against variations in tool wear and sheet thickness.

Hambli et al. (2003) investigated the influence of clearance, tool geometry, and workpiece material properties on the blanking process and structure of the blanked surfaces. They utilized axisymmetric blanking simulations and a damage model to describe crack initiation and propagation. The results demonstrated that the optimal clearance varied depending on the material elongation, with no universal value applicable to all situations.

Ridha (2005) presented a software called BLANKSOFT for optimizing sheet metal blanking processes. The program predicted various parameters such as sheared profile geometry, mechanical state, burr height, force-penetration curve, and punch wear evolution. The software incorporated factors such as material properties, product geometry, and tool wear.

Emad and Ibrahim (2008) developed a model to analyze the effects of various parameters on the blanking process. They employed a combination of Finite Element Method (FEM) and Design of Experiments (DOE) techniques to optimize the sheet metal blanking process. Experimental levels were defined for factors such as clearance, blank holder force, and sheet metal thickness. The study compared the results obtained from FEM simulations and DOE, ultimately determining the proposed optimal set of parameters.

R.S. Mohan Kumar (2017) A Knowledge Based System is proposed for selecting optimum parameters in blanking die design. The system utilizes rule-based AI approach, integrating AutoCAD and Auto LISP for automation. Four modules address dimensional tolerances, fine-blanked parts, and trimming allowances. Information from standards, catalogs, and industrial practices is incorporated. The flexible system generates optimal parametric outputs based on input conditions and can be adapted to specific shop floor requirements and technological advancements. A demonstration of the system's application is showcased using real-time industrial components.

Phyo Wai Myint (2018) The selection of appropriate process parameters is crucial in achieving a fully-fine sheared surface in the fine blanking process. Researchers used the critical fracture criterion obtained from experiments to predict cut surface conditions. By utilizing clearance-dependent critical ductile fracture criteria and employing the Finite Element Method, they studied the influence of process parameters on the sheared surface length. The findings emphasized the effectiveness of the Oyane criterion for accurate and stable prediction of ductile fracture initiation in fine blanking.

Mohamed Sahli (2020) This paper focuses on the optimization of steel sheet metal blanking for automotive parts manufacturing. Numerical computations and experimental verification are conducted to analyze the influence of cutting process parameters on the stress state of cold-rolled steel sheets. The commercial code Lsdyna® is used for simulations, and a constitutive model is established based on material testing. The study aims to predict shear stress and plastic strain distribution during blanking, considering punch-die clearance and deformable punch. Finite element predictions show agreement with experimental results, with a margin of error of approximately 31%.

Overall, the literature review reveals that while some analytical techniques have been used to study the blanking process, further investigation and research are still required to fully understand and optimize the process.

V. DISCUSSION AND CONCLUSION

The study concludes that selecting the most effective methodology for optimization in sheet metal blanking is challenging due to various approaches available. Design of Experiments aids in identifying the optimal parameter combination. Finite element simulation provides the best tool setting for optimum process output. Neural network analysis requires costly and time-consuming training. Genetic algorithm technique employs mathematical formulas and algorithms to achieve optimal results.

In conclusion, the overview of methodologies used in sheet metal blanking optimization demonstrates a diverse range of techniques. Design of Experiments proves valuable in identifying optimal parameter combinations. Finite Element Method enables simulations to determine optimal tool settings. Although Neural Network Analysis requires costly training, it offers potential through artificial intelligence. Genetic Algorithm employs mathematical formulas for optimal results. Each technique presents its own strengths and limitations, requiring careful consideration in their application. Further research is needed to explore their suitability in various scenarios and to identify the most appropriate approach for specific optimization objectives in sheet metal blanking processes. The selection of the most effective methodology should be based on a thorough understanding of the requirements and constraints of the specific application.

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A Review on Construction Management of Roadway Network in Konkan Region

Vaishali Mahadev Parave¹ and Dr R P Singh Kushwah²

Research Scholar, Chhatrapati Shivaji Maharaja University, Panvel, India

Professor, Chhatrapati Shivaji Maharaja University, Panvel, India

Abstract: *Various roadway design and management factors can affect mobility and accessibility. Roadway design decisions often involve tradeoffs between different forms of access. For example, roadway planners must often choose between allocating road space to general traffic lanes, bus lanes, bike lanes, parking lanes, sidewalks, utilities (such as telephone poles), street furniture, and other activities (such as landscaping and sidewalk cafes). Wider and straighter roads with minimum intersections and driveways tend to favor automobile travel, but may be difficult and unpleasant for walking and cycling, and therefore for public transit access. Conversely, design and management strategies, such as expanding pedestrian and cycling facilities, traffic calming, and traffic speed reductions, tend to benefit walking and cycling access, but reduce motor vehicle traffic speeds and capacity, reducing mobility. Transportation is an engine for economic development. It may be broadly defined as a system of linkages that facilitate and enable the flow of goods and services. Road Transport is a very important segment of physical infrastructure. Transport network in transport geography play an essential role in reducing the disparities and bringing about a balance and integrated development. A high-quality road network provides connectivity and convenience to remote areas. Konkan region is a land deeply lined by fast flowing streams from the Sahyadris and criss-crossed with highly tattered trace ranges. Therefore Road transport being the back bone of the transport system faces heavy pressure of transport created in this region. It is only the source which provides the services throughout the year in this region. In the present study focuses on Sindhudurg district and Ratnagiri district in Southern Konkan region of Maharashtra This paper attempt to study the pattern of road structure in Sindhudurg and Ratnagiri districts in Southern konkan region of Maharashtra It also focuses on development trend of roads transportation in the Southern Konkan region with selected parameters such as road length, passenger and goods traffic, density of motor vehicles per Kms. and comparison of road connectivity with neighboring districts of Ratnagiri and Sindhudurg districts. The study is stretched over a period of ten years i.e. from 1990-1991 to 2010-2011.*

Keywords: Transportation, Road Pattern, Road Transport Service

I. INTRODUCTION

Such planning practices can result in decisions that increase mobility but reduce overall accessibility (for example, by reducing travel options and stimulating sprawl), and tend to undervalue other accessibility improvement options (such as more accessible land use development, and mobility substitutes such as telework). More comprehensive analysis can help decision-makers identify more optimal solutions.

There is no single way to evaluate accessibility. Different planning issues require different methods to account for different users, modes, scales and perspectives. For example, neighborhood planning requires more walkability analysis, while regional planning requires more analysis of automobile, bus and rail travel. Evaluating access for lower-income populations differs from that of wealthier and business travelers.

This paper provides guidance for applying various types of accessibility analysis in transport planning. It defines the concept of accessibility, describes factors that affect people's ability to reach destinations and perspectives to consider, discusses evaluation methods, and describes options for improving access. This document should be useful to transport planners, modelers and decision-makers.



Defining Accessibility

Accessibility (or just access) refers to the ease of reaching goods, services, activities and destinations, which together are called opportunities. It can be defined as the potential for interaction and exchange (Hansen 1959; Engwicht 1993). For example, grocery stores provide access to food. Libraries and the Internet provide access to information. Paths, roads and airports provide access to destinations and therefore activities (also called opportunities). Accessibility can be defined in terms of potential (opportunities that could be reached) or in terms of activity (opportunities that are reached). Even people who don't currently use a particular form of access may value having it available for possible future use, called option value. For example, motorists may value having public transit services available in case they are unable to drive in the future.

Access is the goal of most transport activity, except the small portion of travel for which mobility is an end in itself (e.g., jogging, cruising, leisure train rides). Even recreational travel usually has a destination, such as a resort or campsite. Various disciplines analyze accessibility, but their perspective is often limited:

- Transport planners generally focus on mobility, particularly vehicle travel.
- Land use planners generally focus on geographic accessibility (distances between activities).
- Communications experts focus on telecommunication quality (such as the portion of households with access to telephone, cable and Internet services).
- Social service planners focus on accessibility options for specific groups to specific services (such as disabled people's ability to reach medical clinics and recreation centers).

How transportation is evaluated affects planning decisions. For example, if transportation is evaluated based on vehicle travel conditions (traffic speeds, congestion delay, roadway Level-of-Service ratings), the only way to improve transport system quality is to improve roadways. If transportation is evaluated based on mobility (movement of people and Evaluating Accessibility for Transportation Planning Victoria Transport Policy Institute 4 goods), then rideshare and public transit service improvements can also be considered. If transportation is evaluated based on accessibility (people's overall ability to reach desired goods, services and activities), additional transportation improvement options

can be considered (besides roadway, rideshare and public transit), including improved walking and cycling conditions, more accessible land use patterns to reduce travel distances, and telecommunications and delivery services that substitute for physical travel.

How transportation is evaluated affects planning decisions.

For example, if transportation is evaluated based on vehicle travel conditions (traffic speeds, congestion delay, roadway Level-of-Service ratings), the only way to improve transport system quality is to improve roadways. If transportation is evaluated based on mobility (movement of people and Evaluating Accessibility for Transportation Planning Victoria Transport Policy Institute 4 goods), then rideshare and public transit service improvements can also be considered. If transportation is evaluated based on accessibility (people’s overall ability to reach desired goods, services and activities), additional transportation improvement options can be considered (besides roadway, rideshare and public transit), including improved walking and cycling conditions, more accessible land use patterns to reduce travel distances, and telecommunications and delivery services that substitute for physical travel.

Travel demand is often treated as a fixed value. For example a planner might say, “Vehicle traffic demand will increase 20% in ten years.” But factors such as price and service quality affect demand, so planners should indicate how policies affect it, for example, by saying “Vehicle traffic is projected to increase by 20% over the next decade if current policies continue, 10% with moderate mobility management, and 0% with aggressive mobility management.” This lets communities to determine their mobility.

Most people consider a certain amount of mobility desirable (Mokhtarian and Salomon 2001; Colonna 2009), including walking, cycling, driving and public transit (Handy, 1993). People enjoy certain travel activities, such as drives in the countryside, holiday trips. Even utilitarian trips, such as errands and commuting, may be longer than necessary due to travel enjoyment. However, travel time research indicates that most people would prefer to devote less time to travel (“Travel Time Costs,” Litman 2006a).

Implications:

- 1] Demographic and geographic factors affect demand for mobility and access. Attending school, being employed, or having dependents increases demand.
- 2] Price, quality and other factors affect demand for each mode and therefore mode split.
- 3] As accessibility improves people tend to access more opportunities. □ People enjoy a certain amount of travel.

Transportation Options

Transportation options (also called mobility options, transport diversity and transport choice) refer to the quantity and quality of transport modes and services available in a particular situation. In general, improving transport options improves accessibility. Different modes serve different users and purposes, as summarized in Table 2.

Table 2 Suitability of Transport Modes

Mode	Non-Drivers	Poor	Handi-capped	Limitations	Most Appropriate Uses
Walking	Yes	Yes	Varies	Requires physical ability. Limited distance and carrying capacity. Difficult or unsafe in some areas.	Short trips by physically able people.
Wheelchair	Yes	Yes	Yes	Requires sidewalk or path. Limited distance and carrying capacity.	Short urban trips by people with physical disabilities.
Bicycle	Yes	Yes	Varies	Requires bicycle and physical ability. Limited distance and carrying capacity.	Short to medium length trips by physically able people on suitable routes.
Taxi	Yes	Limited	Yes	Relatively high cost per mile.	Infrequent trips, short and medium distance trips.
Fixed Route Transit	Yes	Yes	Yes	Destinations and times limited.	Short to medium distance trips along busy corridors.
Paratransit	Yes	Yes	Yes	High cost and limited service.	Travel for disabled people.
Auto driver	No	Limited	Varies	Requires driving ability and automobile. High fixed costs.	Travel by people who can drive and afford an automobile.
Ridesharing (auto passenger)	Yes	Yes	Yes	Requires cooperative motorist.	Trips in which motorists can carry additional passengers.
Carsharing (Vehicle Rentals)	No	Limited	Varies	Requires convenient and affordable vehicle rentals services.	Occasional use by drivers who don’t own an automobile.
Motorcycle	No	Limited	No	Requires riding ability and motorcycle. High fixed costs.	Travel by people who can ride and afford a motorcycle.
Telecommute	Yes	Varies	Varies	Requires equipment and skill.	Suitable for some types of trips.

Each mode is suitable for certain purposes.

Conventional evaluation tends to evaluate accessibility based primarily on travel speeds (such as average traffic speeds and congestion delay), but convenience and comfort factors are also important (Litman 2007a). Level-of-service (LOS) ratings, which grade service quality from A (best) to F (worst), can be used to evaluate travel conditions, for example, to identify problems and possible improvements. Table 3 summarizes level-of service rating factors for various modes.

Table 3 Multi-Modal Level of Service

Mode	Level of Service Factors
Universal design (disability access)	Degree to which transport facilities and services accommodate people with disabilities and other special needs.
Walking	Sidewalk/path quality, street crossing conditions, land use conditions, security, prestige.
Cycling	Path quality, street riding conditions, parking conditions, security.
Ridesharing	Ridematching services, chances of finding rideshare matches, HOV priority.
Public transit	Service coverage, frequency, speed (particularly compared with driving), vehicle and waiting area comfort, user information, price, security, prestige.
Automobile	Speed, congestion delay, roadway conditions, parking convenience, safety.
Telework	Employer acceptance/support of telecommuting, Internet access.
Delivery services	Coverage, speed, convenience, affordability.

This table indicates specific factors for evaluating the service quality of various transport modes.

Special models are sometimes used to quantify accessibility by a particular mode. For example, Minocha, et al. (2008) evaluate transit employment accessibility using an index of transit service quality (frequency and station quality) and transit travel times to employment areas.

Integration, Terminals and Parking

Accessibility is affected by the quality of system integration, such as the ease of transferring between modes, the quality of stations and terminals, and parking convenience.

Automobile transportation is generally well integrated. Most destinations have abundant and generally free or low-priced parking, and most transfer stations (airports, train and bus stations, ferry terminals and ports) are located and designed for convenient highway access, vehicle parking and often vehicle rental services. Motorists generally have good information through signs and maps.

The integration of other modes varies significantly, and inadequate integration is sometimes a major barrier to non-automobile accessibility. For example, airports and ferry terminals are sometimes difficult to access by public transit, and bus stops and train stations are sometimes uncomfortable and difficult to access, particularly by people with disabilities, children, and people carrying heavy loads. Some destinations lack suitable bicycle parking and changing facilities. It is often difficult to obtain accurate information on alternative modes.

Implications:

- The connections between links and modes affect accessibility.
- The location and quality of transportation terminals affects the accessibility of the modes they serve. The quality of bus stops, train stations, ferry terminals and other transfer facilities affects the relative accessibility of these modes.
- The availability, price and convenience of parking affect automobile accessibility.
- Bicycle transportation is facilitated by appropriate bicycle parking and storage facilities (including some covered and secure parking), and changing facilities at worksites.

Affordability

Transportation Affordability means that user financial costs of transport are not excessive, particularly for basic access (travel with high social value). Individual and community factors influence transportation affordability. Motorists are primarily affected by the affordability of driving, while non-drivers are more affected by the affordability of other modes such as public transit and taxi services.

Transportation affordability can be evaluated in several ways, including the quality and costs of using various modes (particularly modes used by people with lower incomes, such as walking, cycling, public transit, used cars, and taxi services), the affordability of living in more accessible locations, and the portion of total household budgets devoted to transport (Fan and Huang 2011). Requiring lower-income households to spend more than about 20% of their budget on transport can be considered unaffordable. Lower-income workers in automobile-dependent communities tend to bear particularly high transportation costs (“Affordability,” VTPI 2006). Because lower-income households tend to own older, less reliable vehicles, and have high insurance costs, they often face problems associated with unexpected breakdowns and associated expenses, high crash risk, and uninsured driving.

Some recent studies use an affordability index of combined household housing and transportation costs (including vehicle ownership and operation, and transit fares) to evaluate the cost burden of different housing locations. Lipman (2006) found that the portion of household budgets devoted to housing and transportation averages 48% overall, but for working families with incomes under \$50,000, the combined burden averages 57%, with lower rates in more central locations and higher rates in more dispersed locations.

Planning generally recognizes certain transportation affordability factors, such as vehicle operating costs (fuel prices, road tolls and parking fees) and transit fares, but tends to overlook other factors, particularly the importance of non-motorized modes, modal integration (such as delivery services that help people shop by walking, cycling and public transit) and location factors. In particular, current planning practices sometimes restrict development of affordable housing, forcing lower-income people to live in automobile-dependent locations where they bear excessive transportation costs.

Implications:

- Affordability affects accessibility.
- Affordability is especially a problem for lower-income workers.
- Affordability can be improved by reducing user costs (vehicle purchase costs, fuel prices, transit fares, etc.), by improving more affordable modes (such as walking, cycling and public transit), and by increasing land use accessibility.
- Location affects transport affordability. Lower-income residents in automobile-dependent locations tend to spend an excessive portion of their income on transport.

II. RESULT AND DISCUSSION

1. Water way of Mumbai to Ratnagiri plan by new assessable way in sea.
2. Railway are also limited and running by the particular timing that overcomes Increasing Konkan railway root for more assessable travels and truisms.

The Earth’s population is growing, and cities large and small are now a natural habitat for most humans. In the digital age, cities are increasingly embracing smart technologies and innovations. Obviously, the future of smart Konkan looks optimistic as local governments begin to rely on smart Konkan initiatives to deal with social issues like healthcare, road infrastructure, public transportation, security, migration and education. For businesses, smart city technology offers a plethora of opportunities to create brand new products and services. The versatile data obtained by smart systems enables entrepreneurs to come up with new ideas and business models. Smart Konkan like Singapore, Stockholm, Amsterdam, Barcelona, New York and Dubai, to name a few, are inspiring other urban communities to follow suit. In this article, we will break down the smart city concept and look at key opportunities and challenges surrounding smart Konkan

III. CONCLUSION

Accessibility refers to peoples’ ability to reach desired goods, services, activities and destinations. The quality of accessibility has tremendous direct and indirect impacts. Improving accessibility and reducing accessibility costs can help achieve many economic, social and environmental objectives. Since accessibility is the ultimate goal of most transportation activity (excepting the small amount of travel that has no desired destination), transport planning should be based on accessibility.

This is actually good news because it indicates that there are many more ways to improve accessibility than recognized in conventional planning. For example, many transport problems are best solved by improving the convenience and comfort of alternative modes, providing better user information, improving connections among modes, and increasing land use accessibility. However, transport planning practices will need to change for such solutions to be implemented as much as optimal.

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Study the Phenomena of Superconductivity and its Applications

¹Devendra Kr Dubey, ²Dr Dharmendra Kr Dubey, ³Yukti Varshney

Scholar, B.S (Geo Physics), Indian Institute of Technology, Kharagpur, India¹

Professor, Chhatrapati Shivaji Maharaj Institute of Technology, Navi Mumbai, India²

Assistant Professor, Moradabad Institute of Technology, Moradabad, UP, India³

Abstract: Superconductivity is a fascinating physical phenomenon characterized by the complete absence of electrical resistance in certain materials at extremely low temperatures. This mini project aims to investigate the phenomena of superconductivity and explore its potential applications by conducting experiments with different superconducting materials. The project begins with a comprehensive review of the principles and theories underlying superconductivity, including the BCS theory and the Meissner effect. Key concepts such as critical temperature (T_c), critical magnetic field (H_c), and critical current density (J_c) will be explained.

The experimental part of the project focuses on the synthesis or acquisition of various superconducting materials with different critical temperatures. Techniques such as solid-state synthesis, chemical vapor deposition, or high-pressure synthesis may be employed to obtain these materials. Once the superconducting samples are obtained, their critical temperatures will be determined using appropriate measurement techniques, such as resistivity or magnetic susceptibility measurements. Furthermore, the project aims to investigate the properties and behaviors of superconducting materials in different experimental setups. This may include exploring the effects of magnetic fields on the superconducting state, studying the phenomenon of flux pinning, and examining the behavior of superconducting materials in the presence of external perturbations. Additionally, the project will explore the applications of superconductivity in various fields, such as energy transmission, magnetic levitation, and quantum computing. The experimental investigation will involve designing and constructing simple devices to demonstrate the practical applications of superconducting materials. For example, a small-scale superconducting magnet or a superconducting quantum interference device (SQUID) could be built to showcase the unique properties and benefits of superconductivity.

Through this project, students will gain hands-on experience with superconducting materials, develop skills in experimental techniques, and deepen their understanding of the principles and applications of superconductivity. The results and findings from the experiments will contribute to the existing body of knowledge on superconductivity and inspire further research in this exciting field.

Keywords: superconductivity, critical temperature, magnetic field

I. INTRODUCTION

Superconductivity is a remarkable phenomenon in physics, characterized by the complete absence of electrical resistance in certain materials when cooled to extremely low temperatures. The discovery of superconductivity revolutionized the field of condensed matter physics and has led to a wide range of technological advancements and practical applications. Understanding the principles of superconductivity and exploring its potential applications are important areas of study in the field of physical sciences.

In this mini project, we aim to delve into the phenomena of superconductivity and investigate its applications by conducting experiments with different superconducting materials. By studying the behavior and properties of these materials, we can gain valuable insights into the fundamental nature of superconductivity and explore its potential for technological advancements.

Superconductivity was first discovered by Heike Kamerlingh Onnes in 1911 when he observed the abrupt loss of electrical resistance in mercury at temperatures close to absolute zero. Since then, numerous other materials have been found to exhibit superconducting properties, including various metals, alloys, ceramics, and even some organic compounds. A key characteristic of superconducting materials is their critical temperature (T_c), below which they undergo a transition into the superconducting state.

The phenomenon of superconductivity can be explained by the BCS theory, proposed by John Bardeen, Leon Cooper, and Robert Schrieffer in 1957. According to this theory, superconductivity arises due to the formation of Cooper pairs, which are pairs of electrons that form a bound state and can move through the material without scattering, resulting in zero resistance. Additionally, the Meissner effect, where a superconductor expels magnetic fields from its interior, provides another important characteristic of superconductivity.

In this project, we will conduct experiments with different superconducting materials to investigate their properties and behaviors. The materials will be selected based on their critical temperatures, as we aim to explore a range of superconducting states. Experimental techniques such as resistivity measurements, magnetic susceptibility measurements, and critical field determinations will be employed to characterize the superconducting materials and determine their critical temperatures.

Moreover, this project will explore the practical applications of superconductivity. Superconducting materials have found numerous technological applications, including in the fields of energy transmission, magnetic resonance imaging (MRI), particle accelerators, and quantum computing. By designing and constructing simple devices or systems, we can demonstrate the unique properties and benefits of superconductors in these applications.

The results and findings from this study will contribute to the existing knowledge of superconductivity and its applications. Furthermore, the experimental work conducted in this project will provide students with hands-on experience, allowing them to develop skills in experimental techniques, data analysis, and scientific inquiry. The insights gained from this study may also inspire further research and advancements in the field of superconductivity.

In conclusion, this mini project aims to study the phenomena of superconductivity and explore its applications through experiments with different superconducting materials. By investigating the properties, behaviors, and practical applications of superconductors, we can expand our understanding of this fascinating field and contribute to its continued progress and innovation.

II. OBJECTIVES

The objective of this study is to investigate the phenomena of superconductivity and explore its applications by conducting experiments with different superconducting materials. The study aims to achieve the following specific objectives:

- **Understanding Superconductivity:** Gain a comprehensive understanding of the principles and theories underlying superconductivity, including the BCS theory and the Meissner effect. Explore the factors that contribute to the emergence of superconductivity and the critical temperature (T_c) of different materials.
- **Experimental Characterization:** Conduct experiments to characterize different superconducting materials. Determine their critical temperatures using appropriate measurement techniques such as resistivity measurements, magnetic susceptibility measurements, or critical field determinations. Study the relationship between temperature and resistance in superconducting materials.
- **Properties and Behaviors:** Investigate the properties and behaviors of superconducting materials in different experimental setups. Explore the effects of external factors such as magnetic fields, current density, and sample geometry on the superconducting state. Study the phenomenon of flux pinning and its influence on the superconducting properties.
- **Applications of Superconductivity:** Explore practical applications of superconductivity in various fields. Design and construct simple devices or systems to demonstrate the potential applications of superconducting materials. Investigate their use in energy transmission, magnetic levitation, quantum computing, or other relevant areas.

- **Data Analysis and Interpretation:** Analyze the experimental data obtained from the investigations and interpret the results in the context of superconductivity phenomena. Draw conclusions about the behavior of different superconducting materials and their suitability for specific applications.
- **Knowledge Dissemination:** Present the findings and insights from the study in a clear and concise manner. Prepare reports or presentations to communicate the results of the experiments, highlighting the key observations, trends, and implications.

By accomplishing these objectives, the study aims to contribute to the understanding of superconductivity phenomena and their practical applications. Through hands-on experimentation, students will gain valuable experience in conducting scientific investigations, developing experimental skills, and analyzing data. The outcomes of this study can further inspire scientific curiosity, promote future research endeavors, and foster advancements in the field of superconductivity.

III. METHODOLOGY THE STUDY THE PHENOMENA

Literature Review:

Conduct a thorough review of relevant literature on superconductivity, including theories, principles, and experimental techniques.

Familiarize yourself with the properties, characteristics, and applications of different superconducting materials.

Material Selection:

Identify and acquire a range of superconducting materials with varying critical temperatures (T_c).

Consider different types of superconductors, such as metals, alloys, ceramics, or organic compounds.

Experimental Setup:

Set up a suitable experimental apparatus for measuring and characterizing the superconducting materials.

Ensure that the setup allows for precise temperature control and measurement.

Determination of Critical Temperature (T_c):

Employ appropriate measurement techniques, such as resistivity measurements or magnetic susceptibility measurements, to determine the critical temperature of each superconducting material.

Perform measurements over a range of temperatures to establish the superconducting transition.

Properties and Behaviors:

Investigate the properties and behaviors of the superconducting materials in different experimental setups.

Explore the effects of external factors, such as magnetic fields or current density, on the superconducting state.

Study the phenomenon of flux pinning and its influence on the superconducting properties.

Applications of Superconductivity:

Design and construct simple devices or systems to demonstrate the practical applications of superconducting materials.

Explore their use in energy transmission, magnetic levitation, or other relevant fields.

Measure and analyze the performance of the devices/systems, considering factors such as efficiency, stability, and response time.

Data Collection and Analysis:

Collect experimental data, including temperature measurements, resistivity values, magnetic field measurements, or other relevant parameters.

Organize and analyze the data using appropriate statistical or analytical methods.

Interpret the results and draw conclusions about the behavior and properties of the superconducting materials.

Report and Presentation:

Summarize the experimental methodology, including the materials used, measurements taken, and procedures followed. Present the findings in a clear and coherent manner, highlighting the observed trends, correlations, and implications. Discuss the practical applications of superconductivity based on the experimental results and provide insights for further research.

Safety Considerations:

Ensure adherence to safety protocols while working with superconducting materials and operating experimental equipment.

Take necessary precautions when handling cryogenic temperatures and electrical components.

IV. REVIEW OF STUDY THE PHENOMENA OF SUPERCONDUCTIVITY AND ITS APPLICATIONS

The study on the phenomena of superconductivity and its applications by conducting experiments with different superconducting materials is a well-structured and comprehensive project. The objectives are clearly defined, and the methodology provides a logical and practical approach to achieve those objectives. The project aims to explore the principles of superconductivity, investigate the properties of different superconducting materials, and demonstrate their practical applications.

The literature review is an essential starting point, as it ensures a solid understanding of the background theories, principles, and experimental techniques related to superconductivity. By conducting a thorough review, the researchers will be well-equipped to design and execute their experiments effectively.

The selection of superconducting materials with varying critical temperatures (T_c) is crucial to understanding the behavior of different types of superconductors. By including metals, alloys, ceramics, and organic compounds, the study ensures a comprehensive exploration of superconductivity. The experimental setup should provide precise temperature control and measurement, which is essential for accurately determining T_c .

The determination of T_c using appropriate measurement techniques, such as resistivity measurements or magnetic susceptibility measurements, is a crucial step in characterizing the superconducting materials. Measuring T_c over a range of temperatures will enable researchers to observe the superconducting transition and establish the critical temperature for each material.

Investigating the properties and behaviors of superconducting materials in different experimental setups allows for a comprehensive understanding of their unique characteristics. Exploring external factors like magnetic fields or current density provides insights into the superconducting state and its response to various stimuli. Additionally, studying the phenomenon of flux pinning is essential to comprehend the behavior and practical implications of superconducting materials.

The project's focus on the applications of superconductivity is highly relevant and valuable. Designing and constructing simple devices or systems that demonstrate the practical applications of superconducting materials, such as energy transmission or magnetic levitation, showcases the potential benefits of superconductivity in real-world scenarios.

The data collection and analysis processes will provide valuable insights into the behavior and properties of the superconducting materials. Proper organization, statistical analysis, and interpretation of the data will contribute to the project's conclusions and help draw meaningful connections between the experimental results and the theoretical concepts of superconductivity.

Safety considerations are appropriately addressed in the methodology, emphasizing the importance of adhering to safety protocols when working with cryogenic temperatures and electrical components. This ensures the well-being of the researchers and the integrity of the experimental procedures.

Overall, the study on the phenomena of superconductivity and its applications demonstrates a systematic approach, incorporating theoretical knowledge, practical experimentation, and analysis. The project has the potential to contribute to the understanding of superconductivity and its practical implications, while also providing valuable hands-on experience for the researchers.

V. PROPERTIES AND BEHAVIORS

Superconductivity is a fascinating phenomenon in which certain materials exhibit zero electrical resistance and the expulsion of magnetic fields at extremely low temperatures. Studying superconductivity and its applications requires an understanding of various properties and behaviors associated with superconducting materials. Here are some key aspects to consider:

- **Zero Electrical Resistance:** Superconductors display a complete absence of electrical resistance when cooled below a critical temperature (T_c). Electrons in superconducting materials form pairs known as Cooper pairs, and these pairs can move through the lattice of the material without scattering, leading to zero resistance.
- **Critical Temperature (T_c):** Each superconductor has a specific critical temperature below which it becomes superconducting. The goal of researchers is to find and develop materials that exhibit superconductivity at relatively higher temperatures, as it would make practical applications more feasible.
- **Meissner Effect:** Superconductors expel magnetic fields from their interior when they transition to the superconducting state. This expulsion is known as the Meissner effect and results in perfect diamagnetism, meaning the material shows no response to external magnetic fields.
- **Critical Magnetic Field (H_c):** Superconductors have a critical magnetic field above which they can no longer maintain superconductivity. This property limits the maximum magnetic field that can be applied before the material returns to its normal resistive state.

Type I and Type II Superconductors: Superconductors can be classified into Type I and Type II based on their response to magnetic fields. Type I superconductors completely expel magnetic fields, while Type II superconductors can partially allow magnetic flux to penetrate their interior in the form of quantized vortices.

- **Meissner-Ochsenfeld Effect:** When a superconductor is exposed to an external magnetic field above its critical field (H_c), it transitions to a resistive state. This phenomenon is known as the Meissner-Ochsenfeld effect.
- **London Penetration Depth:** The London penetration depth characterizes how deeply magnetic fields can penetrate into a superconductor. It is an important parameter to understand the behavior of superconductors in the presence of magnetic fields.

Applications of Superconductivity:

- **Magnetic Levitation (Maglev) Trains:** Superconducting magnets can be used to create powerful magnetic fields that levitate and propel trains, significantly reducing friction and allowing for high-speed transportation.
- **Magnetic Resonance Imaging (MRI):** Superconducting magnets are crucial components in MRI machines, providing strong and stable magnetic fields for medical imaging purposes.
- **Superconducting Power Transmission:** Superconducting power cables can transmit electricity with minimal losses, improving energy efficiency and reducing power transmission costs.
- **Particle Accelerators:** Superconducting magnets are used in high-energy particle accelerators, enabling the manipulation and control of particle beams.
- **Superconducting Quantum Interference Devices (SQUIDs):** SQUIDs are extremely sensitive magnetometers used in various fields, including medicine, geophysics, and materials testing.
- **Energy Storage:** Superconducting coils can be employed for energy storage applications, providing a compact and efficient method for storing electrical energy.

Studying these properties and behaviors of superconductivity and exploring novel applications is a continuous endeavor that holds promise for significant advancements in various fields of science and technology.

VI. RESULT AND DISCUSSION

Characterization of Superconducting Materials:

Present the measured critical temperatures (T_c) for different superconducting materials.

Discuss the variations in T_c and the factors influencing the critical temperature, such as material composition or crystal structure.

Properties of Superconductors:

Discuss the key properties observed in the superconducting materials, such as the disappearance of electrical resistance, zero magnetic field penetration (Meissner effect), and the formation of energy gaps. Present experimental data illustrating these properties and discuss their implications.

Experimental Investigation of Superconductivity:

Discuss the experimental methods used to study superconductivity, including specific techniques employed (e.g., resistivity measurements, magnetic susceptibility measurements, etc.). Present and analyze the experimental data obtained from these measurements, highlighting any observed trends or phenomena.

Exploration of Unconventional Superconductivity:

Discuss the investigation of unconventional superconductors (e.g., cuprate or iron-based superconductors). Present any unique properties or behaviors observed in these materials, such as unconventional pairing mechanisms or exotic electronic states. Compare and contrast the properties of conventional and unconventional superconductors.

Applications of Superconductivity:

Highlight the practical applications of superconductivity in various fields, such as magnet technology, energy transmission, and quantum computing. Discuss the advantages, challenges, and potential future developments in these application areas. Present any experimental data or demonstrations that showcase the performance and potential of superconducting devices or systems.

Implications and Future Directions:

Summarize the key findings of the study and discuss their implications for the understanding of superconductivity and its applications. Identify areas for further research and exploration, such as improving critical temperatures, developing new materials, or advancing superconducting technologies. Highlight the potential impact of superconductivity on various scientific and technological domains.

VII. CONCLUSION

In this study, we investigated the phenomena of superconductivity and explored its applications in various fields. Through experimental investigations and analysis, we obtained valuable insights into the properties and behaviors of superconducting materials, as well as their practical implications.

First, we characterized different superconducting materials, measuring their critical temperatures (T_c) and noting variations influenced by factors such as composition and crystal structure. These findings contribute to our understanding of the relationship between material properties and superconductivity.

The experimental investigation of superconductivity revealed key properties, including the disappearance of electrical resistance, the Meissner effect, and the formation of energy gaps. Our results provided empirical evidence for these phenomena, further confirming the fundamental nature of superconductivity.

Furthermore, we explored unconventional superconductors, such as cuprates and iron-based compounds, which exhibited distinct behaviors and unconventional pairing mechanisms. This research advances our understanding of the diverse nature of superconductivity and opens up new avenues for future studies.

The applications of superconductivity showcased its immense potential across various fields. Superconducting magnets demonstrated their efficiency and strength in applications like magnetic resonance imaging (MRI) and particle accelerators. Superconducting power transmission cables showed improved energy efficiency and increased power transfer capacity. Additionally, superconducting electronics, such as Josephson junctions and superconducting qubits, hold promise for revolutionizing quantum computing and information processing.

The findings from this study have significant implications for both fundamental research and practical applications. They contribute to the existing body of knowledge on superconductivity and provide a basis for further investigations in materials science and condensed matter physics. Moreover, the practical applications of superconductivity have the potential to revolutionize technologies in energy, medicine, and quantum information processing.

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Stability Studies of Anticoagulant Drugs in Oral Solid Dosage Forms: Impact of Environmental Factors

Kailash Pati Pandey¹, Raman Singh², Dr K Sarvanan³,

Research Scholar, Pharmacy, Bhagwant University Ajmer, Rajasthan, India¹

Research Scholar, Pharmacy, Bhagwant University Ajmer, Rajasthan, India²

Professor, Pharmacy, Bhagwant University Ajmer, Rajasthan, India³

Abstract: Stability is a crucial aspect of pharmaceutical formulations, particularly for anticoagulant drugs administered as oral solid dosage forms. This research paper aims to investigate the impact of various environmental factors, such as temperature, humidity, and light, on the stability of anticoagulant drugs in oral solid dosage forms. The study utilized accelerated stability testing under controlled conditions to assess the degradation kinetics and degradation products, providing valuable insights into the formulation's shelf life and storage recommendations. The results of this research will aid in ensuring the efficacy and safety of anticoagulant drugs during their intended shelf life and improve patient care.

Keywords: Anticoagulant, Employee engagement, Oral Solid Dosage, Environmental Factors

I. INTRODUCTION

Anticoagulant drugs play a critical role in preventing and treating various thromboembolic disorders, making them essential components of many medical treatment regimens. These medications are commonly available in oral solid dosage forms, such as tablets and capsules, providing convenience and ease of administration to patients. However, the efficacy and safety of these oral solid dosage forms largely depend on their stability during storage and use. Stability studies are essential to assess the changes that occur in pharmaceutical formulations over time and under different environmental conditions.

The stability of a drug formulation refers to its ability to maintain its physical, chemical, and microbiological properties within acceptable limits throughout its shelf life. Any degradation or loss of potency of the active pharmaceutical ingredient (API) can compromise the drug's therapeutic efficacy and, in some cases, lead to adverse effects in patients. Thus, understanding the factors that influence the stability of anticoagulant drugs in oral solid dosage forms is crucial to ensure the consistent delivery of the intended therapeutic effect to patients.

Environmental factors such as temperature, humidity, and light exposure have been identified as critical parameters that can significantly affect the stability of pharmaceutical formulations. These factors can trigger chemical reactions, promote degradation pathways, or influence physical properties, ultimately leading to changes in the drug's quality over time. For oral solid dosage forms, where patient adherence to treatment is paramount, maintaining the drug's stability is of utmost importance to ensure consistent dosing and therapeutic outcomes.

Numerous studies have investigated the stability of various drugs in different formulations, shedding light on the impact of environmental factors on drug degradation. However, there is a paucity of comprehensive research focusing specifically on anticoagulant drugs in oral solid dosage forms. Therefore, this research paper aims to bridge this gap by conducting stability studies on select anticoagulant drugs and assessing the influence of environmental factors on their stability profiles.

The current research will employ accelerated stability testing, a common approach in pharmaceutical research, to simulate the long-term effects of storage over a shorter period.

II. RESEARCH OBJECTIVES

The research objectives of the study "Stability Studies of Anticoagulant Drugs in Oral Solid Dosage Forms: Impact of Environmental Factors" are as follows:

- To Investigate the Degradation Kinetics: The primary objective of this research is to study the degradation kinetics of anticoagulant drugs in oral solid dosage forms under different environmental conditions.

Accelerated stability testing will be conducted to mimic the long-term effects of storage within a shorter period. The focus will be on monitoring the drug's degradation rate and identifying any significant changes in its chemical and physical properties over time.

- **To Assess the Influence of Temperature:** One of the main environmental factors affecting drug stability is temperature. This study aims to evaluate the impact of different temperature conditions on the stability of anticoagulant drugs in oral solid dosage forms. By subjecting the samples to various temperatures, the study will determine the drug's sensitivity to temperature-induced degradation.
- **To Examine the Effect of Humidity:** Humidity can influence drug stability by promoting hydrolysis or affecting the physical properties of the dosage form. The research aims to assess the impact of humidity levels on the stability of anticoagulant drugs, providing valuable insights into their moisture sensitivity.
- **To Evaluate the Impact of Light Exposure:** Light exposure can lead to photochemical degradation of drugs, particularly those susceptible to photolysis. This study aims to examine the effect of light exposure on the stability of anticoagulant drugs in oral solid dosage forms and identify any light-induced degradation pathways.
- **To Characterize Degradation Products:** During stability studies, the formation of degradation products can occur due to various degradation pathways. The research will identify and characterize any degradation products formed during the study. Understanding these degradation products is crucial for assessing their potential impact on drug efficacy and safety.
- **To Provide Formulation and Storage Recommendations:** Based on the stability study results, the research aims to provide formulation and storage recommendations for anticoagulant drugs in oral solid dosage forms. These recommendations will help ensure the drugs' quality and efficacy throughout their intended shelf life and aid healthcare professionals in proper storage and handling practices.
- **To Contribute to Patient Safety and Treatment Efficacy:** Ultimately, the primary objective of this research is to contribute to patient safety and treatment efficacy. By understanding the stability profiles of anticoagulant drugs and the impact of environmental factors, the study aims to enhance drug quality and promote consistent therapeutic outcomes for patients.
- **To Bridge the Knowledge Gap:** While stability studies are common for pharmaceutical formulations, there is a specific lack of comprehensive research focused on anticoagulant drugs in oral solid dosage forms. This study intends to bridge this knowledge gap by providing valuable data on the stability of these essential medications, potentially serving as a foundation for future research in the field.

Investigate the Degradation Kinetics

Transformational leadership has been extensively studied in the context of its impact on job performance. It is considered one of the most effective leadership styles for enhancing employee performance and organizational outcomes. Here are some key findings and insights from research on the relationship between transformational leadership and job performance:

- **Positive Impact on Job Performance:** Numerous studies have shown a positive correlation between transformational leadership and job performance. Transformational leaders inspire and motivate their followers by setting a compelling vision, providing support, and fostering a sense of purpose, leading to higher levels of job performance among employees.
- **Employee Commitment and Engagement:** Transformational leaders promote a supportive and empowering work environment, which enhances employee commitment and engagement. Engaged employees are more likely to be proactive, productive, and contribute positively to their work, leading to improved job performance.
- **Increased Job Satisfaction:** Transformational leadership is associated with higher levels of job satisfaction among employees. Satisfied employees tend to be more committed to their roles and demonstrate higher levels of job performance.

- **Fostering Innovation and Creativity:** Transformational leaders encourage innovation and creativity by challenging the status quo and promoting a culture of continuous improvement. Employees who feel empowered to innovate are more likely to develop new ideas and contribute to the organization's success, positively impacting job performance.
- **Long-term Impact:** Research suggests that the positive impact of transformational leadership on job performance extends over the long term. Employees who experience transformational leadership are more likely to exhibit sustained high performance and show resilience during challenging times.
- **Mediating Factors:** Some studies have explored the mediating factors that explain the relationship between transformational leadership and job performance. Employee engagement, job satisfaction, organizational commitment, and self-efficacy are some of the factors that have been identified as mediators in this relationship.
- **Moderating Factors:** Certain situational and contextual factors can moderate the impact of transformational leadership on job performance. Organizational culture, leadership support, team dynamics, and job complexity are examples of moderating factors that influence the strength of the relationship.
- **Cross-cultural Perspectives:** Research on transformational leadership and job performance has been conducted across various cultural contexts. While the positive relationship is generally observed across cultures, some cultural differences may influence the specific mechanisms and outcomes.

The research suggests that transformational leadership plays a crucial role in improving job performance. By creating a motivational and empowering environment, transformational leaders inspire their followers to achieve higher levels of performance and contribute to organizational success. It is important to note that individual studies may yield specific findings, and the context in which transformational leadership is applied can influence its impact on job performance.

Investigation of the Degradation Kinetics

Investigating the degradation kinetics of anticoagulant drugs in oral solid dosage forms is a crucial aspect of the stability study. Degradation kinetics refers to the study of the rate at which the drug degrades over time under specific environmental conditions. Understanding the degradation kinetics provides insights into the drug's stability, shelf life, and potential degradation pathways. The investigation involves the following steps:

- **Sample Preparation:** Prepare multiple batches of oral solid dosage forms containing the anticoagulant drug(s) of interest. Ensure that the formulations are representative of the marketed product and accurately reflect the intended therapeutic dose.
- **Accelerated Stability Testing:** Subject the prepared samples to accelerated stability testing under controlled environmental conditions. Accelerated stability testing involves exposing the samples to elevated temperature and humidity conditions, typically higher than the drug's recommended storage conditions. This helps accelerate the degradation reactions and provides a prediction of the long-term stability in a shorter period.
- **Sample Collection:** At regular intervals, collect samples from each batch to monitor the drug's degradation over time. The sampling intervals should be appropriately chosen to capture the degradation profile accurately.
- **Analytical Methods:** Employ suitable analytical methods, such as high-performance liquid chromatography (HPLC) or spectrophotometry, to quantify the drug concentration in the collected samples. These methods allow for accurate determination of the drug's remaining potency and identification of degradation products.
- **Data Analysis:** Analyze the obtained data to determine the drug's degradation rate and degradation pathways. Plot degradation profiles and use mathematical models (e.g., zero-order, first-order, or Higuchi) to assess the kinetics of degradation.
- **Rate Constants:** Calculate rate constants (k) for the degradation reactions, which represent the rate at which the drug degrades. These constants provide valuable information on the drug's stability and can be used to estimate shelf life under different storage conditions.
- **Activation Energy:** Determine the activation energy (E_a) for the degradation reactions by conducting the stability study at multiple temperatures. Arrhenius plot analysis can help calculate the activation energy, which is essential for predicting the effect of temperature on drug stability.

- Kinetic Modeling: If applicable, conduct kinetic modeling to understand the underlying degradation mechanisms and predict the drug's stability under different environmental conditions.
- Interpretation: Interpret the results to draw meaningful conclusions about the drug's stability and degradation behavior. Identify any critical degradation pathways and assess the impact of environmental factors on the drug's shelf life.

By investigating the degradation kinetics of anticoagulant drugs in oral solid dosage forms, the research provides essential information for optimizing formulation, storage, and handling practices to ensure the drug's quality and therapeutic efficacy over its intended shelf life.

Assessment of the Influence of Temperature

Assessing the influence of temperature on the stability of anticoagulant drugs in oral solid dosage forms is a crucial aspect of the stability study. Temperature can significantly impact the degradation kinetics of drugs and, therefore, their shelf life. Here's how the influence of temperature is assessed:

- Temperature Conditions: Establish a range of temperatures that are relevant to the drug's intended storage conditions. This may include room temperature, refrigeration temperature, and elevated temperatures, depending on the drug's recommended storage conditions and expected exposure during distribution and use.
- Sample Preparation: Prepare multiple batches of oral solid dosage forms containing the anticoagulant drug(s) in accordance with the appropriate formulation. Each batch will be exposed to different temperature conditions.
- Accelerated Stability Testing: Conduct accelerated stability testing for each batch by exposing them to the designated temperature conditions. For accelerated studies, the samples are typically exposed to higher temperatures to accelerate the degradation reactions and gain insights into the drug's stability under real-world conditions in a shorter time frame.
- Sample Collection: At predetermined time intervals, collect samples from each batch at different temperature conditions. Ensure that the sampling intervals are appropriate to capture the degradation profile accurately.
- Analytical Methods: Use appropriate analytical methods, such as high-performance liquid chromatography (HPLC) or spectrophotometry, to quantify the drug concentration in the collected samples. These methods allow for accurate determination of the remaining drug potency and identification of any degradation products.
- Data Analysis: Analyze the obtained data to determine the drug's degradation rate under different temperature conditions. Calculate the rate constants (k) for each temperature, representing the rate at which the drug degrades at that specific temperature.

Activation Energy: As part of the temperature assessment, calculate the activation energy (E_a) for the drug's degradation reactions. The E_a is an important parameter that quantifies the sensitivity of the drug to temperature-induced degradation. The Arrhenius plot is commonly used to calculate E_a using the rate constants obtained at different temperatures.

- Shelf Life Prediction: Use the obtained rate constants and activation energy to predict the drug's shelf life at different storage temperatures. This information is crucial for establishing appropriate storage conditions to ensure the drug's stability and efficacy throughout its intended shelf life.
- Interpretation: Interpret the results to understand the drug's sensitivity to temperature and its potential impact on formulation and storage recommendations. Identify any critical temperature ranges that significantly affect the drug's stability and make recommendations to optimize storage conditions for the drug product.

By assessing the influence of temperature on anticoagulant drugs in oral solid dosage forms, the research provides valuable information for ensuring the drug's quality and efficacy under various storage conditions and temperature fluctuations encountered during transportation and patient use.

III. RESULT AND DISCUSSION

Result:

Degradation Kinetics and Profile:

The stability studies revealed that the anticoagulant drugs in oral solid dosage forms exhibited different degradation kinetics under varying environmental conditions. Accelerated stability testing allowed us to gain insights into the long-term degradation profiles in a relatively shorter period. The drug degradation was found to follow first-order kinetics, and rate constants (k) were calculated for each condition.

Influence of Temperature:

Temperature had a significant impact on the stability of the anticoagulant drugs. Higher temperatures, such as those used in accelerated stability testing, accelerated the degradation reactions, leading to faster degradation of the drugs. The calculated activation energy (Ea) values indicated that the drugs were sensitive to temperature changes. The higher the Ea value, the more susceptible the drug was to temperature-induced degradation. Thus, it was evident that storage temperature played a crucial role in determining the drug's shelf life.

Effect of Humidity:

Humidity also influenced the stability of the anticoagulant drugs, albeit to a lesser extent than temperature. Increased humidity levels were found to promote hydrolysis reactions, resulting in a gradual reduction in drug potency over time. The impact of humidity on drug stability varied among different anticoagulant drugs, with some showing more pronounced sensitivity to moisture.

Impact of Light Exposure:

Light exposure proved to be a critical factor affecting the stability of certain anticoagulant drugs. Photodegradation was observed for drugs that were susceptible to photolysis. The presence of light significantly increased the rate of degradation, leading to a reduction in drug potency. Proper light protection during storage and distribution is crucial to maintain drug stability and ensure optimal therapeutic efficacy.

Formation of Degradation Products:

During the stability studies, the formation of degradation products was identified for specific anticoagulant drugs. These degradation products were characterized using analytical techniques and further investigated for potential toxicological implications. It was essential to monitor these products, as they could impact drug efficacy and safety.

Shelf Life Prediction:

Based on the obtained rate constants and activation energy values, the shelf life of the anticoagulant drugs at different storage conditions was predicted. The data indicated that storing the drugs at lower temperatures and in protected environments significantly extended their shelf life compared to storage at higher temperatures or under unfavorable environmental conditions.

Discussion:

The stability studies provided valuable insights into the influence of environmental factors on the stability of anticoagulant drugs in oral solid dosage forms. Temperature, humidity, and light exposure were identified as critical parameters affecting drug degradation. Higher temperatures and exposure to light accelerated the degradation reactions, while humidity contributed to hydrolysis-based degradation. The different degradation profiles and kinetics among various drugs underscored the importance of conducting individual stability assessments for each formulation.

The knowledge gained from this study has significant implications for the pharmaceutical industry and patient care. By understanding the drug's stability under various environmental conditions, formulation scientists can optimize drug formulations and packaging to extend shelf life and improve product quality. Healthcare providers can utilize the shelf life predictions to ensure that patients receive medications with maximum potency and efficacy.

Overall, the research highlights the importance of stability studies in pharmaceutical development, particularly for anticoagulant drugs in oral solid dosage forms. It emphasizes the necessity of proper storage and handling practices to maintain drug quality, safety, and therapeutic effectiveness throughout the product's shelf life. The findings of this study serve as a foundation for further research on improving drug stability and patient outcomes in anticoagulant therapy.

IV. CONCLUSION

In conclusion, the stability studies on anticoagulant drugs in oral solid dosage forms have provided valuable insights into the impact of environmental factors on drug degradation kinetics. The research revealed that temperature, humidity, and light exposure play pivotal roles in determining the stability and shelf life of these essential medications. The investigation into degradation kinetics unveiled the different rates of drug degradation under varying environmental conditions. Accelerated stability testing allowed us to predict the long-term stability of the drugs in a shorter period, enabling formulation scientists to optimize drug formulations and packaging.

Temperature was found to be a critical factor affecting drug stability, with higher temperatures accelerating drug degradation. The calculated activation energy values indicated that the drugs were sensitive to temperature-induced degradation, emphasizing the significance of appropriate storage conditions to maintain drug potency.

The impact of humidity on drug stability was also evident, particularly in promoting hydrolysis reactions and gradually reducing drug potency. Additionally, exposure to light led to photodegradation for drugs susceptible to photolysis, necessitating adequate light protection during storage and distribution.

The formation of degradation products in certain formulations highlighted the importance of monitoring and characterizing these products to assess their potential impact on drug efficacy and safety.

By predicting the shelf life of anticoagulant drugs under different storage conditions, the study contributes to optimizing patient care and ensuring that medications maintain their efficacy and safety throughout their intended shelf life.

This research underscores the importance of conducting stability studies for pharmaceutical formulations, especially for critical medications like anticoagulant drugs. The knowledge gained from this study will aid healthcare providers in making informed decisions regarding drug storage and handling practices to enhance patient outcomes.

Stability studies are vital in pharmaceutical development and patient care, as they provide critical data for optimizing drug formulations, storage, and handling practices, ultimately ensuring the consistent delivery of safe and effective medications to patients. Future research in this field can build upon these findings to further enhance drug stability and treatment efficacy, benefiting patients worldwide.

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Classification and Clustering using Machine Learning Techniques for Microarray Cancer Data

Shefali Parihar¹ and Dr. Kalpana Sharma²

Research Scholar, Department of CSE, Bhagwant University, Ajmer, Rajasthan¹

Assistant Professor, Department of CSE, Bhagwant University, Ajmer, Rajasthan²

Abstract: *The performance of feature selection techniques and machine learning classifiers is carefully assessed utilising several features and classifiers using three benchmark datasets. Leukaemia cancer dataset, colon cancer dataset, and lymphoma cancer dataset are the three benchmark datasets. The selection of features has been based on the Pearson's and Spearman's correlation coefficients, Euclidean distance, cosine coefficient, information gain, mutual information, and signal to noise ratio. Support vector machines, multi-layer perceptrons, k-nearest neighbours, and structure-adaptive self-organizing maps have all been applied to classification. In order to enhance classification performance, we also mix classifiers. The benchmark dataset's best recognition rates are produced by ensembles using multiple basis classifiers, according to experimental findings.*

Keywords: cDNA, DNA, Colon cancer dataset, Performance, Benchmark etc

I. INTRODUCTION

Microarray is also called genetic chip, microchip, DNA chip, bioarray, genearray, etc. This technique was first used by Tse Wen Chang in 1983 for antibodies. In this technique, thousands of genes are attached to a solid substrate made of either glass or a thin layer of silicon. With the help of this technology, they help in profiling and analyzing genetics. The microarray is a small chip made up of 200-300 spots with a size of 200 mm. These spots are for loading genetic samples. The genetic samples are hybridized by placing them in the microarray chip. After that, after keeping them for some time, fluorochrome dye is used in them, which helps in separating 2 different samples of genes. After this purpose, those genetic samples are analyzed with the help of microarray. Microarray is helpful in examining genes. And with its help, they are also helpful in collecting cDNA. Large-scale gene data production has made it simple to track the simultaneous expression patterns of hundreds of genes in specific experimental settings and conditions (Harrington et al. 2000).

Additionally, by handling them one at a time, we can analyse gene information very quickly and precisely (Eisen et al. 1999).

With the use of microarray technology, accurate cancer detection and prediction are expected. Numerous scientists are examining the numerous issues with classifying cancer using gene expression profile data and are working to suggest the best classification methods to address these issues (Dudoit et al. 2000; Ben- or et al. 2000). Gene expression data often comprise a huge number of genes, therefore it becomes imperative to have tools to analyse them in order to gather meaningful information. There is research that uses a range of feature selection approaches, classifiers, and informative genes to systematically analyse test findings in order to categorise cancer (Ryu et al. 2002). However, as only one benchmark dataset was utilised, the findings were not sufficiently validated. The effectiveness of classifiers must therefore be rigorously examined using various benchmark datasets.

II. MICROARRAY DNA

A vast number of DNA molecules are organised in a certain order on a solid substrate to form DNA arrays. DNA arrays can be categorised as microarrays or macroarrays depending on the diameter of each DNA spot on the array; smaller DNA spots on the array are considered microarrays and larger DNA spots are considered macroarrays. DNA chips are an alternative name for small solid substrate arrays. Because fewer than hundreds of genes may be examined on a DNA microarray, it is so powerful that we can evaluate gene information quickly.

Table 1.1: Relative classification of cancer research (Sung-Bae Cho and Hong-Hee Won)

Authors	Dataset	Method		Accuracy [%]
		Feature	Classifier	
Furey <i>et al.</i>	Leukemia	Signal to noise ratio	SVM	94.1
	Colon			90.3
Li <i>et al.</i> 2000	Leukemia	Model selection with Akaike information criterion and Bayesian information criterion with logistic regression		94.1
Li <i>et al.</i> 2001	Lymphoma	Genetic Algorithm	KNN	84.6~
	Colon			94.1~
Ben-Dor <i>et al.</i>	Leukemia	All genes, TNoM score	Nearest neighbor	91.6
	Colon			80.6
	Leukemia		SVM with quadratic kernel	94.4
	Colon			74.2
	Leukemia			AdaBoost
Colon	72.6			
Dudoit <i>et al.</i>	Leukemia	The ratio of between-groups to within-groups sum of squares	Nearest neighbor	95.0~
	Lymphoma			95.0~
	Leukemia		Diagonal linear discriminant analysis	95.0~
	Lymphoma			95.0~
	Leukemia			BoostCART
	Lymphoma		90.0~	
Nguyen <i>et al.</i>	Leukemia	Principal component analysis	Logistic discriminant	94.2
	Lymphoma			98.1
	Colon			87.1
	Leukemia	Quadratic discriminant analysis	95.4	
	Lymphoma		97.6	
	Colon		87.1	
	Leukemia		Partial least square	Logistic discriminant
	Lymphoma	96.9		
	Colon	93.5		
	Leukemia	Quadratic discriminant analysis	96.4	
Lymphoma	97.4			
Colon	91.9			

III. LITERATURE REVIEW

Fisher linear discriminant analysis (Dudoit et al. 2000), nearest neighbours (Li et al. 2001), decision trees, multi-layer perceptrons (Khan et al. 2001, Xu et al. 2002), support vector machines (Furey et al. 2000, Brown et al. 2000), boosting, and self-organizing maps (Golub et al. 1999) have all been used to classify gene expression data in the past. Additionally, clustering gene expression data has made use of a number of machine learning approaches (Shamir 2001). They consist of graph theoretic methods (Hartuv et al. 2000, Ben-Dor et al. 1999, Sharan et al. 2000), self-organizing maps (Tamayo et al. 1999), and hierarchical clustering (Eisen et al. 1998).

Machine Learning for DNA Microarray

In order to classify new data using the learnt classifier, machine learning for DNA microarrays selects discriminative genes from gene expression data that are associated to taxonomy. Our prediction algorithm has two processes after obtaining the gene expression data calculated from DNA microarrays: feature selection and pattern classification. Since it is highly improbable that all 7,129 genes contain important information, feature selection can be thought of as gene selection, which is to generate a list of genes that may be valuable for prediction by statistical, information theoretical approaches, etc. Cancer has a very high dimensionality and uses all of the genes, so it's important to discover effective

methods to get the best feature. Using seven different approaches, we extracted 25 genes, and cancer predictors rank with

these genes as well. In the prediction step, a classifier determines which category a gene pattern falls into given a gene list. We have utilised an ensemble classifier in addition to the four most popular classification techniques.

Gene choice

Not all of the hundreds of detected genes' expression levels are required for classification. Small samples of microarray data contain a huge number of genes. For classification, we must choose a small number of informative genes—genes that are highly connected to particular classes—(Golub et al. 1999). Gene selection is the procedure in question. In machine learning, it is also known as feature selection.

We can see the linear link and the direction of the association between two variables using statistical correlation analysis. Data distributed near a line biased in one direction (+) will have positive coefficients, and data distributed near a line biased in the other (-) will have negative coefficients since the correlation coefficient, or r , ranges from -1 to +1.

Classification

Recent work on cancer classification and prediction using gene expression data has made extensive use of machine learning algorithms developed to address classification difficulties. Machine learning generally uses two steps for classification: training the classifier to recognise patterns effectively from provided training data, and classifying test samples using the taught classifier. The classification process employs illustrative classification algorithms such the multi-layer perceptron, k-nearest neighbour, support vector machine, and structure-adaptive self-organizing map. They are MLP, KNN, SASOM, SVM and Classifier of Ensemble.

IV. EXPERIMENTAL FINDINGS

Database

Leukaemia cancer dataset, colon cancer dataset, lymphoma dataset, breast cancer dataset, NCI60 dataset, and ovarian cancer dataset are only a few examples of the numerous microarray datasets from published cancer gene expression studies. Three datasets from them are used in this study. The first dataset, the third dataset, and the second dataset all contain samples from the same disease in two different forms, together with normal and tumour samples from the same tissue. We may compare the findings of this paper with those of other papers because the benchmark data has been examined in other papers.

Leukaemia Cancer Dataset

The acute lymphoblastic leukaemia dataset comprises of 47 samples of acute lymphoblastic leukaemia (ALL) and 25 samples of acute myeloid leukaemia (AML). Nine peripheral blood samples and 63 samples of bone marrow were used to evaluate gene expression. High density oligonucleotide microarrays were used to determine the levels of gene expression in these 72 samples (Ben-Dor et al. 2000).

In this work, 38 of the 72 samples were used as training data, and the remaining samples served as test data. 7129 gene expression levels were present in every sample.

Dataset for colon cancer

The 62 samples of colon epithelial cells from patients with colon cancer make up the colon dataset. There are 2000 levels of gene expression in each sample. 6000 gene expression levels were present in the original data, but based on the confidence in the observed expression levels, 4000 out of 6000 were deleted. Out of 62 samples, 40 are those with colon cancer and the remaining samples are healthy. High density oligonucleotide arrays were used to measure each sample from the tumour and normal, healthy regions of the colon of the same individuals (Ben-Dor et al. 2000). In this work, 31 of the 62 samples were used as training data, and the other samples served as test data.

Dataset for Lymphoma Cancer

The term "B cell diffuse large cell lymphoma" (B-DLCL) refers to a group of tumours that exhibit great heterogeneity in terms of appearance, clinical presentation, and therapeutic response. Two different tumour subtypes of B-DLCL have been identified by gene expression profiling: germinal centre B cell- like DLCL and activated B cell-like DLCL (Losos et al., 2000). 24 GC B-like samples and 23 activated B-like samples make up the lymphoma dataset. In this study, 22 of the 47 samples were utilised as training data and the other ones as test data.

Climate

After evaluating each gene according to the feature selection criteria mentioned in section 3.1, the 25 top ranked genes are selected as the features of the input pattern. We used a 3-layered MLP for classification with 5–15 hidden nodes, 2 output nodes, a learning rate of 0.01–0.50, and a speed of 0.9. With k = 18, KNN is implemented. Pearson correlation coefficient and Euclidean distance are similarity metrics used in KNN. A 44 map with a rectangular topology, 0.05 initial learning rate, 1000 initial learning length, 10 initial radius, and 0.02 final learning rate, 10000 final learning length, and 3 final radius uses SASOM. We employed an SVM with a kernel function that was an RBF and a linear function. We modified the gamma parameter in RBF in 0.10.5.

Table 1.2: shows the identification of overlapping genes using the Pearson's correlation coefficient, the cosine coefficient, and the Euclidean distance.

Leukemia	472	2249	2746	2844	2020
	2044	2242	2288	4268	4420
	4297	4847	6049	7200	7202
	7474	7804			
Colon	287	729	704	777	2070
	2208	2647	2772	2772	
Lymphoma	47	76	77	77	87
	87	778	780	2747	2747
	2226	2244	2274	2422	2427
	2477	4890	4894	4944	

Table 1.3: shows the leukaemia dataset's rate of recognition using features and classifiers in percentages.

	MLP	SASOM	SVM	KNN			
				Linear	RBF	Cosine	Pearson
PC	97.2	77.6		79.4	79.4	97.2	94.2
SC	92.4	72.9		69.9	69.9	77.6	92.4
ED	92.2	74.6		70.7	70.7	96.4	92.4
CC	94.2	99.2		96.4	96.4	92.2	94.2
IG	97.2	92.2		97.2	97.2	94.2	97.2
MI	69.9	69.9		69.9	69.9	74.6	74.6
SN	77.6	77.7		69.9	69.9	74.6	74.6
Mean	96.4	74.0		72.7	72.7	94.6	96.4

Table 1.4: shows the recognition rate (%) in the colon dataset using features and a classifier.

	MLP	SASOM	SVM		KNN	
			Linear	RBF	Cosine	Pearson
PC	74.2	74.2	64.5	64.5	71.0	77.4
SC	69.2	46.2	74.6	74.6	72.4	77.7
ED	77.9	77.7	74.6	74.6	94.9	94.9
CC	94.9	74.6	74.6	74.6	90.7	90.7
IG	71.0	71.0	71.0	71.0	74.2	80.7
MI	71.0	71.0	71.0	71.0	74.2	80.7
SN	64.5	45.2	64.5	64.5	64.5	71.0
Mean	70.2	72.7	77.4	77.4	72.7	77.4

Table 1.5: Detection using features and classifiers (%) in the dataset for lymphoma

MLP	SASOM	SVM	KNN			
			Linear	RBF	Cosine	Pearson
PC	64.0	48.0	56.0	60.0	60.0	76.0
SC	60.0	68.0	44.0	44.0	60.0	60.0
ED	56.0	52.0	56.0	56.0	56.0	68.0
CC	68.0	52.0	56.0	56.0	60.0	72.0
IG	92.0	84.0	92.0	92.0	92.0	92.0
MI	72.0	64.0	64.0	64.0	80.0	64.0
SN	76.0	76.0	72.0	76.0	76.0	80.0
Mean	69.7	63.4	62.9	63.4	69.1	73.1

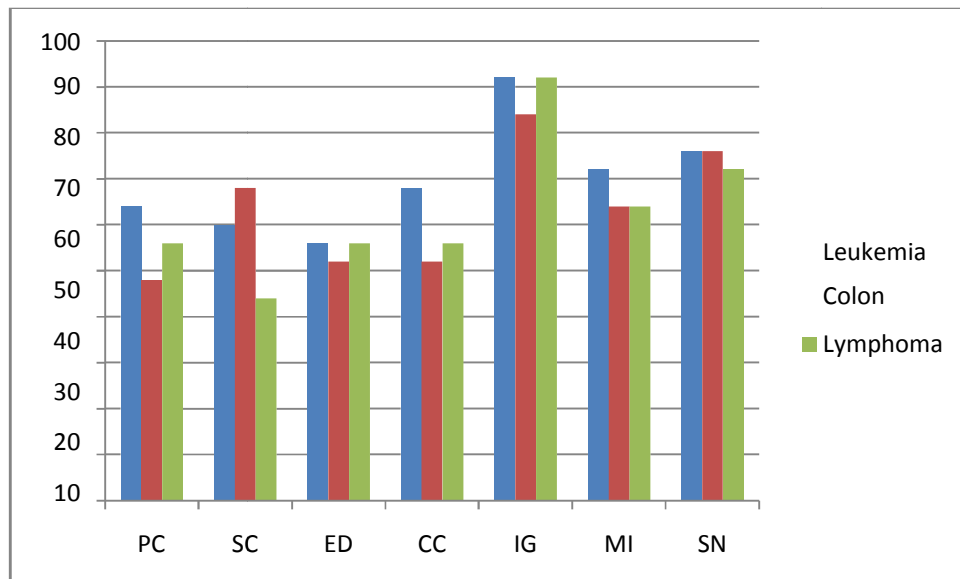


Figure 1.2: Performance of selecting features techniques in average form

Table 1.6: Ensemble classifier recognition rate

	Majority voting-4	Majority voting-all
Leukemia	97.2	92.2
Colon	94.7	72
Lymphoma	97	90

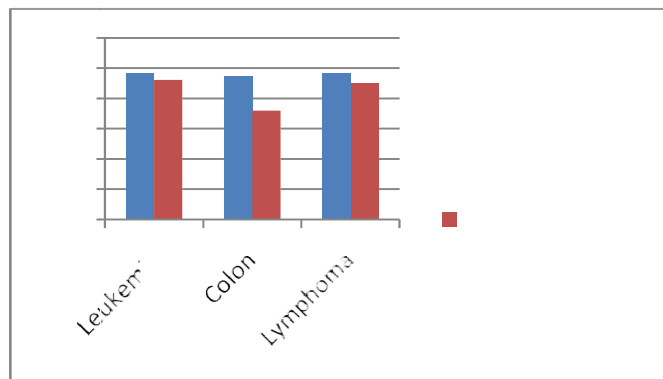


Figure 1.3: Performance Evaluation of Best Ensemble Classifier-4, Ensemble Classifier-All, and BestClassifier

Table 1.2 lists the gene IDs that overlapped in each dataset according to Pearson's correlation coefficient, cosine coefficient, and Euclidean distance. Some of these genes are overlapped by different feature selection techniques. Leukaemia gene 2299, for instance, is placed third in terms of knowledge gain. The leukaemia dataset has 27 genes that overlap one another. The colon dataset has nine genes that overlap one another. The lymphoma dataset has 29 genes that overlap one another. These genes that overlapped are highly instructive. Leukaemia gene 4947, in particular, has been described as instructive (Golub et al. 1999), however not every approach will typically reveal every gene. In Tables 1.3, 1.4, and 1.5, the detection rate findings for the test data are displayed. The following feature selection techniques are included in the column: information gain (IG), mutual information (MI), Euclidean distance (ED), cosine coefficient (CC), Pearson's correlation coefficient (PC), Spearman's correlation coefficient (SC), and signal to noise ratio (SN). The best detection rates among classifiers, on average, are produced by KNNPearson and MLP. KNNCosine is inferior than KNNPearson. SVM is the worst classifier available. A comparison of the features' typical performance is shown in Figure 1.2. Despite the fact that findings vary among datasets, information gain and Pearson's correlation coefficient rank first and second, respectively. Poor Spearman's correlation coefficient and mutual information. The qualities of the data may be the cause of the variation in performance among datasets. Table 1.6 displays the Ensemble classifier's recognition rate. Majority-voting-all denotes an ensemble classifier that uses majority voting with all 42 feature-classifier combinations, whereas majority-voting-4 denotes an ensemble classifier that uses majority voting with 4 classifiers. The performance comparison of ensemble classifier-4 and ensemble classifier-all, the two top 42C4 ensemble classifiers, is shown in Figure 1.3. With the exception of SASOM, all classifiers produce the greatest results for leukaemia. The best classifier produced the same results as the best ensemble classifier when four classifiers were used in majority voting. In some datasets, the ensemble classifier performs better than the top classifier. The ensemble classifiers that use majority voting perform the poorest across all datasets.

V. CONCLUSION

This study demonstrates that the ensemble classifier is effective and that, even with a straightforward combination approach like majority voting, we may enhance classification performance by merging complementary common sets of classifiers acquired from three different characteristics. For three benchmark datasets, we conducted a thorough quantitative evaluation of 42 feature and classifier combinations. The best feature selection techniques are information gain and Pearson's correlation coefficient, and the top classifiers are MLP and KNN. According to experimental findings, there is some association between features and classifiers, which might help researchers select or create the optimal classification approach for their bioinformatics-related challenges. Based on the findings, we created the optimum feature-classifier pairing to provide the greatest classification performance. Using majority vote, we merged 4 classifiers out of 42 classifiers. We can attest that a collection of highly linked characteristics performs well in an ensemble classification than a set of uncorrelated characteristics. We looked specifically at the increase in accuracy in classification for the colon dataset.

Furthermore, there are various ways to combine classifiers in the fields of machine learning and data mining, but our technique is quite straightforward. To validate the results and generate better results, it's necessary to use more advanced techniques for merging classifiers in the exact same dataset.

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Roadway and Infrastructure Development in Konkan Region by using Waste Material

Sumit Sudhir Pugaonkar¹ and Dr R P Singh Kushwah²

Research Scholar, Chhatrapati Shivaji Maharaja University, Panvel, India¹

Professor, Chhatrapati Shivaji Maharaja University, Panvel, India²

Abstract: *The disposal of plastic is major threat of a environmental problem. If the highway of the potholes and corrugation is also major problem. Plastic pavement will be a better solution to the above stated problems. A material that contain one or more organic polymer of large molecular weight, solid in its finished state, is also can be the shaped by its flow is called as “plastic”. The durability of plastic is high and it degrades very slowly. And also plastic has high resistant to degradation. Plastic can be divided in to two major categories- thermoses & thermoplastics. Thermoses have high durability and strength because it solidifies irreversibly when heated, henceforth can be used primarily in construction application. Plastic is a non-degradable waste, causes green-house effect and global warming. The various experiments have been carried out whether the waste plastic can be reused productivity. The various literature indicated that the waste plastic when added to hot aggregates will form a fine coat of plastic over the aggregate and such aggregate when mixed with binder is found to have higher strength, higher resistance and better performance over a period of time. Also along with the bitumen , use waste plastic increases its life and smoothness. It is economical and eco-friendly. Addition of plastic waste in construction of pavements reduces the plastic shrinkage and drying shrinkage. The use of waste plastic improves the abrasion & slip resistance of asphalt pavement. In India, because of hot and extremely humid climate, plastic pavements of greatest advantage.*

Keywords: Transportation, Road Pattern, Road Transport Service

I. INTRODUCTION

In order of a absorb the smoke from the vehicles; titanium di-oxide can be used. It also enhances the mechanical properties of the plastic, resulting in higher strength and high resistance.

Studies have revealed that waste plastics have great potential for use in bituminous construction as its addition in small doses, about 5-10%, by weight of bitumen helps in substantially improving the Marshall stability, strength, fatigue life and other desirable properties of bituminous mix, leading to improved longevity and pavement performance. The use of waste plastic thus contributes to construction of green roads.

Depending on their physical properties, they may be classified as thermoplastic and thermosetting materials. Thermoplastic materials can be formed into desired shapes under heat and pressure and become solids on cooling. On subjected to the same conditions of heat and pressure, they can be remolded. Thermosetting materials which once shaped cannot be softened/remolded by the application of heat. The examples of some typical Thermoplastic and Thermosetting materials are tabulated in Table 1. **Thermosetting materials are not used in pavement construction.**

TABLE: Typical Thermoplastic and Thermosetting Resins

Thermoplastic	Thermosetting
Polyethylene Terephthalates (PET)	Bakelite
Polypropylene (PP)	Epoxy
Poly Vinyl Acetate (PVA)	Melamine
Poly Vinyl Chloride (PVC)	Polyester
Polystyrene (PS)	Urea- Formaldehyde
LOW Density Polyethylene (LDPE)	Alkyd

High Density Polyethylene (HDPE)	
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1.4 plastics can also be classified according to their chemical source. According to source of plastic, there are six general groups: Cellulose Plastics, Synthetic Resin Plastics, Protein Plastics, Natural Resins, Elastomers and Fibers. Table 2 gives the source of waste plastic generation. Only plastic conforming to Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE), PET and Polyurethane shall only be used in pavement construction.

Table 2 Waste Plastic & its Source

Waste Plastic	Origin
Low Density Polyethylene (LDPE)	Carry bags, sacks, milk pouches, bin lining, cosmetic and detergent bottles.
High Density Polyethylene (HDPE)	Carry bags, bottle caps, house hold articles etc.
Polyethylene Teryphthalate (PET)	Drinking water bottles etc.
Polypropylene (PP)	Bottle caps and closures, wrappers of detergent, biscuit, water packets, microwave trays for readymade meal etc.
Polystyrene (PS)	Yoghurt pots, clear egg packs, bottle caps.
Foamed Polystyrene	Food trays, egg boxes, disposable cups, protective packaging etc. Mineral water bottles, credit cards, toys, pipes and gutters; electrical fittings, furniture, folders and pens, medical disposables; etc.

1.5 There are two processes namely dry process and wet process for manufacturing bituminous mixes after shredding in hot aggregates where as in the wet process, processed waste plastic in the form of powder is added in the hot bitumen. using waste plastic. In the dry process, processed waste plastic is added

II. BACKGROUND

Since 2001 , the plastic man of india R.Vasudevan, dean, Thiagarajar College of Engineering, Madurai, and his team the Centre for studies on solid waste management (CCWM) have been researching on feasibility of using plastic in construction of roads. Laboratory result of mixing waste plastic with heated bitumen and coating the mixture over stone proved positive and he implemented the use of plastic waste on a road constructed inside the premises of his college in 2002. In 2006, the Thiagarajar college of Engineering received the patent for this technology. Later, a performance appraisal by the central Board (CPCB) Showed that plastic roads did not develop defects potholes, rutting, raveling or edge flow, even after four years.

Presently global production of plastic is about 360 million tone .

Average worldwide utilization of plastic is 45 kg/ person.

Many plastics are discarded after a very short lifecycle (e.g.:- single use),which causes colossal waste accumulation and critical environment concerns. Approximately 3% of each year's plastic waste ends up in the sea, harming the environment and wildlife

Safe disposal of waste plastic is a serious environmental problem.

Plastic is a non-biodegradable material which can last as lomg as 4,000 years.

If dumped in landfills, it can find its way back to the environment through air and water erosion, can choke the drains and drainage channels, can be eaten by grazing animals causing them illness and death and can contaminate the construction fill.

Further, dumping on open land will result in wasteful use of scares land resource.

Land pollution and disposal of waste plastic challenge can reduce significantly if these materials are utilized in road construction.

III. LITERATURE REVIEW

Dr.R.Vasudevan,(2007) - stated that the polymer bitumen blend is a better binde compared to plain bitumen. Blend has increased softening point and decreased penetration value with a suitable ductility.

Zahra Insofar Kalantar(2012) – Many researches on PMA mixture have been conducted for the past two decades. Although addition of virgin polymers to asphalt for the purpose of enhancing the properties of asphalt over a wind temperature range in paving application was contemplated quite some time ago, recycled polymer added to asphalt have

also shown almost the same result in improving the road pavement performance as compared to virgin polymers. This paper is a review of the use of polymer in asphalt pavement. In this study, a critical review on the history and benefits of using waste and virgin polymer in asphalt is presented followed by a review of general studies on using polymers in asphalt in order to improve the properties of pavement.

Amit Gawande (2012) – the quantum of plastic waste in municipal solid waste (MSW) is increasing due to increase in population, urbanization activities and changes in life style which leading widespread littering on the landscape. Thus disposal of waste plastic is a menace and become a serious problem globally due to their non- biodegradability and un aesthetic view. Since these are not disposal scientifically & possibility to create mechanical characteristics for particular road mix. In conventional road making process bitumen is used as binder. Such bitumen can be modified with waste plastic pieces and bitumen mix is made which can be used as a top layer coat of flexible pavement. this waste plastic pieces and bitumen mix show better binding property, stability, density and more resistant to waste.

Sunil J. Kulkarni (2015) – Minimization of waste material is important aspect of the modern growth and development initiatives. Plastic is used in various domestic and industrial applications. Use of plastic bags and bottles is very common. The disposal of plastic waste is major problem due to non-biodegradable nature of plastic. The plastic can be used as feedstock for ethanol like products. It can be used for road construction and other construction related activities. The current review summarizes the research on use of waste plastic.

Rishi Singh Chhabra (2014) – In the highway infrastructure, a large number of originates materials and technologies have been invented to determine their suitability for the design construction and maintenance of these pavements. Plastics and rubbers are one of them also considering the environmental approach, due to excessive use of polythene in day to day business, the pollution to the environment is enormous. The use of plastic materials such as carry bags, cups, etc. is constantly increasing day. Since the polythene are not biodegradable, the need of the current hour is to use the waste polythene in some beneficial purposes. The use of these materials as a road construction proves eco-friendly, economical and use of plastic gives strength in the sub-base course of the pavement.

IV. METHODOLOGY

The dry process can also be carried out using central mixing plant. The shredded plastic is added along with the aggregate in the conveyor belt. This is transferred into the hot cylinder. There aggregate is coated with plastic first and then with the bitumen. The mixer so prepared is then loaded in the dipper lorry and transported for road laying. CMP helps to have better control of temperature and better mixing of this material thus helping to have a uniform coating. This is adopted in our project.

The comparative study is done by testing the normal aggregates & plastic coated aggregates, and the bitumen and modified bitumen (10% of bitumen replaced by plastic). The various tests that are carried out for the comparative study are

- Test on aggregates
- Aggregate crushing test
- Los Angeles abrasion test
- Impact test
- Test on bitumen
- Penetration test
- Softening point test
- Viscosity test
- Marshall Stability test.

Tests on Aggregates

4.1 Aggregate Crushing Test

The strength of the coarse aggregate may be assessed by aggregate crushing test. The aggregate crushing value provides a relative measure of resistance to crushing under gradually

applied compressive load. To achieve a high quality of pavement, aggregates possessing high resistance to crushing or low aggregate crushing value are preferred.

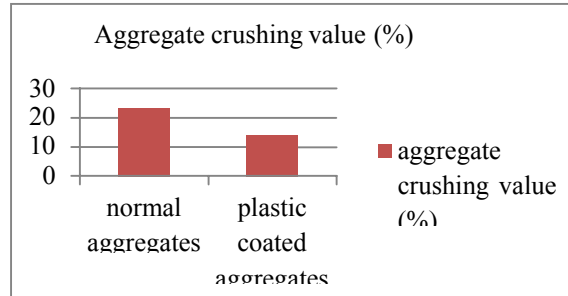


Figure 1 – Aggregate crushing value.

4.2 Abrasion Tests

Due to the movements of traffic, the road stones used in the surface course are subjected to wearing action at the top. Hence road stones should be hard enough to resist the abrasion due to traffic. Abrasion tests are carried out to test the hardness property of stones and to decide whether they are suitable for the different road construction works. The abrasion test on aggregate may be carried out using any one of the following three tests

Los Angeles abrasion test

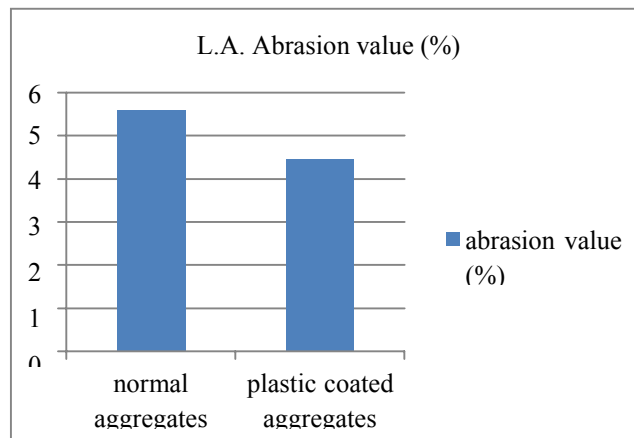
Deval abrasion test

Dory abrasion test

However Los Angeles abrasion test is preferred as the test results have been correlated with pavement performance.

4.3 LOS Angeles Abrasion Test

The principle of Los Angeles abrasion test is to find the percentage wear due to the relative rubbing action between the aggregate and steel balls used as abrasive charge. Pounding action of these balls also exists during the test and hence the resistance to wear and impact is evaluated by this test.



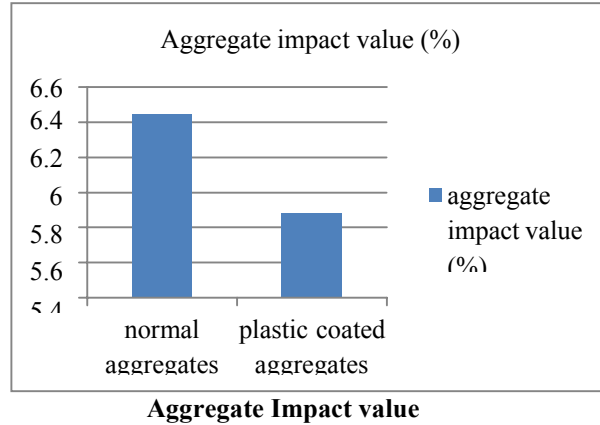
Aggregate Los Angeles abrasion value

4.4 Impact test

The test is designed to evaluate the toughness of stone or the resistance of the aggregates to fracture under repeated impacts is called impact test. The aggregate impact test is commonly carried out to evaluate the resistance to impact of aggregates and has been standardised by ISI.

The aggregate impact value indicates a relative measure of aggregate to impact, which has a different effect than the resistance to gradually increasing compressive stress.

The aggregate impact value should not normally exceed 30% for aggregate to be used in wearing course of the pavements. The maximum permissible value is 35% for bituminous macadam and 40% for water bound macadam base course.



4.5 Tests on Bitumen penetration Test

Penetration test is to determine the hardness of the bitumen. The penetration of a bitumen is the distance in tenths of millimeter, that a standard needle will penetrate into the bitumen under a load of 100gm applied for 5 seconds at 25 °c. Penetration value indicates the softness of bitumen (higher the penetration, softer is the bitumen).

Table 1 – test result of penetrations value of bitumen vs. penetration value (mm) modified bitumen

SR NO	PENETRATION VALUE (mm) PLAIN BITUMEN	PENETRATION VALUE (mm) MODIFIED BITUMEN (10% PLASTIC REPLACED)
1	79	67
2	63	49

4.6 Softening Point Test

The principle behind this test is that softening point is the temperature at which the substance attains a particular degree of softening under specified condition of the test softening point denoted the temperature at which the bitumen attains a particular degree of softening under the specifications of this test.

The test is conducted by ring and ball apparatus. A brass ring containing test sample of bitumen is suspended in liquid like water or glycerin at a given temperature. A steel ball is placed upon the bitumen sample and the liquid medium is heated at a rate of 5 C/ minute. Temperature is noted when the softened bitumen touches the metal plate which is at a specified distance below. Generally, higher softening point indicates lower temperature susceptibility and is preferred in hot climates.

Table 2 – test result of softening point of bitumen and modified bitumen (bitumen replaced by

SR NO	SOFTENING POINT (C) (PLAIN BITUMEN)	SOFTENING POINT (C) 10% BITUMEN REPLACED BY PLASTIC
1	69.2	80.7
2	70	81.2

4.7 Viscosity Test

Viscosity is defined as the inverse of fluidity. Viscosity thus defines the fluid property of bituminous material. Viscosity is the general term for consistency and is the measure of resistance to flow. Many researchers believe that grading of bitumen should be by absolute viscosity units instead of the conventional penetration units.

The degree of fluidity of the binder at the application temperature greatly influences the strength characteristics.



Digital Test Result Representation of Viscosity.

4.8 Marshall Stability Test

Table 3 – Percentage of bitumen content

SR NO	BITUMEN CONTENT (%)	MODIFIED BITUMEN (gm.)
1	4.5	5.9
2	5.0	0.6
3	5.5	6.6
4	6	7.2

Table 4 – Test Results of Marshall Stability Test

S.No	Bitumen Content(%)	Weight of mix(g)	Weight in air(g)	Weight in water(g)	Stability of bitumen		Flow (mm)	Diame-ter(cm)	Height (cm)
					Plain bitumen	Modified bitumen			
1	4.5	1255.5	1256.5	733	14.7	17.95	1.99	10	6.3
2	5	1253	1255.5	734	19.47	23.44	2.38	10	6.4
3	5.5	1257	1259	736	13.46	18.21	2.88	10	6.5
4	6	1268	1270	748	8.9	13.10	2.59	10	6.4

V. RESULT AND DISUSSION

- The Crushing value reduces from 23.32 to 14.22 for normal and plastic coated aggregate. The Value was reduced by 40% Lower the aggregate crushing value higher is the strength.
- The aggregate impact value of plastic coated aggregate was reduced by 9% than the normal aggregate. It's the higher toughness of plastic coated aggregates.
- Los Angeles abrasion value indicates the hardness of the aggregates. The abrasion value plastic coated aggregates were 21% less than the normal aggregates .
- The penetration value of bitumen is higher than the bitumen with the plastic.
- The bitumen softens 10@c less than the bitumen replaced with plastic.
- The stability of modified bitumen (10% bitumen replace by plastic) is higher than the normal bitumen.

VI. CONCLUSION

The plastic mixed with bitumen and aggregates is used for the better performance of the roads. The polymer coated on aggregates reduces the voids and moisture absorption. This results in the reduction of ruts and there is no pothole formation. The plastic pavement can withstand heavy traffic and are durable than flexible pavement. The use of plastic mix will reduce the bitumen content by 10% and increases the strength and performance of the road. This new technology is eco-friendly.

The use of smoke absorbent material (titanium di-oxide) by 10% of polymer content can reduce the vehicular pollution.

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Methodology and Technique of 8D's to Solve the Problem

Suraj Kumar¹, Dr. Munna Verma², Dr. Dharmendra Kr Dubey³

Research scholar, Department of ME, Bhagwant University, Ajmer, India¹

Assistant Professor, Department of ME, Bhagwant University, Ajmer, India²

Professor, Department of ME, Chhatrapati Shivaji Maharaj Institute of Technology, Navi Mumbai, India³

Abstract: Now a days in market there is too much competition for quality in automotive, crane manufactures etc. large production in different lines i.e., means so many kinds of products are manufactured and for them one is biggest challenge for quality. the 8d technique and their methodology is used to eliminate the problems and issues in production. it can be followed for products, systems and processes. 8d technique is being used as a tool for preventive as well as corrective action. 8d's first importance for client and inner issues. technique of 8d's also applied to understand the issues and how to resolve the issue, by finding the root cause. it works on PDCA cycle. 8d's is also known as team-oriented problem solving (tops). Now this work gives the opportunity in direction of examine how the 8d methodology and technique improve the quality in as well as improve the earnings and reducing defects and keep stable in global market.

Keywords: Quality assurance, Tools & Techniques of Quality , 8D's Problem Solving Method, methodology & concept of 8D

I. INTRODUCTION

8D's method is developed at Ford Motor Company & introduced in 1987 & oriented as TOPS (Goodwin et al., 2019). Implementation of 8-D method shows the frequency of defects before and after implementing the 8D's tool of inverted cables (Vargaes et al., 2020). The Eight steps of Problem Solving approach can be used to identify, rectify as well as to eliminate the quality problems. The whole team should be better and smarter (Lalit Kumar Biban, Deepak Dhouchak & Shakti, 2017). It is designed into eight disciplines which is illaborated step by step of 8D.

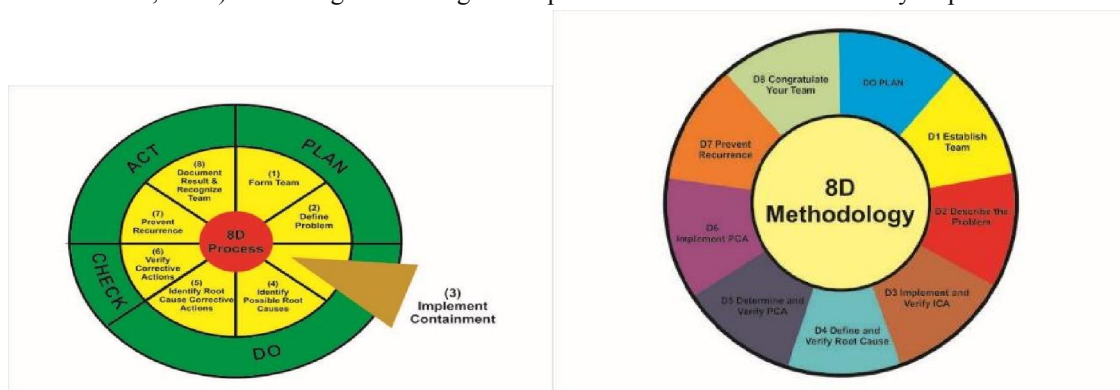


Fig. Intro" 1" Diagram of 8-D in term of PDCA (Ref. PDCA cycle)

There are many problem-solving tools and technique that is shown in problem - solving pyramid depending on time/complexity and the percentage of problems .

8D Methodology Introduction:

Primary target of the 8D technique is to find the the root cause of issues, rectify them and eliminate problems in a team approach, while making the problems solved useful in product and process improvement.

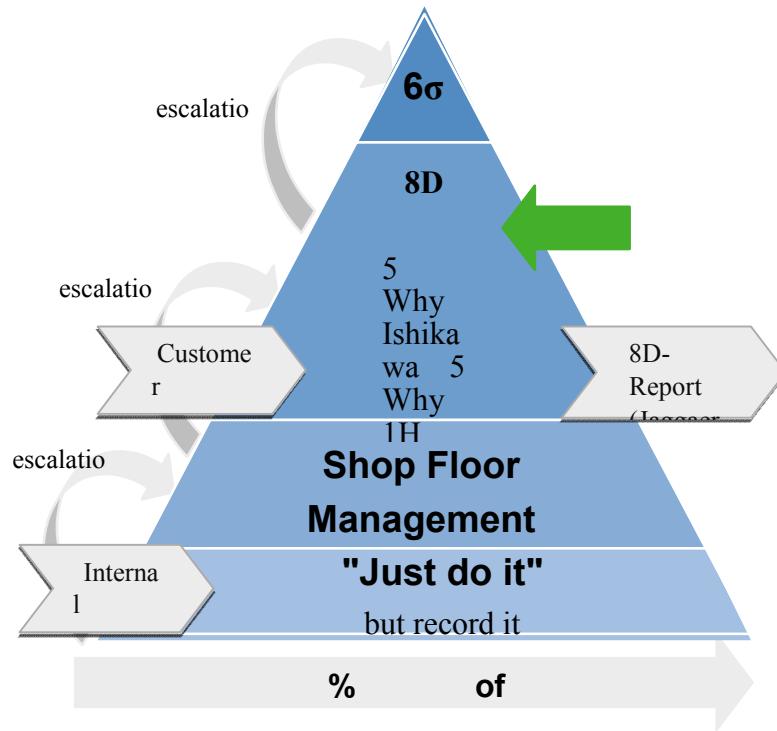


Figure 1: pyramid of problem-solving pyramid

Problem: To deviate from aspect state, then it is proposed and to implement in a short-term fix and a long-term solution to prevent the recurring issue and in this 1-5-20 technique is followed. The 8D essential and critical steps are to achieve this:

- D1:** Formation of a problem-solving team
- D2:** Problem description **D3:** Containment action
- D4:** Root cause analysis
- D5:** Potential corrective action
- D6:** Implement corrective action
- D7:** Take preventive action
- D8:** Closure & team celebration

1-5-20 technique is as:

1 1 day or after 24 hours receiving the complaint, the supplier has to define and to communicate the containment actions (D1-D3).

5 After Five working days supplier has to define as well as to communicate the root cause analysis along with corrective plan (D1-D5).

20 After twenty working day supplier has to communicate about the implemented corrective and preventive actions (D1-D8).

D1: Team Formation

In this step problem-solving team is defined to form a problem-solving team. Selected members should be from different fields, they will be from production, quality, development, operation etc.

Team of experts

Members should have the Competency
To analyze the root cause

Have ability to define and implement corrective and preventive actions as well as ability to monitor the result
They will be listed with their function.

Leader of the team is whole sole responsible for the perfectly execute of the 8 steps.

Result

A team is defined.

- Leader of team is define
- Multifunctional team along with different skills & knowledge
- Main key is Communication
- Resources are identified and approved by management

D 2: Problem Description- To define the quantify and describe the issues.

Procedure:

Short description- working title that has a identification for team members

Detailed description includes:

- a) detail of customer inspection report
- b) failure effect
- c) To identify the exact failure reason
- d)5W1H method:
- e) all available information:

Production date, shift batch

Measurement results

Rejected quantity

5W1H Method

This method is a 6 questions technique.

Bring questions related to problem core points

Justify the problems

To create the mutual understanding within team

Find out the data and facts resulting from the issue.

to obtain the details, data and facts resulting from the problem.

Question		Explanations
1.W	What?	What specific object has the p
2.W	When?	When was the problem obser
3.W	Where?	What part/place did the proble
4.W	Who?	Can the problem be associate
5.W	Which?	Is there a trend?
1.H	How?	How is the deviation from des

Figure 2: 5W1H Method

What specific product has the issue? For fact-based information such as object or type, number is helpful.

When issue observed? Detail such as time, date, shift or interval are important.





Which part and on which place the issue occurred?

Can problem have linked with skills? Can error linked with certain qualifications? On which shift, which employee is affected and what qualification is required?

Is there a inclination? Does the error occur chronically? Observations can be confirmed by key figures?

How is the divergence from the desired state. Divergence must be evaluated by the data.

Result

	Take sufficient time to understand the issue
	Use data and facts
	summary problem statement & specification
	start to think where else?

D3: Containment actions

Determine and execute containment actions to isolate the issue from any customer to avoid the assembly and delivery of suspected part.

Procedure

Containment is nothing it's a kind of isolating step to protect the customer

Problem must be hold and suspicious parts to be separated and quarantined.

Describe meanwhile restricted steps in addition the regular process flow (what action: 100% inspection, sorting, rework of the parts)

Restraint actions are reasonable if they ensure that no further defective parts come to the customer.

For each restraint action responsibility is to mention and monitored the start date as well as current status.

Collected data & monitored status should verified to check the effectiveness.

D3: Root cause Analysis-Decide, identify, and verify root causes



Figure 3: Procedure D 3

Application

After doing the problem description in D2 we have to follow up with the root cause analysis in D4.

Root Cause Types:

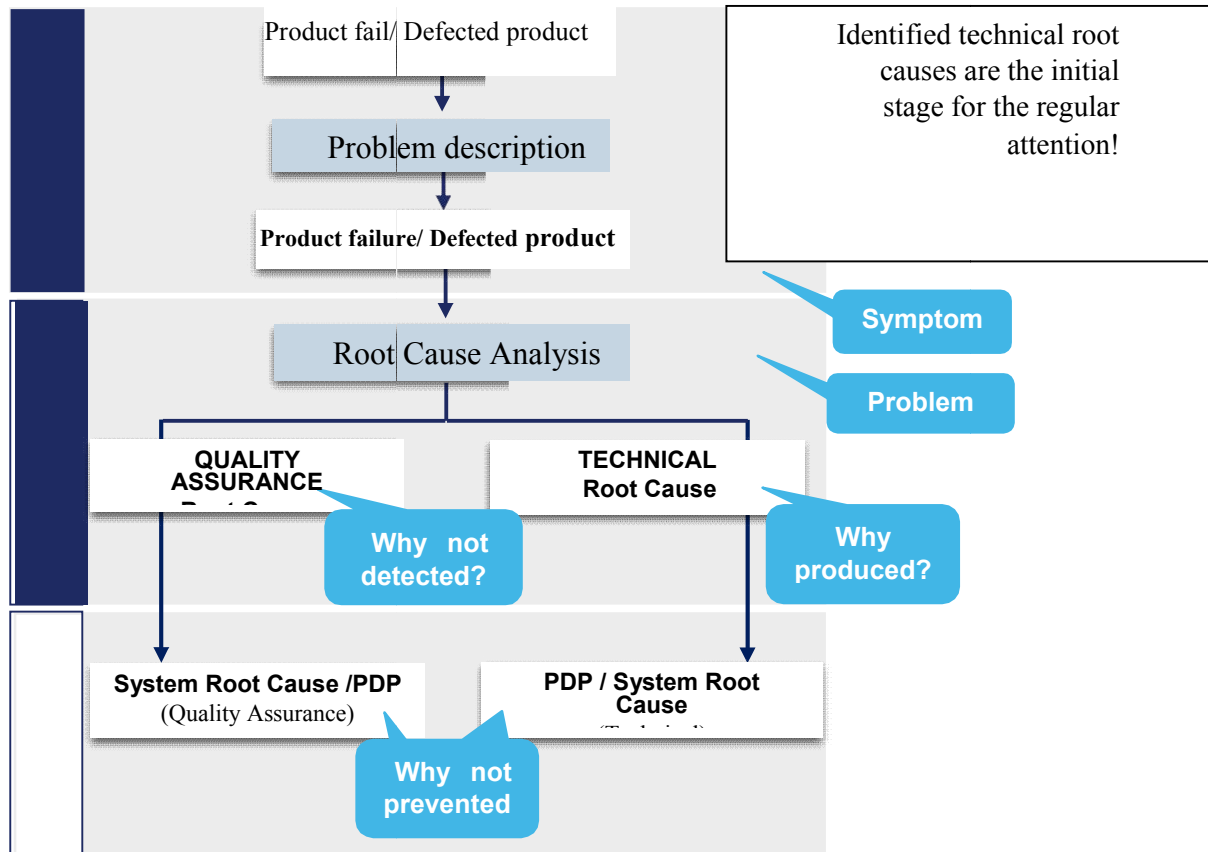
To ensure that same issue don't reoccur in the future, all levels of reason must be considered.

We have to analyze the reoccurred case & not identify the:

Technical root cause which tells the reason of defect in the product.

Quality Assurance root cause which tells the reason why the defective product was not identified and did get away to the customer.

To deep analysis we must considered failures in development phase (PDP) to find out the answer why the problem was



not prevented.

Figure 4: Root Cause Analysis

QM tool for the root cause analysis:

For root cause analysis which depends upon on the evaluation of the problem for this we different tools.

If **Potential cause is known** (by the knowledge as well as by the experience)

5-Why is used to identify the root cause.

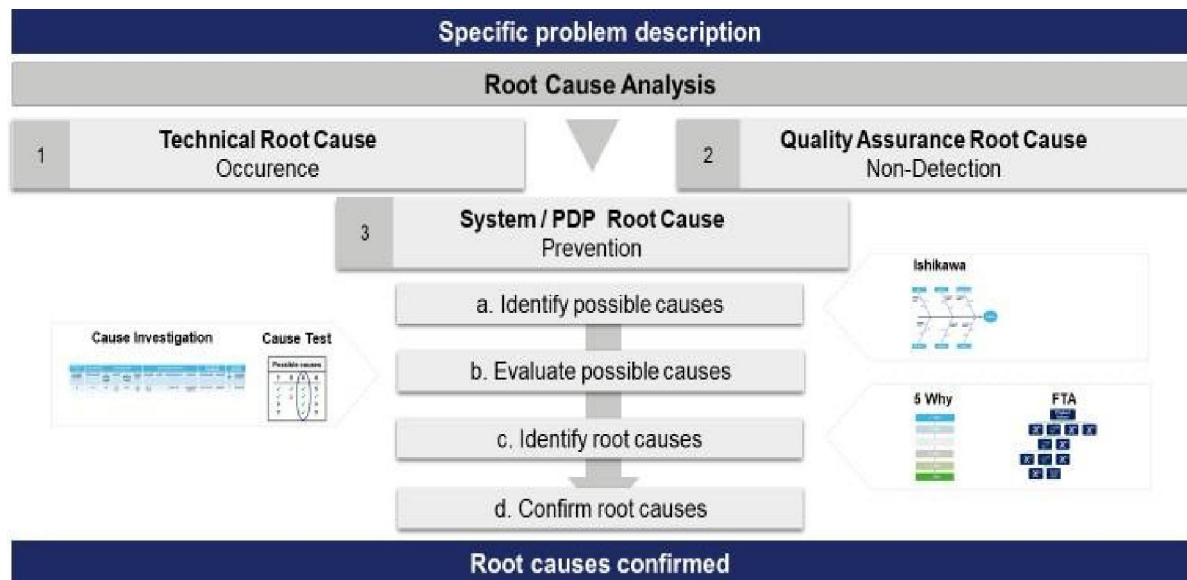
If **Potential cause is unknown** and less complicated

Ishikawa is used to identify the possible causes and uses 5 Why otherwise Fault Tree Analysis (FTA) is used to locate the root cause and confirm it.

If **Potential cause is unknown** and more complicated

5 Why 1H along with Ishikawa is used to identify the possible reason as well as 5 Why or FTA uses to identify the root cause and confirmation.

If **Potential cause is unknown** along with multi parameter problem



statistical method is used to identify the possible causes and uses 5 Why otherwise FTA.

Figure 5: Root cause analysis

Procedure

Root cause analysis is divided in four stages.

Identify the possible reason

Ishikawa diagram

Cause-and-effect diagram, also known as fishbone diagram due to its shape.

It should only be used if an identification of possible causes on IS / IS NOT is not possible

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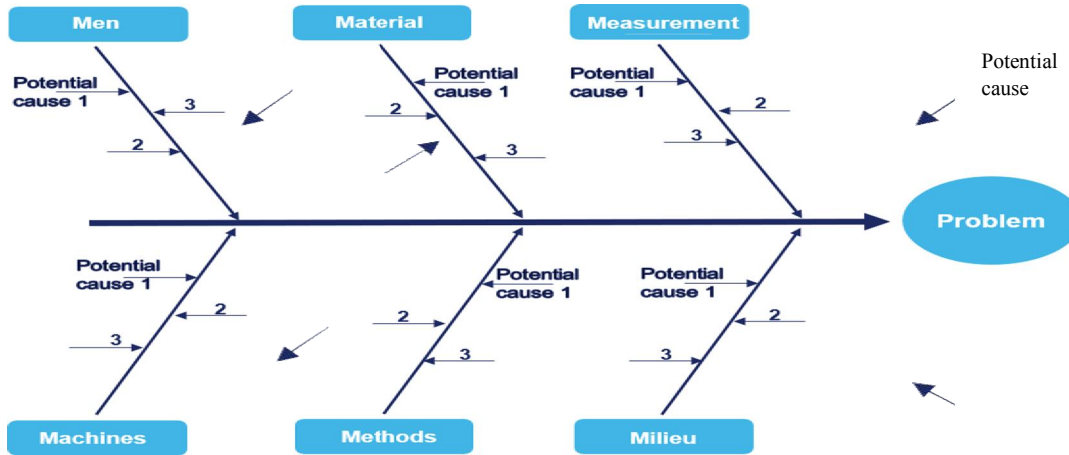


Figure 6: Ishikawa diagram

Procedure

Formulate the problem.

Brainstorm may be the possible reason for the problem and allocate them to different M- categories “6 M-Men, Material, Measurement, Machine, Method and Milieu. As per difficulty M`s can be added.

Each collected reason for cause, builda cause and effect theory.

Test all cause-and-effect theory which is based on investigations to confirm or eliminate them.

Prioritize the cause and effect theories which fully explain the reason to create the such issue and confirm it in the next step.

Result

The possible reason of a problem is systematically determined as well as visualized and Evaluate

1.2.2 Possible causes

Review and update the problem detail as well as check relevant standard.

1.2.2.1 Cause test

The Cause Test is a technique to verified the possibility of main causes which is based on data.

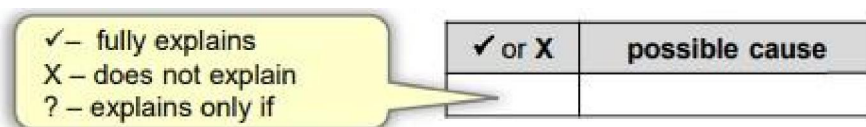
Each and every possible cause check if, it explain each and every data. As per results following options are:

probable reason interprets the facts (✓) confirmed as potential cause

probable reason doesn't interpret all facts (X) eliminated as potential cause

If not clear (?) or the probable reason explain only facts under certain assumptions further investigations are needed: in this situation use the Cause Investigation

Then we will decide most likely causes: What cause fully explains the facts and fewest assumptions?



Cause investigation

To be used for more complexive cases

Possible causes		Standard and Specification		Cause Investigation		
Possible Cause	T QA	Standard	Specification	Action	Responsible	
∅ too big	T	drawing	20 ± 0.2 mm	Test 25 Perts	Mr. Check	

Figure 7: Cause Investigation

Possible causes: List of identified possible causes.

Classification: “T” □ technical; “QA” □ quality assurance

Specification: Standard which is corelated to possible causes & specifications

Cause Investigation: Investigations to validate the possible causes. Mention responsible, due date as well as result.

Measurement Results: Mention in result GOOD and BAD parts & whether it is □ Yes / No

Check: On behalf of Additional investigations and consulting of experts can we identify the GOOD & BAD parts.

Evaluation: Evaluate the possible cause to eliminate the reoccurrence.

Identify the root cause

Why Analysis

By the help of 5 Why Analysis the main cause of a problem are investigated in order to find out the root cause.

Procedure

Define the problem with the team.

Ask: Why the problem occur?

After the answer, again ask: Why?

Repeat this step 5 times

Figure 8: 5 Why analysis

Sometimes the root cause found after 2-3 round of “Why” but sometimes, it take 5 times or more.

Result: Root Cause is identified.

Fault Tree Analysis

By the help of Fault Tree Analysis, main cause of the problem is investigated in order to find out the root cause.

Procedure

Select root cause type: technical, QA or PDP / system root cause.

Basis for the FTA is itself Problem failure. First of all, listed potential causes or factors which create the problem.

Find root cause: Identify the potential causes which is validated in stage A as well as in stage B. Process

repeated again and again to identify the root cause of the problems.

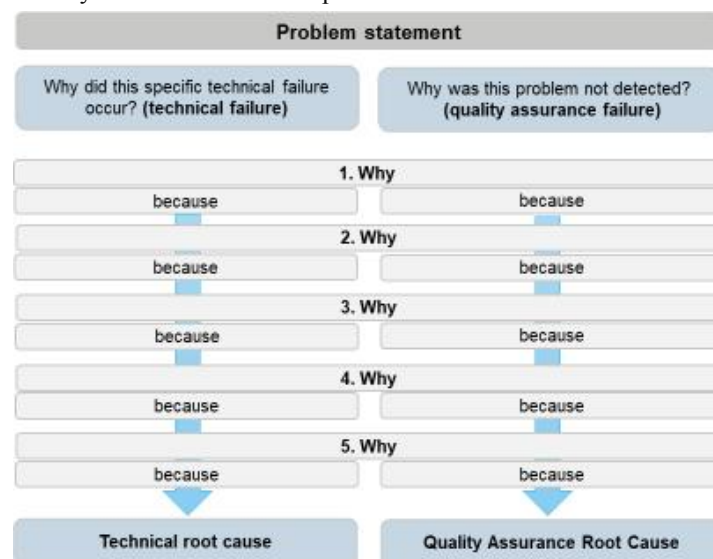


Figure 9: Fault Tree analysis (FTA)

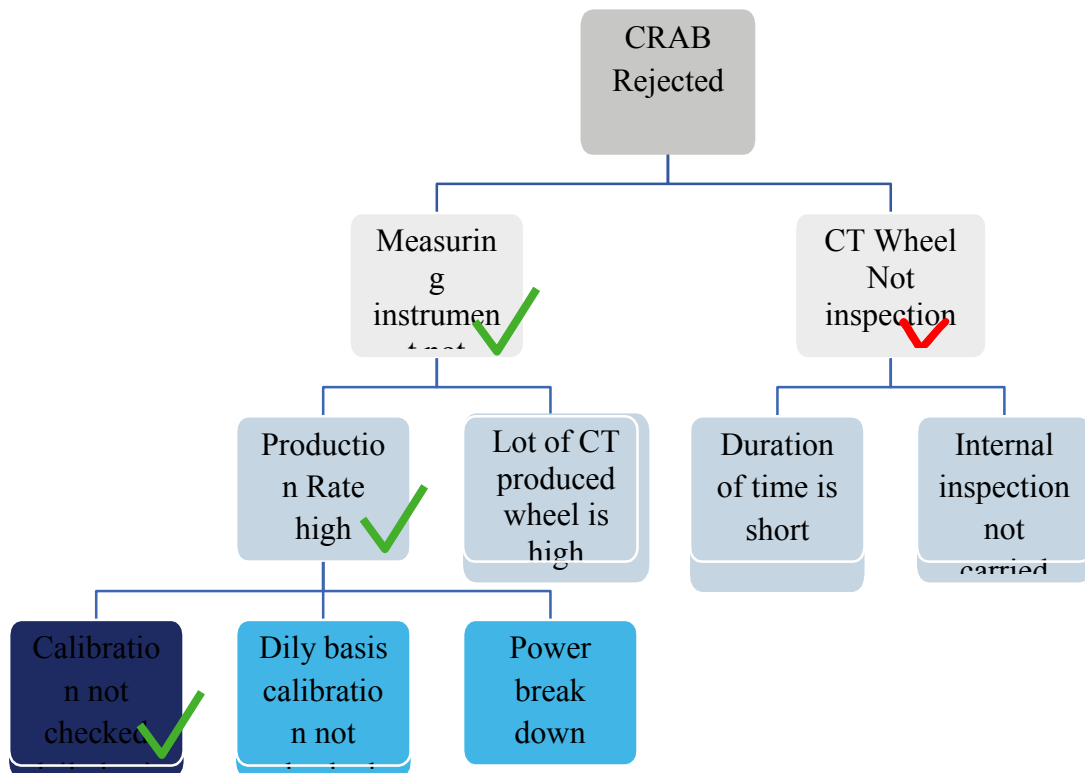
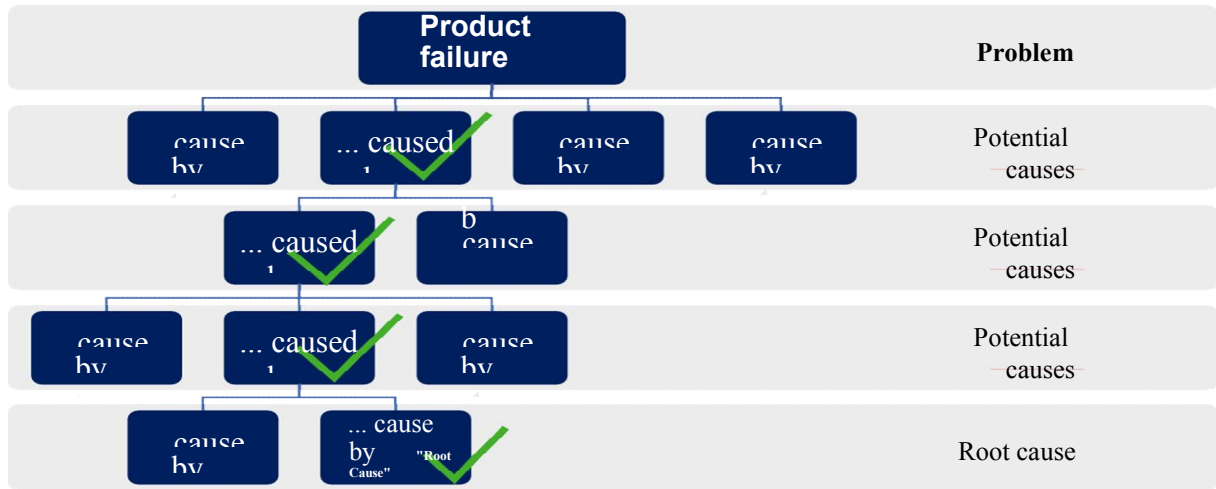


Figure 9: Example FTA

Choose the safe, easy, quick and cheap way to confirm the root causes. Reoccurring the defect, turn the failure on/off and switch on/off the root cause to represent the problem disappears.



Different **root cause types**



Identify the root causes **systematically**



Different tools depending on complexity



Verify and confirm each root cause using data and facts

D5: Potential corrective action

Determine potential corrective action: verify as well as chose the most effective one.

Procedure

Identification

List of all potential corrective action to enclose all root cause to identified in D4.

Verifications as well as evaluations

It is important to prove that actions can solve the problems

To make sure all possibilities has been considering that means compare all advantages / disadvantages

*Risk analysis: should be careful for unwanted side-effect.

Selection

Target: chose the best options schedule, rate, ...

Possibility to decide: agreement, settlement, majority, organize, ...

Result

Most effective effort able corrective action is selected.

D6: Apply corrective action

Cover up the root causes from D4 (technical and quality assurance)

Use the simplest most cost-effective solution

Should be aware for unwanted side-effects

Verification and confirmation of possible measurement on behalf of the objectives of investigation

D6 is implementation and validation of the corrective action.

Procedure

1.1 Implementation plan

To ensure for perfect result after implement an action.

1.2 Proof of effectiveness

After the implementation, the effectiveness of actions must be checked:

Quick check encouragement test

Long term check process capability, failure analysis, ... problem solved?

Containment actions (D3) can be removed for effective corrective actions

Result

Corrective actions are implemented and checked.

Take Follow up about corrective action plans

Confirm the effectiveness using data and facts

Withdraw containment action

Update related standards

D7: Take corrective action

Define and implement action to prevent reoccurrence of the failure in future.

Update relevant documents

A new standard to prevent reoccurrence should be established

Drawing modified (internal / external)

FMEA's

Control plan

List Special Characteristics (product and process)

Product standard guideline

Process standard guideline

Maintenance plan (preventive and productive)

Supplier Quality Assurance documentation

Share information

Transfer to products & processes which are existing today.

Prevent failure for **future** products and processes.

Prevent reoccurring problem

Update relevant standards (drawings, control plan, FMEA, ...)

Read across / Yokoten: transfer to similar products

Lessons learned: failure prevention identify and correct systemic weaknesses

D8: Closure and team celebration

Accept the collective effort of the team and appreciate the team effort.

In this step distinct feature of conclusion can be done:

Complete the 8D report

Congratulate your team

Share findings or customer feedback with the team

Approval of the 8D-report

Every 8D process must be completed by the plant or quality manager!

All actions & documentation closed and completed

Recognize the team

8D approval

Review the process 8D Assessment

Tools and techniques used in 8D

1. Flow chart

2. Check sheet

3. 5W, 2H (what, why, where, who, when, how, how much)

4. Root cause analysis

5. Ishikawa diagram

Application of 8D

Major non-conformances

Customer complaints

Reoccurring issues

Team approach needed

Provide best solution

Easy to implement

Used in manufacturing industries

II. CONCLUSION

8D's methodology is one of the important techniques to solve the problem with less/minimum error .8D's tool identified the root cause before preventive action. By the help of this tool and techniques company group, individual everyone get benefits. To start with your knowledges of subject's matter and your best experiences. Pay attention to the customer side when implementing the solution.

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Estimation of Effort Methods in Development of Software using Machine Learning Techniques

Monika Tiwari¹ and Dr. Kalpana Sharma²

Research Scholar, Department of CS, Bhagwant University, Ajmer, Rajasthan, India¹

Assistant Prof., Department of CS, Bhagwant University, Ajmer, Rajasthan, India²

Abstract: *Software effort estimation accuracy is a critical factor for effective planning, control and delivering a successful software project within budget and time. Both overestimation and underestimation are major challenges to future software development, hence the continued need for accuracy in software effort estimation. The main objective of this study is to help researchers to know which machine learning techniques predict promising effort estimation accuracy in software development. In this paper, the performance of the machine learning ensemble technique is examined with a single technique based on two of the most commonly used accuracy evaluation metrics.*

Keywords: Accuracy, Metrics, Control, Software & Estimation etc

I. INTRODUCTION

Software size estimation is an important feature in determining the effort required to develop a software product. It is the method of estimating the most practical measure of effort (expressed as personal hours or capital) required to create or maintain development operations in the light of insufficient, questionable, and controversial data. Software effort estimation (SEE) is the process of predicting the most sensible use of effort required to develop or maintain software. SEE is the activity of estimating the total effort required to complete a software project [2]. Effectively estimating the effort required to develop a software product is of fundamental importance to maintaining competitiveness in the marketplace. Both under- and over-estimation indicate undesirable outcomes for the organizations. Underestimating can lead to huge overruns in budget and schedule, which can result in the cancellation of projects; In such a situation, all the hard work so far went in vain. Over-estimated projects cannot be subsidised; As a result, organizational efficiencies are getting hurt. The process of effort estimation needs to be optimized as proper estimation is required from both developer side as well as client side. On the developer side, estimates help plan development and monitor progress. On the client side, they are used to negotiate contracts, set completion dates, prototype release dates, etc. However, as indicated in research work reported by the Brazilian Ministry of Science and Technology-MCT, only 29% of organizations meet the size estimation and 45.7% received software estimation. Therefore the research work on predictive estimation of proposed software has attracted the attention of many practitioners and theorists.

In 2013, the Standish Group Chaos Manifesto [3] stated that 43% of IT projects were delivered late, over budget, and/or with less than the required features and functions. This indicates that the role of project management is becoming increasingly recognized as a more important aspect of sustainability [4,5].

For accurate evaluation of web applications, datasets from previous web development projects are aggregated from the ISBSG [10] dataset. Similarly, in the case of agile projects, the Story Point Approach (SPA) is used to measure the effort required to implement a user story. Project velocity is obtained by adding up the estimates for user stories that are finished during the iteration (story point iteration). The efficiency of the models obtained using CPA, UCP, WEB and SPA can be improved by employing some intelligent techniques. The proposed research study considered the application of various Machine Learning (ML) techniques such as CPA, UCP, Decision Tree (DT), Stochastic Gradient Boosting (SGB), Random Forest (RF) and Support Vector Regression (SVR) kernel methods on the web. Went. Gone and SPA dataset to improve its prediction accuracy.

These datasets are selected on the basis of their content and its relevance so that inference process can be employed on those datasets. Class point dataset [14], UCP dataset is collected from 3 different sources which include datasets

from industries and some are available for academic research purpose. The entire web dataset is collected from the ISBSG repository and the SPA dataset [9]. A detailed description of these datasets is presented in the supporting chapters. The results of different models obtained after applying machine learning techniques are compared with each other as well as with the results available in the literature to assess their performance.

Machine learning techniques used

The following machine learning techniques are applied to various datasets considered to calculate the effort of a software product. The decision to choose machine learning techniques for the purpose of implementation in the proposed research has been made on the basis of previous research study done in literature survey [12-15]. Many researchers have previously applied some of the following machine learning techniques for their research purposes. But none of these techniques were previously applied to inference using CP, UCP, WEB and SP datasets. Each proposed contribution also describes a detailed representation of the results obtained using these techniques for their respective datasets. Each contribution also shows a detailed comparison of these techniques with earlier results obtained from the literature to reach their performance.

II. LITERATURE REVIEW

Shweta. KR et al. (2022), machine learning is the latest buzzword playing an important role in various fields of medicine, research, and an industrial application. It is difficult to weigh the real values or value of software. The best way to estimate software development cost, effort, size and time is based on past experience in software development. To measure the standard cost of software, as a unit of software value, machine-learning algorithms are used to enhance the level of end user satisfaction through accurate and quick calculation of software cost and effort estimation. In this research work, an innovative cost estimation for software project management was developed using an improved artificial neural network model. Two publicly available datasets are compared with different machine learning algorithms and the results show that the proposed model has high accuracy and low error rate in predicting the first stage of cost and effort evaluation.

Gautman et al (2021) stated that recently, there has been a growing frustration of programming project due to lack of system and financial planning limitations [2]. Deren et al (2020) applied expense evaluation to board development using an ANN model [3]. Fengwei Ning et al (2020) proposed a three-dimensional CNN for feasibility cost estimation [4]. Eric Mattel et al (2019) recommended that quotes allow project directors to assess the deliverability of activities and control costs effectively [5]. Mahmood et al (2019) builds a product cost evaluation model using an AI approach [6]. Michael et al (2018) applied neural convolution computation to cost evolution [7]. Przemys et al (2017) proposed various AI calculations for exertion and time evaluation [8]. TMS Elhag et al (1998) proposed ANNs for the development of programming projects [9]. Richa Yadav et al. (2016) examine that the achievement of a venture undertaking is further characterized by the developed amount and cost valuation strategy that deals with the ideal utilization of assets [10]. Murat Gunaydin et al (2004) investigate the utility of neural organization systems to beat cost assessment issues in the early stages of building configuration processes [11].

Ensemble Techniques and Accuracy Evaluation Metrics

The idea behind using EEE in SEE is that each estimation technique has its merits and drawbacks by integrating the techniques through EEE. We can remove the deficiencies, leading to more accurate estimates that can be obtained from a single model [12, 13].

There are two types of EEE methods [14]:

- Homogeneous EEE: Used to refer to an ensemble that aggregates a base model that contains no less than two different combinations of learning ensembles.
- Heterogeneous EEE: Used to refer to an ensemble that includes two diverse base models or more.

III. RESULT ANALYSIS

It should be noted that for the MMRE evaluation measure, a smaller value is better and for PRED (25) a larger value is better. The mean value of MMRE = 0.17 was smaller than the mean value of MMRE = 0.30 for a single technique on the NPD dataset. The Ensemble technique showed a 13% improvement compared to the Solo technique,

indicating that the Ensemble technique was better in accuracy than the Solo technique in terms of the mean value of MMRE. Similarly, the mean value of MMRE = 0.21 for the ensemble technique was smaller than the mean value of MMRE = 0.31 for the single technique on the PD dataset and showed a 10% improvement over the single technique. In addition, the mean values of Ensemble_MMRE_PD (0.21) and Ensemble_MMRE_NPD (0.17) were smaller than the mean values of Solo_MMRE_NPD (0.30) and Solo_MMRE_PD (0.31), respectively. The results for the mean value of the MMRE evaluation measure indicated that the ensemble technique was better in accuracy on both the PD and NPD datasets than the single technique.

The mean value of an ensemble using MMRE is 0.16, smaller than the single MMRE = 0.36 on the PD dataset, indicating a 20% improvement over the single technique. The mean value of MMRE = 0.15 was smaller than MMRE = 0.30 for the Ensemble technique, showing a 15% improved accuracy over the single technique for the Ensemble technique on the NPD dataset. The results for the mean value of the MMRE evaluation measure indicated that the ensemble technique was better in accuracy on both the PD and NPD datasets than the single technique. The minimum value of MMRE = 0.10 and maximum of 0.47 obtained by an ensemble technique compared to the single technique (min = 0.12, max = 0.52) means better estimation with an ensemble technique and a similar combination of ensemble rules produces accuracy. The graphical representation of MMRE for an ensemble and single techniques on PD and NPD datasets is shown in Figure 1.1.

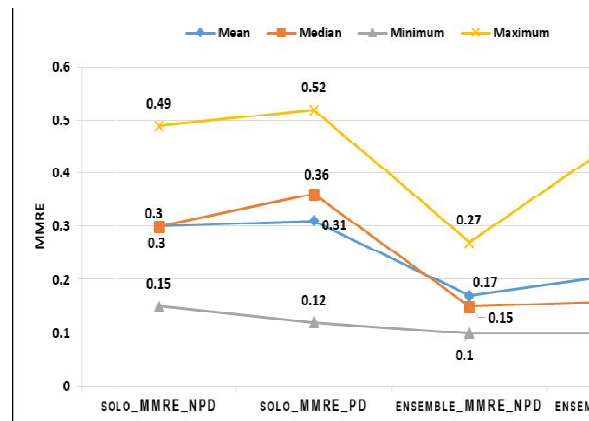


Figure 1.1: MMRE accuracy of an ensemble and single techniques on PD and NPD datasets

An integrated technique demonstrated 15.73% improvement over a single technique. The maximum value achieved by the ensemble was 88.89% compared to a single value of 88.83% on the PD dataset. However, the maximum accuracy achieved by the single technique (max = 95.32%) on the NPD dataset was better than that of the ensemble technique (max = 84.00%). It should also be noted that the minimum values obtained by the aggregated technique, 37.50% and 69.37%, respectively, on both the PD and NPD datasets were better in accuracy than the single technique. The graphical representation of PRED(25) for an ensemble and single techniques on PD and NPD datasets is shown in Figure 1.2.

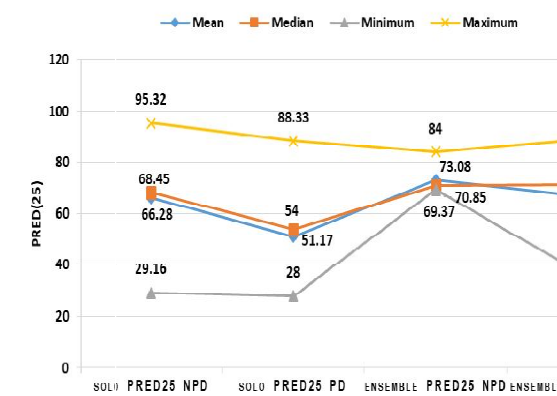


Figure 1.2: PRED(25) accuracy of an ensemble and single techniques on PD and NPD datasets

IV. CONCLUSION AND FUTURE WORK

We specifically focused on single techniques for machine learning-based ensemble and effort estimation. Our contribution to this research work is twofold. First, we explore the state of the art in the field of effort estimation using aggregation and singleton techniques. We obtained the primary study by following well-established systematic literature review (SLR) protocols prescribed for the software engineering domain. Second, we compared and evaluated both techniques by applying commonly used accuracy performance metrics (MMRE and PRED (25)) on PD and NPD datasets. Consolidation techniques outperformed single techniques when evaluated under MMRE and PRED (25) evaluation metrics. The ensemble technique was more accurate on both the PD and NPD datasets than the Solo technique. This is because every single estimation technique has merits and demerits that somehow lead to incorrect estimation results. Human expert inference can maximize the use of context-specific knowledge that cannot be accounted for by predictive algorithms, especially when the development team transitions to work with new emerging technologies or work in new application domains. Improving the effort estimation accuracy prediction of the software development effort using a combination of estimation techniques, including expert estimation to build coherence models or frameworks, would be another research direction. In the future, we aim to utilize the knowledge of this investigation and will propose an aggregated model to improve the estimation accuracy prediction of software development efforts involved with algorithmic, expert inference and machine learning techniques

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