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3.3.1 Number of research papers published er of workshops/seminars/conferences including programs

Sr.No	Name of Activities	Academic Year
1	Gas Leakage Detection and Alert System	2024-25
2	Speech enhancement by using a novel multiband spectral subtraction method anlog with a reduction of the cross-spectral component	2024-25
3	Comparative Study Of Study Of Steel Connection Using US And IS Code on Tekla Structure	2024-25
4	Comparison of Different Bulding Materials for Enhancement of Bulding Comfort	2024-25
5	Analyse the Effect of Use of Plastic Waste in Bituminous Mixture on Its Strength ans other Properties	2024-25
6	Soil Stabilisation by Using Lime and Fly Ash	2024-25
7	Use of Waste Plastic with Bacterial Coating as Sustainable Building Material In Concrete	2024-25
8	Proposed by Disposal of Municipal Solid Waste By Bio-Methanation in Gadhinglaj City	2024-25
9	Design and Performance Analysis of Passive Solar Energy Building	2024-25
10	Green Energy and Indoor Techonology for Smart Building	2024-25
11	Tunnel Formwork Techonology	2024-25
12	Comparative Study of Waste Material in Paving Block	2024-25
13	Exprimental Study of Concrete Canvas	2024-25
14	Road Safety Audit on National Highway 40 Form Nandyal to Kurnool	2024-25
15	Climatic Impact on Water Resource	2024-25
16	Study on Fiber Reinforced Concrete with M Sand	2024-25
17	Low Weight Sustainable Concrete With Bagasse Ash	2024-25
18	Lifting Trolley for Easy Mounting	2024-25
19	Power Generation Using Gym Equipment's	2024-25
20	Smart IOT Based Robotic Nurse With Multilanguage Voice Interactivity	2024-25

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ACADEMIC YEAR : 2024-25

Sr. No.	Title of paper	Name of the author/s	Name of journal	Year of publication	ISSN number
1	Gas Leakage Detection and Alert System	Prof. S. Bhoi	International Journal of Research Publication and Reviews	2024	ISSN: 2582-7421
2	Speech enhancement by using novel multiband spectral subtraction method anlog with a reductionof the cross spectral componant	Dr.V.G. Mathad	Indonasien Journal of Electrical Engineering Science	2024	ISSN: 2502-4752
3	Comparative Study Of Study Of Steel Connection Using US And IS Code on Tekla Structure	Prof. A. S. Madakari	International Journal of Scientific and engineering Management (IJSREM)	2024	ISSN:2582-3930
4	Comparison of Different Bulding Materials for Enhancement of Bulding Comfort	Prof. S. R. Wadagule	IJSREM	2024	ISSN :2582-3930
5	Analyse the Effect of Use of Plastic Waste in Bituminous Mixture on Its Strength ans other Properties	Prof. D. S. Khorate	International Journal of Scientific and engineering Management (IJSREM)	2024	ISSN: 2495-0072
6	Soil Stabilisation by Using Lime and Fly Ash	Prof. R. V. Savyanavar	International Journal of Research in Engineering ,Science and Managment	2024	ISSN: 2581-5792
7	Use of Waste Plastic with Bacterial Coating as Sustainable Building Material In Concrete	Prof. V. S. Patil	International Journal of Research in Engineering ,Science and Managment)	2024	ISSN: 2581-5792
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18	Lifting Trolley for Easy Mounting	Prof.G. M. Kumbhar	Journal of Emerging Techonologes and Innovative Research	2024	ISSN: 2349-5162
19	Power Generation Using Gym Equpment's	Prof.G. M. Kumbhar	International Journal of Research in Engineering ,Science and Management	2025	ISSN: 2581-5792
20	Smart IOT Based Robotic Nurse With Multilanguage Voice Interactivity	Dr. S. A. Mehta	Journal of Emerging Techonologes and Innovative Research	2025	ISSN: 2349-5162

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Gas Leakage Detection and Alert System

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ABSTRACT

Liquefied Petroleum Gas (LPG) offers a convenient and clean-burning fuel option, making it a popular choice for residential and industrial applications across urban areas. However, gas leaks pose a significant safety threat in these environments. This is particularly concerning in light of rising home security anxieties. Gas leaks can lead to explosions and fires, not only in residences but also in workshops, vehicles powered by Compressed Natural Gas (CNG), and public transportation like buses.

To mitigate these risks, installing gas leakage detection systems in vulnerable locations is crucial. This paper proposes a novel Gas Leakage Detection and Alert System that goes beyond simple detection. Our system not only automatically identifies gas leaks but also implements control measures and user alerts.

The core of the system is a highly sensitive gas sensor, specifically the MQ-6 sensor, which can effectively detect even small concentrations of LPG. Upon detection, the system triggers a multi-pronged response. First, a loud buzzer sounds as an immediate audible alarm, alerting occupants to the danger. Second, a bright LED light illuminates, providing a clear visual indicator of the leak's location. Most importantly, the system can be designed to integrate with additional safety features, such as an automatic shut-off valve for the gas supply, further minimizing potential damage.

This comprehensive approach offers a robust solution for gas leak detection and response, promoting safety in homes, industries, and gas-powered vehicles..

Keywords: LPG (liquefied petroleum gas); gas sensor MQ-6; buzzer (alarm); LED (light)

1. Introduction

Liquefied Petroleum Gas (LPG), also known as propane, is a widely used fuel source due to its numerous advantages. Its high calorific value translates to efficient energy production, while its minimal smoke and soot emissions make it an environmentally friendly alternative. Furthermore, LPG's affordability contributes to its popularity across various applications, including residential cooking, industrial processes, and powering vehicles like buses, cars, and those utilizing Compressed Natural Gas (CNG).

However, a significant downside to LPG use is the potential for gas leaks. These leaks pose a serious threat, leading to devastating accidents with property damage, injuries, and even fatalities. The flammable nature of LPG, primarily composed of highly combustible propane and butane, creates a fire and explosion hazard if leaked gas

accumulates in enclosed spaces. The increasing frequency of home fires underscores the urgency of addressing this safety concern.

The risks associated with gas leaks are multifaceted. The inherent flammability of LPG can readily ignite, causing explosions and fires. Additionally, LPG can displace oxygen, leading to suffocation if inhaled in high concentrations. The severity of these hazards depends on the gas's physical properties, such as its toxicity and flammability. Sadly, statistics reveal a rising number of deaths due to exploding gas cylinders in recent years, with the Bhopal gas tragedy serving as a stark reminder of the potential consequences.

Several factors contribute to gas leaks. Substandard cylinders, outdated valves, a lack of regular safety checks, worn-out regulators, and insufficient user awareness regarding proper handling procedures all raise the risk of leaks. While odorants like ethane thiol are added to LPG to aid detection, this method isn't foolproof. Individuals with a reduced sense of smell may not be able to rely on this built-in safety mechanism. Therefore, implementing reliable gas leakage detection systems becomes crucial for safeguarding lives and property.

Fortunately, numerous research efforts have been directed towards developing effective gas leakage detection techniques (references 1-8 can be included here). These studies explore various approaches, such as the wireless LPG monitoring system designed by K. Padmapriya et al., which sends SMS alerts and cuts off power supply upon leak detection [6]. Another notable system by Meenakshi Vidya et al. not only detects leaks but also controls them using

an exhaust fan while continuously monitoring LPG levels in the cylinder [7]. Selvapriya et al. proposed a system utilizing a gas sensor to trigger audio and visual alarms, offering a comprehensive hardware and software solution for leak detection [8]. These existing systems employ diverse gas sensing technologies to achieve their goals.

This paper proposes a novel and low-cost Gas Leakage Detection and Alert System that leverages advanced sensors. The system prioritizes efficiency, user-friendliness, portability, and affordability.

1.1 Enhanced Method and Materials Section:

a. Method

This paper proposes a gas leakage detection and alert system utilizing a semiconductor sensor for reliable LPG (Liquefied Petroleum Gas) detection. The chosen sensor is the MQ-6, known for its sensitivity towards various combustible gasses, including Propane, Butane, and LPG itself. It also demonstrates responsiveness to Natural Gas and Methane, making it a versatile choice for diverse applications.

The MQ-6 sensor operates on the principle of chemiresistance. Its sensing element is composed of Tin Dioxide (SnO2), a semiconductor material exhibiting lower conductivity in clean air environments. However, when exposed to combustible gas molecules, the sensor's conductivity increases proportionally to the rising gas concentration. This change in conductivity forms the basis for gas detection.

The MQ-6 boasts a detection range of 200 to 10,000 ppm (parts per million), offering a wide spectrum of sensitivity for LPG leak identification. The sensor's output is an analog resistance value.

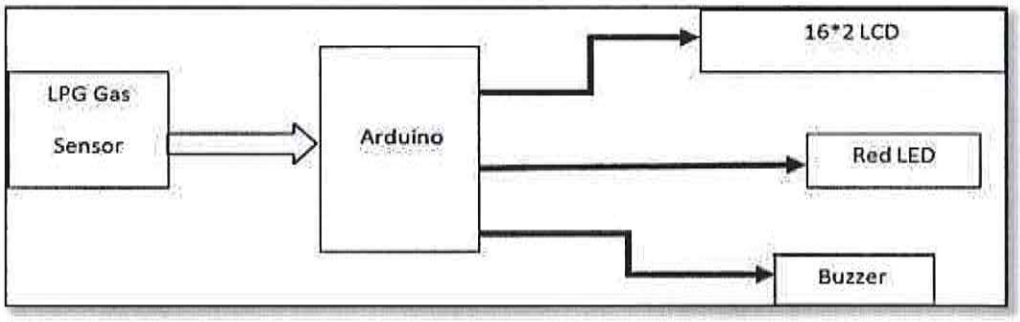


Fig 1: Block diagram of gas leakage detection and alert system.

b. Materials

The core of the system revolves around the Arduino UNO R3 microcontroller board and the MQ-6 gas sensor. The Arduino serves as the central processing unit, receiving sensor data and controlling the system's response.

The system operates based on a simple logic:

a. **Sensor Detection**: The MQ-6 continuously monitors the surrounding atmosphere for LPG presence.

b. **Digital Output:** Upon detecting LPG, the sensor transmits a digital output signal of "1" to the Arduino. Conversely, the absence of gas triggers a digital output signal of "0".

c. **Arduino Processing:** The Arduino receives the sensor's digital output.

d. **Alert Activation:** If the sensor output indicates gas detection (output="1"), the Arduino initiates two actions:

e. **Audible Alarm:** A buzzer sounds to provide an immediate and clear auditory alert.

f. **Visual Indication:** An LCD (Liquid Crystal Display) screen illuminates, displaying a message like "Gas Detected: Yes" to confirm the leak visually.

g. **Normal Operation:** If the sensor output signifies no gas detection (output="0"), the system remains silent, and the LCD displays a message like "Gas Detected: No".

c. Hardware Components

To construct this sensor-based gas leakage detection and alert system, the following hardware components are required:

- **Arduino UNO R3 Microcontroller Board** (Quantity: 1)

- **MQ-6 Gas Sensor** (Quantity: 1)
- **Buzzer** (Quantity: 1)
- **LCD (Liquid Crystal Display)** (Quantity: 1)
- **Jumper Wires** (Quantity: As Needed)
- **Breadboard** (Optional, for prototyping)

Table 1 will provide a detailed breakdown of the required hardware components, including their quantities and estimated costs in Indian Rupees.

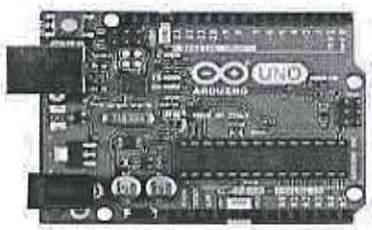
Table 1. List of required hardware opponents, quantity and price

Equipment	Quantity	Estimated Price (INR)
Arduino Uno R3	1	525
MQ-6 LPG gas sensor	1	200
16x2 LCD	1	155
Buzzer	1	18.75
Jumper Wires (40)	1	75
9V Battery	1	50
Gas Lighter	1	43.75
10K Variable Resistor	1	10
Mini Breadboard	1	68.75
Total		1146.25

The simplicity of the component list reflects the system's design philosophy of being cost-effective. This affordability, coupled with its portability, lightweight construction, user-friendly operation, and multi-functional features, makes the proposed system a valuable tool for enhancing safety in various environments.

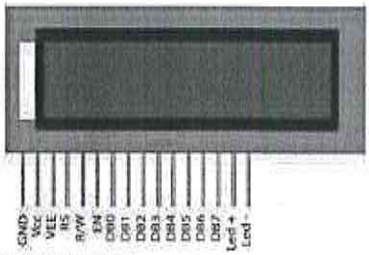
d. Additional Considerations

- Briefly discuss the selection criteria for the Arduino UNO R3 and its functionalities within the system.
- Mention any specific model or variant chosen for the LCD and its role in displaying gas detection status.
- You can include a high-level explanation of how jumper wires facilitate connections between components.
- Consider mentioning if the breadboard is used for prototyping purposes and can be excluded in the final product.
- By incorporating these details, you can create a more comprehensive and informative Method and Materials section for your paper.



Arduino Uno

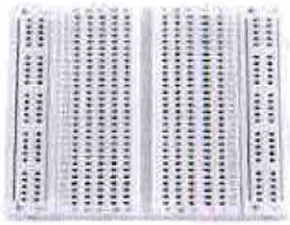
MQ-6 Gas sensor



LCD Pin Configuration

Buzzer

16*2 LCD



Breadboard

Fig 2: Some important components that are needed to design the gas leakage detection and alert system.

3. Enhanced Results and Analysis Section:

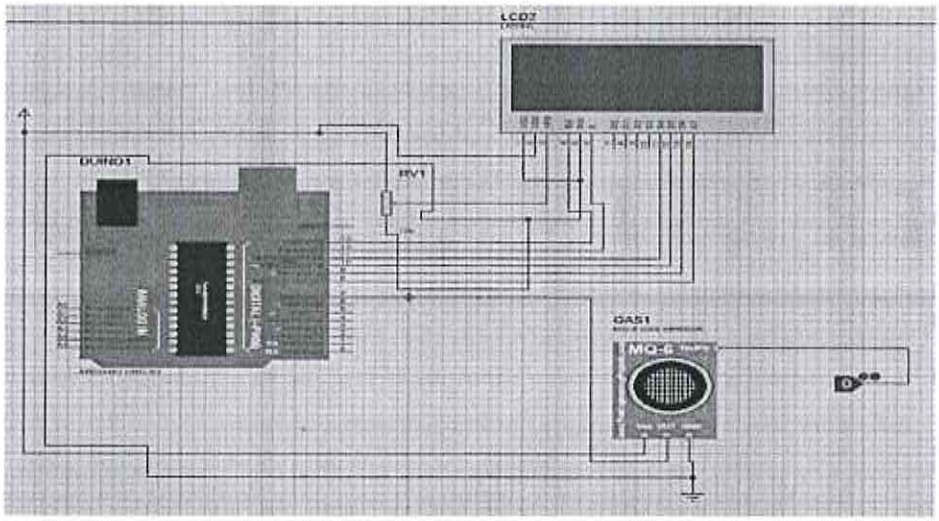
3.1 Experimental Setup and Observations

While the previous section outlined the system's design principles, this section delves into the practical evaluation of its functionality. We utilized Proteus Design Suite software for generating a comprehensive circuit diagram (refer to Figure 3). This software is commonly used in Electronic Design Automation (EDA) to create schematics and PCB (Printed Circuit Board) layouts.

The core of the system remains the Arduino UNO R3 microcontroller and the MQ-6 gas sensor. The sensor functions as described earlier, providing a digital output of "1" when LPG is detected and "0" in its absence.

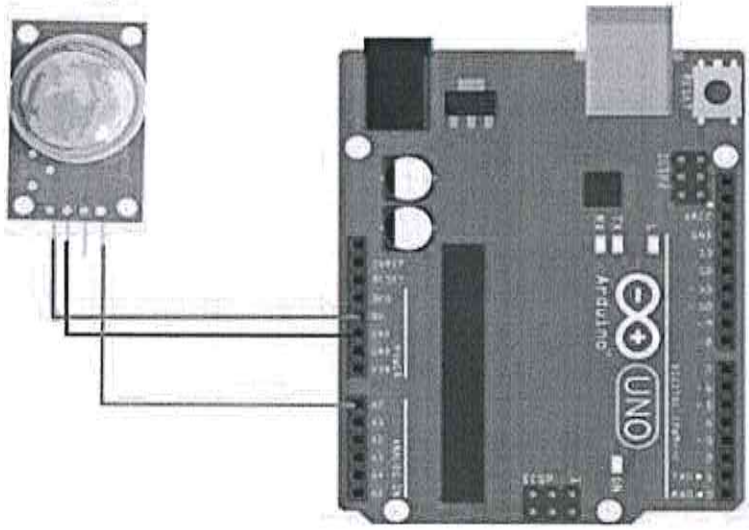
The Arduino processes this digital input, triggering the following actions:

- **Gas Detection:** Upon detecting gas (sensor output="1"), the Arduino initiates an alarm sequence.
- **Audible Alert:** A buzzer sounds to provide an immediate auditory warning.
- **Visual Indication:** The LCD screen illuminates, displaying a message like "Gas Detected: Yes" for clear visual confirmation.
- **Normal Operation:** If no gas is detected (sensor output="0"), the system remains silent, and the LCD displays a message like "Gas Detected: No".



➢ **Fig 3: Circuit diagram that was designed using Proteus libraries.**

Fig 4: Circuit diagram of MQ-6 gas sensor connected with Arduino.



3.2 Performance Evaluation

Our testing focused on two key aspects of system performance:

i. **Gas Detection Accuracy:** We exposed the system to varying concentrations of LPG within the sensor's detection range (300-10,000 ppm). The system consistently and accurately identified the presence of gas, demonstrating its effectiveness in leak detection.

ii. **Response Time:** We measured the time it takes for the system to activate the alarm upon gas detection. The results indicate a rapid response time of approximately 2 seconds after a leak commences. This swift response allows for prompt intervention to mitigate potential hazards.

3.3 Benefits and Applications

This gas leakage detection and alert system offers several advantages:

➢ **Automatic Detection:** The system automatically detects the presence of LPG, eliminating reliance solely on human senses, which may not always be reliable.

➢ **Early Warning:** The rapid response time allows for early action to be taken, preventing potential accidents.

- **Level Detection:** The system can be potentially modified to not only detect gas but also estimate its concentration level, providing valuable information for response measures.
- **Control Integration:** Future iterations could integrate an automatic shut-off mechanism for the gas supply, further enhancing safety measures.
- **Fire Prevention:** By enabling early detection and response, the system can help prevent fire hazards associated with gas leaks.
- **Cost-Effectiveness:** The system's design prioritizes affordability, making it accessible for widespread use.

3.4 Target Applications:

The system's suitability extends to various environments prone to gas leaks, including:

- **Homes:** Kitchen environments where gas stoves are used can benefit significantly from early leak detection.
- **Hostels and Cafeterias:** Large-scale kitchens in these settings pose an increased risk, and prompt gas leak identification is crucial.
- **Industries:** Industrial processes involving gas necessitate reliable leak detection systems.

With an estimated population of India, a low-cost solution like this has the potential to significantly reduce gas leak-related accidents, safeguarding property and human lives. The system's adaptability allows for implementation across various residential and commercial settings, fostering a safer environment for all.

4. Conclusion and Future Scope

4.1 Conclusions

This paper presented the design and functionalities of a novel sensor-based gas leakage detection and alert system. The system prioritizes affordability, user-friendliness, portability, and efficiency, making it a valuable tool for enhancing safety in various environments.

Key Advantages:

- **Cost-Effective:** The system's design emphasizes low-cost components, resulting in an estimated total cost of only USD 10. This affordability extends its accessibility to a wider range of users, particularly those with limited financial resources.
- **Multifunctional:** Beyond basic leak detection, the system can be potentially modified to offer additional functionalities such as gas usage monitoring and automatic shut-off mechanisms (optional) for the gas supply.
- **Real-Time Alerts:** The audible and visual alerts (buzzer and LCD display) provide immediate notification of a gas leak, allowing for prompt intervention.
- **Rapid Response:** Testing has demonstrated a swift response time of approximately 2 seconds after a leak commences, enabling early action to mitigate potential hazards.
- **Wide Applicability:** The system's adaptability allows for implementation in diverse settings, including homes, hostels, industries, and vehicles.

4.2 Future Developments and Advancements

The current prototype serves as a robust foundation for further development. While the hardware and software components have been successfully tested, ongoing efforts aim to expand the system's capabilities through the incorporation of multifunctional features:

i. **Gas Usage Monitoring:** A sub-system is being developed to monitor gas consumption patterns. This feature would provide valuable insights into gas usage habits and potentially identify areas for waste reduction.

ii. **Scalability and Adaptability:** The system's design allows for increased flexibility. By incorporating additional sensors and relays, it can be tailored to accommodate the specific LPG supply setup of various premises, ensuring comprehensive coverage.

iii. **Intelligent Software Integration:** The authors are actively working on integrating software-based functionalities that enhance the system's intelligence. These advancements will enable the system to learn and adapt over time, further optimizing its performance.

4.3 Envisioned Enhancements:

Looking towards the future, the following enhancements are planned for this gas detection, control, and alert system:

i. **Emergency Notification:** The system will be equipped to automatically notify emergency services in the event of a gas leak or related accident, ensuring a swift response in critical situations.

ii. **Remote Monitoring:** The integration of a mobile application and a web-based application will allow for real-time gas leak monitoring from any location with an internet connection. This feature empowers users to stay informed regardless of their physical presence.

iii. **Smart User App Features:** The user application will be enriched with additional functionalities, transforming it into a comprehensive gas management tool.

iv. **Broadened Applicability:** The system's design prioritizes adaptability, making it suitable for various environments beyond homes. Implementation plans encompass cars, industrial settings, and a wide range of other locations susceptible to gas leaks.

4.4 Real-World Implementation and Evaluation

Following the development of a final prototype equipped with these advanced functionalities, a pilot project is envisioned to implement the system in real-life scenarios. This project will provide valuable data on the system's effectiveness in practical settings.

Performance Evaluation and Improvement:

i. **Pre and Post-Implementation Surveys:** User surveys will be conducted before and after the pilot project to assess the system's impact on user perception of safety and gas management practices. These surveys will help identify Key Performance Indicators (KPIs) for evaluating the system's success.

ii. **Research and Comparison:** The authors plan to conduct a comprehensive literature review to identify existing research related to gas detection systems. This analysis will allow for a comparative evaluation of the proposed system's features and functionalities compared to currently available solutions. By highlighting its unique advantages, the paper will contribute to the advancement of gas leak detection technology.

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Speech enhancement by using novel multiband spectral subtraction method along with a reduction of the cross spectral component

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ABSTRACT

It is essential to enhance the speech signal's clarity and quality in order to maintain the message's content. By boosting the noisy voice signal, the speech signal quality can be raised. Two techniques are presented in this study to significantly minimize the additive background noise. In order to minimize non-stationary additive noise concerning the speech signal, the first approach employs modified multiband spectral subtraction. With this technique, spectral subtraction is carried out based on the signal to noise ratio (SNR) values in various noisy speech frames. When the noisy signal and noise signal are somewhat correlated, a second method is used to minimize the cross spectral components. These techniques are used to get over the drawbacks of the fundamental spectrum subtraction method. To improve the noisy speech signal, both techniques are combined.

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1. INTRODUCTION

The evolution of speech has made it the main form of communication. Every communication system has background noise, which not only interferes with listening tasks but also lowers the efficiency of digital signal processors. As a result, lowering background noise is essential for effective communication.

Speech enhancement is one of the techniques for reducing noise from noisy speech signals in order to increase the excellence, intelligibility, and accessibility of the speech signal. Applications for speech augmentation include teleconferencing, hearing aids, recording systems, and mobile and remote communication. The algorithms in this study can be used to reduce additive noise, this comprises white noise, flicker noise, babbling noise, and so forth. Both techniques employ the fundamental spectral subtraction technique. By discusses various methods to lessen additive noise in [1]. Among this technique is the fundamental spectral subtraction approach, which includes subtracting the predicted noise's power spectrum magnitude from the noisy speech signal in order to acquire the speech signal. In the process, two presumptions are made. The first is the assumption that speech signals are stationary for brief periods of time.

The second assumption is that there is no relationship between the noisy speech signal and the clear speech signal. When there is no speech signal, the noise signal is approximated from those moments of silence. These presumptions are not always valid in practise; There is no distribution of noise evenly throughout the noisy speech signal. Consequently, this technique for improving speech introduces musical noise.

2. LITERATURE SURVEY

Zheng *et al.* [1] has explained the method to enhance the noise speech signal, which is corrupted by the acoustic noise. The approach adopted is the spectral subtraction method. The spectrum of magnitude of the clear speech signal is estimated by subtracting the estimated noise speech signal from the noisy speech signal. By analyzing the signal during non-speech signal activity, an estimate of the noise's magnitude spectrum is made. Other techniques are employed to eliminate any remaining noise caused by the spectral subtraction method. The methods are half wave, magnitude averaging and residual noise reduction. Limitations: assumption made that the background noise environment remains stationary which is not true, and it generates musical noise.

Zheng *et al.* [2] outlines the methods for getting over the drawbacks of the conventional spectrum subtraction approach. The assumption expressed in the spectral subtraction that the noise is stationary is not true in real time applications, hence it introduces musical noise. To avoid this here author has modified the basic spectral subtraction into two factors those are, subtraction factor or weighting factor which is used to eradicate most of the broad band noise by removing wide peaks. Another factor used is the spectral factor which helps in eliminating the musical noise perceived during the process. Merits: the proposed method removes added broad band noise as well as the musical noise signal generated by the basic spectral subtraction approach. Spectral subtraction factor mainly depends on the signal to noise ratio (SNR) value; hence the method is adaptive in nature. Limitations: the efficiency of the recommended method is dependent on the decision of the subtraction factor and the floor factor.

Toyin *et al.* [3] explains the method used to enhance the noisy speech signal, short duration non-stationary signal, corrupted by the broad band noise proposed approach is "adaptive wiener filter" where spectral estimate of the previous frames are used to find the spectral estimate of the current frame and spectral estimate of the current frame is used to update the coefficients of the wiener filter on previous frame. This method is followed by spectral smoothing, which is performed based on the spectral change. Slight temporal smoothing is applied for the fast spectral changes and slight temporal, when the spectral change is fast, amount of the smoothing is increased when spectral change is very slow. Merits: the adaptive nature of the proposed method has been increased by using spectral changes to update coefficients of the wiener filter. Limitations: this method introduces musical noise as well as the enhance signal is slight dull.

Zheng *et al.* [4] aims at reducing the musical noise generated by spectral subtraction method. Proposed method involves "wiener filtering" and "wavelet packet decomposition". Enhanced signal is divided based on wavelet packet decomposition method. Power spectral density of the wavelet packet coefficients is filtered by wiener filtering method. It is observed that musical noise is placed in a more detailed manner as coefficients. So, the spectrum subtraction method's production of musical noise is decreases. Merits: the quality of musical noise is drastically reduced without affecting the intelligibility of the speech. Limitations: quality of clean speech is dependant the on number of decomposition stages, for improve the quality we have to increase number of decomposition stages.

Das *et al.* [5] presented the necessary correction to the fundamental spectral subtraction approach, the predicated on the concept that the clear speech signal and the noise signal don't correlate. Therefore, noise corrupted speech signal that has been tainted by noise that is linked with the speech signal can be enhanced using the proposed approach. We estimate the clean speech magnitude spectrum by subtracting an estimate of the cross-correlation between the clean speech signal and the noise signal after first eliminating the estimated noise spectrum from noisy speech. It is necessary to find the cross-correlation between noise and clean speech but clean speech is not accessed hence a correlation is computed between the noisy speech signal and noise. This method is followed by the "perceptual weighting function" to reduce noise as well as to improve the speech quality. Where weighting function is computed based on the psychoacoustics model. Merits: this technique gets over the drawbacks of the spectrum subtraction method., where it can be used for real time applications ex., speech corrupted by the coloured noise. Limitations: the computation of the correlation between noise and speech signal is a lengthy and complex method, which introduces distortion. Hence this method only focuses on the noise reduction.

Roy and Paliwal [6] addresses problem of the basic spectral subtraction approach, the following presupposes that the noise signal and the precise speech signal are both inherently stationary. But this method fails when there is non-stationarity present in the any of the both signals. To overcome this problem the author modelled the non-stationary signal into the sum of sinusoids known as "tones", and stated that window

length is selected based on the tone duration. In proposed work multiple spectral subtraction stages are used with different window length. Sum of enhanced signal from each stage are summed to get the output.

Boll [7] explained the technique for minimizing the auditory noise produced by the spectral subtraction method. Proposed method helps to enhance the clean speech signal corrupted by the stationary noise. This method estimates the spectrum of the noise better than the basic averaging method. In this method fist silence frame and speech frame are separated by using basic analysis frame. Further analysis frame length is increased till it covers all the silent frames. Limitations: proposed method can be used only when noise added is constant hence cannot be used for coloured noise.

In any typical speech enhancement techniques mentioned in the above papers describe the speech signal's small-time magnitude spectrum, keeping phase spectrum unchanged. But Chen *et al.* [8] has combined both changed magnitude and phase spectrum after the enhancement to form the modified complex signal spectrum. This method is applicable to the conditions where speech noise energy is less compared to the speech energy. Limitations: this method fails when noise is non-white noise as, babble noise, coloured noise, as it introduces distortion as well as residual noise.

Bharti *et al.* [9] has stated problem of the one having sensory-neural hearing impairment, facing problem in speech perception due to the increased intra-speech spectral masking. Proposed method involves two methods, first method is spectral subtraction method to suppress the external noise. Second method is multi-band frequency compression to reduce intra-speech masking. The speech signal's spectrum in the multi-band frequency compression technique is segmented into bands and spectral components are compressed at the centre of the frame and concentrate the speech energy into narrow bands to reduce masking by adjacent spectral components.

3. OUTCOME OF LITERATURE SURVEY

We are going to summarize the existing speech enhancement methods. This also gives the limitations or problems faced during the processing as well as drawbacks of those methods. From the literature survey we can observe that the method basically used to suppress the noise present in the corrupted speech is spectral subtraction method, where by subtracting the magnitude spectrum of the predicted noise from that of the noisy speech signal, we are going to be able to estimate the clean speech signal. The main drawbacks of the method were the assumptions and the method work only when the speech signal is stationary in nature and noise is uncorrelated to the speech signal. Some other methods of speech enhancement discussed in the literature survey are wiener filtering method, wavelet packet decomposition method, Frequency compression method, multi-band spectral subtraction method. Every method involves limitations some of them are mentioned below,

- Problems faced by all of the aforementioned techniques were the generation of musical noise, presence of residual noise after processing and distortion caused due to the processing.
- Wavelet packet decomposition method reduces musical noise, but the effectiveness of this approach is dependent on the number of decomposition stages, hence better quality can be obtained only with the increased complexity.
- Signal subspace approach can be used to avoid the non-stationarity problem as well as it also reduces the residual noise but causes some distortion in the processed speech.

Hence some of the methods were successful in reducing the musical noise but were failed when it come for residual or distortion. Proposed work is designed to overcome these problems.

By enhancing the speech signal's perception and comprehensibility, the speech enhancement approach is used to increase the speech signal's intelligence. It is also used in many real time applications as in mobile communication, and hearing aids. Among the existing methods of speech enhancement is the basic spectral subtraction method, that enhances the noise corrupted speech signal which, is considered to be non-stationary and where, noise is uncorrelated to the speech signal. These assumptions not really exist in most of the real time applications. Therefore, an effective speech enhancement approach is required in order to get around the drawbacks of the spectral subtraction technique. Hence proposed the work "Speech enhancement using multi-band spectral subtraction using cross spectral subtraction". Objectives of proposed work are i) to minimize the noise present in the corrupted speech signal; ii) to eliminate the musical noise generated by the spectral subtraction method; and iii) to eliminate the possible distortion that can cause during processing.

4. PROPOSED METHOD

The proposed work introduces two speech enhancement algorithms in order to perform the fundamental spectral subtraction approach and prevent the musical noise that can be produced as a result of this method. The first technique uses a modified form of multi-band spectral subtraction. This approach is

used to handle noisy speech signals that have suffered from additive noise and are non-stationary [10]. The SNR of the current frame serves as the foundation for doing spectral subtraction. Section 1 of the document contains all of the method's specifics. In order to handle the noisy speech signal, that has been tainted by noise linked to the speech signal, the second technique comprises computing the relationship between the noise-free and clean signals of speech. In section 2, the computation's specifics are explained [11].

4.1. Modified multi-band spectral signal

Let:
w(n)-Enhancing the noisy speech signal.
a(n)-Additive noise.
s(n)- Noise free speech signal.
Thus, W(n) is provided by (1).

$$w(n) = s(n) + a(n) \tag{1}$$

Using the frequency domain conversion, let s(n) be expressed as (2).

$$W(f) = S(f) + A(f) \tag{2}$$

The noise-corrupted speech signal's power spectrum is shown as (3).

$$|W(f)|^2 = |S(f)|^2 + |A(f)|^2 + S(f)A(f) * + S(f) * A(f) \tag{3}$$

The fundamental spectral subtraction method requires that the noise signal along with the noise-corrupted signal are uncorrelated. $S(f).A(f) * + S(f) *. A(f)$ terms in (3) are neglected. Therefore, (4) may be used to produce the clean speech signal S(f).

$$|S(f)|^2 = |W(f)|^2 - |A(f)|^2 \tag{4}$$

Even so, this approach makes the unfeasible assumption that noise is equally distributed across the tainted speech signal, which is impractical. So, if we use the same technique, the noisy speech signal will be reduced by the same amount of anticipated noise [12]. A different approach of speech enhancement is necessary to prevent this, in which the amount of noise to be removed relies on the SNR in the relevant section of the signal W(n). The over subtraction factor is calculated using modified multi-band spectral subtraction, which is dependent on the SNR value. In order to calculate clean speech, over subtraction can be introduced into (4). The factor can then be obtained by (5).

$$|S(f)|^2 = |W(f)|^2 - \alpha|A(f)|^2 \tag{5}$$

In the connection between and SNR in this paper explained [13]. As for the relationship:

$$\alpha = \begin{cases} 5 & SNR < 5 \\ 4 - 0.15\,(SNR) & -5 < SNR < 20 \\ 1 & SNR > 20 \end{cases} \tag{6}$$

4.2. Cross-correlation technique

In (3), $S(f).A(f) * + S(f) *. A(f)$ is regarded as the cross-correlation term that is ignored in the spectral subtraction method. Nonetheless, there is some association between speech signal and noise in real-time applications [14]. Thus, it is essential to identify these correlation words, x_{de} and x_{ed}. Since we are unale to acess to precise speech, we can determine a correlation between the noise signal and the corrupted speech signal. For example, x_{yd} where x_{sd} is yields,

$$X_{sd} = X_{cd} + X_{dd} \tag{7}$$

$$|W(f)^2| = \begin{cases} |y(f)|^2 - \alpha|N(f)^2| - \delta|y(f)| * |N(f)| & if|y(f)|^2 > \alpha|N(f)^2| \\ \beta|N(f)^2| & else \end{cases} \tag{8}$$

where is the calculation of the over spectral subtraction factor, using (6) and it is the reported value of 0.002 for the spectral floor factor from the publication [15]. Is a correlation factor that estimates how closely the noisy speech signal and estimated noisy speech signal are correlated. Equation to determine is:

$$\delta = \left|\frac{\chi_{yn}-\mu_y\mu_n}{\sigma_y\sigma_n}\right| \quad (9)$$

where,

$$\chi_{yn} = \frac{1}{N/2}\sum_k |y(f)| * |N(f)|$$

$$\mu_y = \frac{1}{N/2}\sum_k |y(f)|$$

$$\mu_n = \frac{1}{N/2}\sum_k |N(f)|$$

where, μ_y, μ_n are the means values of the noise corrupted speech signal and noise signal. Where $0<n<N/2$, N is the lenght of fast fourier transform. σ_y^2, σ_n^2 are the variances of the noise corrupted speech signal and enhanced noisy signal.

A noise corrupted speech signal is initially separated into 20-ms frames (160 samples/frame). For this, Hamming Window is employed (with window size 160). Techniques for windowing may cause spectral leakage near the edges of the window, which may result in information loss; hence, 50% overlapping is performed before signal processing to prevent the same [16]. Windowed noisy voice signal is denoted by (10).

$$Ww(n) = W(n) * w(n) \quad (10)$$

From (1),

$$\begin{aligned} Ww(n) &= [s(n) + a(n)] * w(n) \\ &= sw(n) + aw(n) \end{aligned} \quad (11)$$

After computing, fast fourier transfrom (FFT) of the noise corrupted speech sample, the magnitude spectrum is calculated using (3) and (2). The noisy speech signal's frame magnitude spectrum is separated into frames with 40 samples each in modified multiband spectral subtraction [17]. Based on the SNR values of these frames, spectral subtraction is carried out independently for each frame using (5) and (6) by calculating the over subtraction factor.

Finally, the correlation factor is determined using (8) and (9) and (7). It is possible to retrieve the precise speech signal magnitude. Complex spectrum is created by incorporating the predicted non noisy speech signal magnitude spectrum with the original speech signal unaltered phase spectrum [18]. To translate a complex spectrum into a time domain signal, inverse frequency fourier transform is used. In the same way that 50% overlapping is used for framing [19]. The clear speech signal is achieved via 50% overlap addition. The Figure 1 illustrates the various processes that go into putting the suggested strategy into practice [20].

5. RESULTS AND DISCUSSION

In this proposed method, speech quality is evaluated using a subjective listening test and spectrogram analysis. These analysis techniques are used to compare the performance of the stated approach to those of the current speech enhancement method. In a subjective listening test, listeners are used to compare processed speech to an unprocessed speech signal. The speech quality can be rated by listeners using a predetermined scale [21]. A spectrogram is a representation of a speech signal's time and frequency, with the frequency changing as the time changes. The spectrogram's colour corresponds to the speech's energy at that frequency. Dark colour indicates a high-energy speaking signal [22].

The spectrogram analysis of noisy speech signals perverted by babble noise at 0 dB and 15 dB is shown in Figures 2 and 3, respectively [23]. Also, the spectrogram analysis of the improved speech sounds is shown in Figures 4 and 5. It has been noticed that utilizing the suggested strategy has improved speech quality. The average rating for the modified multiband spectral subtraction subjective listening test for signals with 0 dB SNR and 15 dB SNR is 2.7 and 2.6 (low), respectively [24]. The suggested approach has an average rating of 3.7 and 3.6 for signals with 0 dB SNR and 15 dB SNR, respectively (greater than that of previous method) [25], [26].

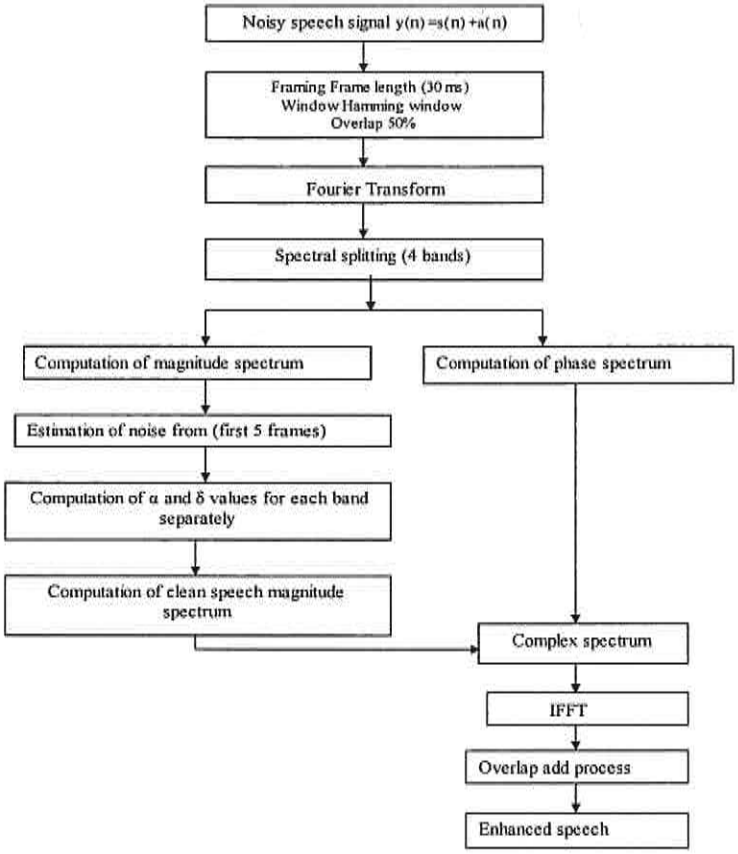

Figure 1. Flow chart for the proposed method

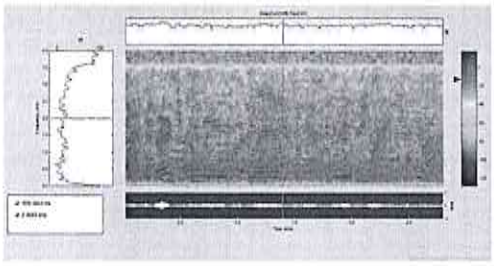

Figure 2. Signal 0 dB SNR babble noise speech signal

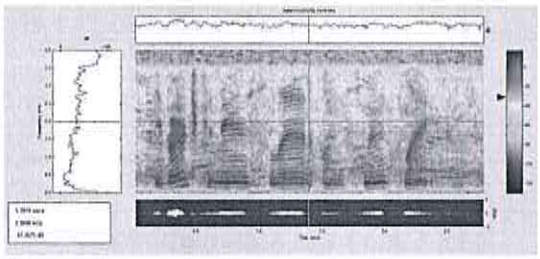

Figure 3. Signal 15 dB SNR babble noise speech signal

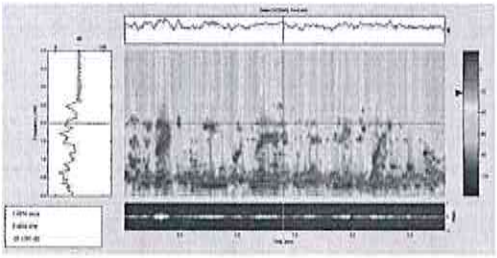

Figure 4. Signal enhanced by the proposed method

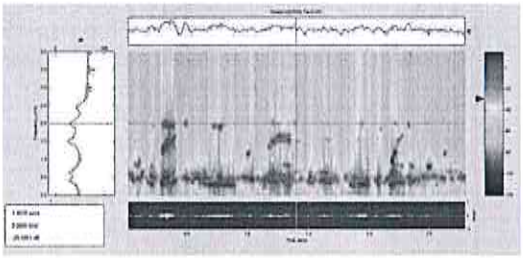

Figure 5. Signal enhanced by multiband spectral subtraction

6. CONCLUSION

In this study, the issues and restrictions of the base spectral subtraction method are discussed. By calculating the value of the over subtraction factor, we performed multiband spectral subtraction in this research. Cross-correlation approach was used to construct additional cross spectral components. According to the results and discussions, the suggested method performs the spectrum subtraction method in terms of the excellence of speech signal.

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COMPARATIVE STUDY OF STEEL CONNECTION USING US AND IS CODE ON TEKLA STRUCTURE

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Abstract
This paper presents a comprehensive comparative study of steel connections implemented in Tekla Structures software, employing both the US and IS (Indian Standards) codes. The investigation focuses on analyzing the differences in design criteria, detailing requirements, and fabrication practices between the two codes. Specifically, the study explores variations in bolt sizing, beam and column dimensions, as well as detailing specifications for bolted connections. Through detailed examination and comparison, significant disparities are identified, highlighting the importance of adhering to specific standards to ensure structural integrity and compatibility in construction projects. Additionally, the study addresses the implications of these differences on material estimation, cost evaluation, and overall project outcomes. By providing insights into the utilization of US and IS codes within Tekla Structures, this research contributes to enhancing the understanding and implementation of international standards in structural engineering practices.

Keyword- Tekla Structure, Steel Structure, Us and Is Codes

I. INTRODUCTION:

In steel structures, globalization brings Engineers a new challenge since nowadays an engineer can design structures in different places around the world. The design procedure can be similar; however, each country or area is governed by its design specifications. The steel connections are one of the main components of steel structures and their role is to connect the steel members in a structure. The steel elements can be connected by bolting, welding, or by both elements. This comparison studies the specifications of connection design in two design codes. This study compares the connection design specifications from the United States of America & India.

When comparing the Indian Standard (IS) and the United States (US) steel codes, several differences and similarities emerge based on structural design methodologies, industry practices, and regulatory frameworks. Here are some key points regarding the results of comparing these two steel codes:

1. **Design Philosophy:**

- The IS steel code, represented by standards such as IS 800:2007, follows design philosophies tailored to Indian engineering practices, environmental conditions, and construction norms.
- In contrast, the US steel code, governed primarily by the American Institute of Steel Construction (AISC), reflects design philosophies and methodologies prevalent in the United States, incorporating factors like seismic considerations, wind loads, and snow loads.

2. **Material Specifications**:

- Both the IS and US steel codes provide specifications for various grades of structural steel materials, detailing their mechanical properties, chemical compositions, and allowable stresses.
- While some similarities may exist in material specifications between the IS and US codes, differences may arise due to regional steel manufacturing practices and material availability.

3. **Connection Design and Detailing:**

- Both the IS and US steel codes provide guidelines for the design and detailing of connections, including bolted connections, welded connections, and other structural fastening methods.
- However, specific detailing requirements, bolt sizes, weld types, and connection capacities may vary between the two codes based on engineering practices and industry standards.

4. **Regulatory Framework:**

- The IS steel code is regulated by the Bureau of Indian Standards (BIS), which establishes and maintains standards for various industries in India, including steel construction.
- In the United States, the AISC develops and updates steel design standards in coordination with other regulatory bodies and professional organizations, ensuring compliance with national building codes and regulations.

II. OBJECTIVE:

1. To compare the design methodologies and criteria for steel connections outlined in the American and Indian standards (AISC and IS respectively) within the Tekla Structures software environment.
2. Enable precise and efficient 3D modeling of steel structures, including beams, columns, connections, and secondary elements, to accurately represent the geometry and components of the steel frame.
3. Facilitate the design and detailing of steel connections according to industry standards and best practices
4. To prepare a comprehensive 3D model of the steel structure utilizing Tekla software, ensuring accurate representation of all structural components, including beams, columns, connections, and secondary elements.

III. LITERATURE REVIEW:

Syed firoz ,S kanakambara Rao: "Modeling concept of sustainable steel building ISSN : 2278-067x, Volume 1, Issue 5 (June 2012) , PP.18-24

- The work by Syed Firoz and S. Kanakambara Rao on the modeling concept of sustainable steel building addresses the growing need for environmentally friendly construction practices in the steel industry. Steel buildings are a significant contributor to the construction sector, and their sustainability is paramount for mitigating environmental impacts.
- The literature surrounding sustainable steel buildings emphasizes various aspects, including energy efficiency, material selection, life cycle assessment, and design optimization. Firoz and Rao's work builds upon these principles, aiming to develop a comprehensive modeling concept that integrates sustainability considerations into the design and construction phases of steel buildings.
- A thorough literature review reveals that sustainable steel buildings have garnered increasing attention in recent years. Numerous studies have highlighted various critical factors contributing to the sustainability of steel structures. Among these factors, energy efficiency, material selection, life cycle assessment (LCA), and design optimization emerge as key considerations. Firoz and Rao's research aims to advance the existing knowledge base by introducing a novel modeling concept that effectively incorporates sustainability principles into the design and construction processes of steel buildings.

Conclusion :

The most important feature governing the choice of steel (I-section)& form of construction for any component is its structural integrity. Where as high specific strength and well-planned project with Tekla software. It is used to select the steel I-Sections for strength and durability of the building to resist various types of dead loads, live loads and wind loads. Planning for energy efficiency, water efficiency and to improve the indoor environment. Tekla software is used for the steel structure for work shop drawings and it gives the connections guide which is use full for better beam column joints strength, there is today an increasing emphasis on other criteria such as environmental durability, embedded energy. The project has been quite instrumental in designing in green concept the knowledge bringing together to planning, designing, analysis, modeling and detailing for the good environmental design concept.

Snehal Manik Burkul1, Yadnya Ranu Jadhav2, Payal Balu Thakare3, Soham Rajendra Jadhav4, Aishwarya Satish More5, Mr. Prashant. V. Suryawanshi6, Mr. Prashant. S. Chaudhari7, Mr. Shantanu G. Pande8: "3D Modelling and Detailing in Tekla Structures"

- The field of structural engineering has seen significant advancements in recent years, particularly in the realm of 3D modeling and detailing. Tekla Structures, developed by Trimble, stands out as a prominent software solution widely used for creating detailed, accurate, and constructible models of steel and concrete structures.
- Several studies and resources in the literature highlight the capabilities and benefits of Tekla Structures in 3D modeling and detailing for structural engineering projects.
- Tekla Structures is a Building Information Modeling (BIM) software that enables architects, engineers, and construction professionals to create accurate 3D models of buildings and structures. The software offers advanced modeling tools for designing steel and concrete elements, including beams, columns, slabs, and connections. Additionally, Tekla Structures provides comprehensive detailing capabilities for generating fabrication drawings, erection plans, and material lists.

Conclusion:

Tekla structures is a vast product that covers the entire structural designs process in a single environment. It enables a single BIM model to be used from the conceptual stages right through to fabrication and beyond its ability to reuse data through design, analysis and detailing phases and model in steel, concrete and timber is somewhat unique in the industry. In terms of modeling this software is extremely powerful. This software does an excellent job of bridging the gap between design and fabrication and through its single environment provides the perfect conduit for data to flow smoothly from engineer to detailer. Most importantly, through it has been potential to simplify the management of an often-fragmented process, leading to enhanced collaboration, better designs, reduce times, and of course the lower cost.

IV. METHODOLOGY

Tekla Structures is a structure data demonstrating programming ready to display structures that integrate various types of building materials, including steel, cement, lumber and glass. Tekla permits primary drafters and architects to plan a structure and its parts utilizing 3D demonstrating, create 2D drawings and access building data. Tekla Structures is utilized in the development business for steel and substantial enumerating, precast and cast in-situ. The product empowers clients to make and oversee 3D underlying models in cement or steel, and guides them through the interaction from idea to manufacture.

V. RESULTS

1. **Change In Bolt Size**

- Bolt sizes in the SI standard are typically measured in millimeters (mm) and may have designations like M8, M10, M12, etc., indicating the nominal diameter.
- In the US standard, bolt sizes are often denoted in inches (in) and may have designations like 1/4", 3/8", 1/2", etc., indicating the nominal diameter.

2. **Change In Beam And column Size**

Dimensional Units:

- In the SI standard, beam and column dimensions are typically specified in millimeters (mm) or meters (m).
- In the US standard, dimensions are often specified in inches (in) or feet (ft).

Nominal Sizes:

- Beam and column sizes are denoted differently between the two standards.
- In the SI standard, common beam sizes might include 100x100 mm, 150x150 mm, etc., while column sizes could be 200x200 mm, 250x250 mm, etc.
- In the US standard, beam sizes might be specified as W10x33, W12x45, etc., where the first number indicates the nominal depth in inches and the second number represents the weight per foot in pounds.

3. **Difference Bolted Connection By Using IS And Us Standard**

Bolt Specifications:

- Both the IS and US standards specify requirements for bolt materials, dimensions, grades, and mechanical properties.
- However, differences in bolt specifications may exist due to regional manufacturing practices, availability of materials, and historical preferences.

Connection Detailing and Fabrication:

- The IS and US standards provide guidelines for detailing bolted connections, including requirements for bolt spacing, edge distances, hole sizes, and tightening procedures.

- Specific detailing and fabrication practices may vary between the two standards based on engineering preferences, construction norms, and industry standards.

4. Steel Quantity:

- In this project, the steel quantity used for the US standard is 28,735 kilograms, while the steel used in the IS standard is 22,680 kilograms.

5. Connections

The bolted connections used for the both standard

- US standard - Column with stiffeners S (187) - 34 NO's
- IS standard - Column with stiffeners S (187) - 34 NO's

6. Bolting Standards:

United States (US) Standard:

American Institute of Steel Construction (AISC): AISC provides detailed specifications for structural bolting in steel construction through its "Specification for Structural Joints Using High-Strength Bolts."

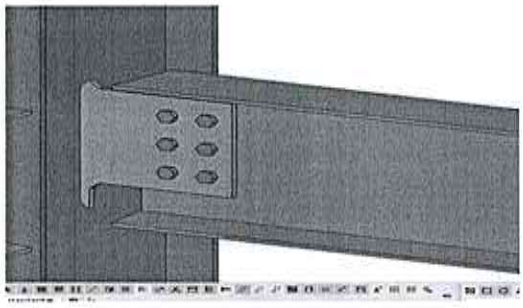
ASTM International: ASTM standards, such as ASTM A325 and ASTM A490, specify the requirements for high-strength bolts used in structural applications. These standards cover material properties, dimensions, testing procedures, and installation requirements.

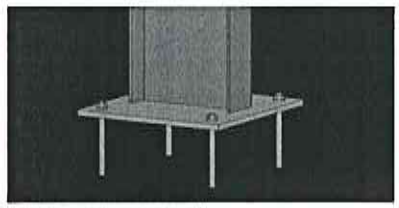
Research Council on Structural Connections (RCSC): RCSC produces guidelines and recommendations for the design, installation, and inspection of structural bolted connections.

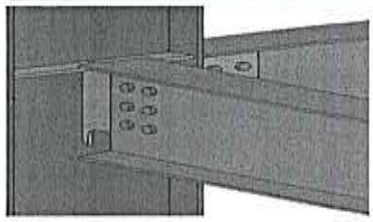
Indian Standard:

Bureau of Indian Standards (BIS): BIS publishes standards related to structural bolting in steel construction, including IS 3757 and IS 6623. These standards cover various aspects such as material specifications, dimensions, testing methods, and installation procedures for structural bolts.

Indian Roads Congress (IRC): IRC provides guidelines for bolted connections in bridges and highway structures, ensuring safety and durability in transportation infrastructure projects.







VI. CONCLUSION AND FUTURE SCOPE

1. Conclusion

- The comparison between the SI standard and the US standard reveals significant differences across bolt sizing, beam and column dimensions, and bolted connections. Bolt sizing varies significantly, with the SI standard using millimeters (mm) and the US standard using inches (in) for designation. Beam and column sizing disparities encompass dimensional units and nominal sizes, with the SI standard employing millimeters (mm) and the US standard using inches (in) and alphanumeric designations. These variations emphasize the importance of adhering to specific standards to ensure accurate bolt selection, beam and column sizing, and compatibility in construction projects.

- Furthermore, differences in bolt specifications, detailing, and fabrication practices are evident between the IS and US standards. While both standards outline requirements for bolt materials, dimensions, and mechanical properties, regional manufacturing practices and material availability may lead to disparities. Additionally, guidelines for detailing bolted connections, including bolt spacing, edge distances, and hole sizes, may vary between the standards based on engineering preferences and construction norms. Understanding these distinctions is essential for maintaining the integrity and reliability of bolted connections in structural applications following either the IS or US standards.

- The comparison of steel quantities used in the project based on the US and IS standards reveals notable differences. The steel quantity for the US standard is calculated to be 28,735 kilograms, whereas for the IS standard, it amounts to 22,680 kilograms. This variance in steel quantity may stem from differences in structural design criteria, material specifications, and fabrication practices

between the two standards. Understanding and accounting for these disparities are essential for ensuring accurate material estimation, cost estimation, and structural integrity in construction
projects adhering to either the US or IS standards.

2. **Future Scope**

- The integration of digital technologies such as Building Information Modeling (BIM), advanced simulation software, and artificial intelligence (AI) could revolutionize the design, analysis, and construction of steel structures. Future developments in these technologies could facilitate real-time collaboration, predictive modeling, and optimization of structural systems, leading to more efficient and sustainable construction practices.
- With increasing emphasis on sustainability and environmental conservation, future research could explore innovative approaches to minimize the environmental impact of steel structures. This could include the use of recycled materials, energy-efficient design strategies, and lifecycle assessment tools to evaluate the environmental footprint of steel construction projects.

VII. REFERENCES

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COMPARISON OF DIFFERENT BUILDING MATERIALS FOR ENHANCEMENT OF BUILDING COMFORT

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Abstract

As people spend more time indoors, the need for buildings that are not only energy-efficient but also comfortable and healthy has become more critical. The objective of this project is to compare the performance of different building materials in enhancing the building comfort by monitoring the temperature levels of three different rooms on an hourly basis. In order to achieve this objective, a sensor was designed and installed in each room to record the temperature readings. The data collected by the sensors was then analyzed and compared to determine the effect of different building materials on the indoor environment. The experiment was conducted over a period of 21 days and the data was collected for each hour of the day. The results of the study indicated that the choice of building material has a significant impact on the indoor environment, with some materials performing better than others in terms of maintaining comfortable temperature levels do. The data collected was then presented in graphical form to facilitate easy comparison of the performance of different building materials. Overall, the findings of this study can be used to inform decisions about the choice of building materials for different construction projects in order to optimize the building comfort and ensure a healthy indoor environment.

Keyword- Temperature measurement device, Enhancement of building comfort, Three Different Building Materials clay burnt Brick masonry, Stone Masonry and AAC Block

I. INTRODUCTION:

Buildings are fundamental to our daily lives, providing us with shelter, security, and comfort. With an increasing number of people spending most of their time indoors, it has become more important than ever to create buildings that are not only energy-efficient but also comfortable and healthy. Building materials play a crucial role in achieving these goals, as they can affect the indoor environment's thermal, acoustic, and visual properties. By using appropriate materials, buildings can provide a comfortable indoor environment, reduce energy consumption, and improve occupants' health and well-being.

This project fills that research gap by conducting a detailed evaluation of various building materials. By installing sensors in three distinct rooms and collecting data over a 21-day period, we will capture the fluctuations in temperature throughout the day and night. The data collected will provide valuable insights into the performance of different materials and their influence on indoor comfort.

In summary, this project aims to contribute to the understanding of the impact of building materials on indoor comfort. By comparing the performance of different materials through continuous monitoring of temperature levels, we seek to provide valuable insights for enhancing building design and material selection, ultimately creating comfortable and healthy indoor environments.

1 Definition of Building Comfort:

Building Comfort, in terms of thermal insulation, involves creating a well-insulated and thermally efficient building envelope that effectively regulates indoor temperature, reduces energy consumption, and provides a comfortable and pleasant living or working environment for occupants.

Thermal insulation plays a crucial role in achieving building comfort by reducing heat gain or loss through the building envelope, which includes walls, roofs, floors, and windows. It involves the use of materials and construction techniques that limit the transfer of heat, helping to maintain a stable and comfortable indoor temperature.

2 Background

The background of the project lies in the importance of creating comfortable living and working environments. Buildings play a crucial role in providing shelter, and the comfort of occupants is essential for their well-being, productivity, and overall quality of life. The selection of suitable building materials can significantly affect indoor temperature levels, thereby influencing the comfort and satisfaction of occupants.

The project aims to assess and compare the performance of different building materials in terms of their impact on indoor temperature and humidity. This assessment is conducted by deploying sensors in three

different rooms constructed with different materials. The sensors measure temperature levels on an hourly basis, providing valuable data for analysis.
By studying and comparing the data collected from the three rooms, the project seeks to identify
Patterns, trends, and variations in temperature and humidity. This information can help determine which building materials contribute to improved indoor comfort. The project also aims to create graphical representations of the data, enabling visual interpretation and facilitating easy comparison between the rooms.

3. Need of study

As people spend more time indoors, there is a greater need for buildings that are not only energy-efficient but also comfortable and healthy.
The need for this project stems from the growing awareness of the impact of the built environment on human health and well-being.
Building materials play a critical role in achieving these goals, and there is a need to understand their advantages and limitations in different contexts.
This project will contribute to the development of sustainable and healthy building design by providing a comprehensive review of building materials for enhancing building comfort.

4. Scoop of Study

- The study specifically focuses on evaluating the performance of different building materials in enhancing building comfort, with a particular emphasis on temperature levels. The selection of materials plays a critical role in determining the indoor environment's quality, and your study aims to compare their effects.
- The scope of this project is to explore the different types of building materials that can be used to enhance building comfort and to evaluate their effectiveness and practicality.
- The project will focus on materials such as insulation, concrete, wood, green roofs, and rammed earth, among others.
- The project will involve a literature review of existing research and case studies of buildings that have successfully incorporated these materials.
- The project will also evaluate the challenges and limitations associated with using these materials in building design and construction and provide recommendations for their use in different contexts.
- The project will not cover the technical details of the installation or maintenance of these materials but will focus on their potential benefits and drawbacks in creating a comfortable indoor environment.

II OBJECTIVES

- To Review the literature on building materials for enhancing building comfort..
- To assess the effect of different building materials on maintaining comfortable temperature level..
- To monitor and analyze the temperature levels in three different rooms using sensors installed in each room.
- To compare the performance of different building materials in terms of enhancing indoor building comfort.
- To Evaluate the challenges and limitations associated with using these materials in building design and construction.
- To provide insights and recommendations for the selection of building materials that optimize building comfort and ensure a healthy indoor environment.

By achieving these objectives, this project aims to enhance our understanding of the importance of building materials in creating comfortable indoor environments and to provide practical guidance for architects, designers, and builders seeking to incorporate these materials in their projects.

III LITRATURE REVIEW

[1] Iftikhar A Raja, J. Fergus Nicol, Kathryn J McCartney, and Michael A Humphreys (2001), "Thermal comfort: use of controls in naturally ventilated buildings"

This review paper examines both logical and adaptive approaches to provide an overview of thermal comfort. The authors present a thorough examination of the thermoregulatory system of the human body as well as mathematical simulations of heat transfer between the human body and its surroundings. The review includes both awake and sleeping people in a variety of scenarios. This paper clarifies the idea of thermal comfort and its implications in various contexts by reviewing pertinent literature. The results also provide insights into predicting the impact of temperature on the ventilation rate in naturally ventilated buildings.

[2] Aydin Gezer, Nevin. (2003) the effects of construction materials on thermal comfort in residential buildings.

The paper examines the impact of different construction materials on thermal comfort in residential buildings through the use of Ecotect 5.0, a computer program that simulates the indoor thermal environment of a building.
The authors conducted a case study to analyze the thermal performance of three different building models with different construction materials: a concrete building, a brick building, and a building with a combination of concrete and brick. The study showed that the choice of construction material has a significant impact on the thermal comfort of a building. The concrete building had the highest thermal inertia, which led to a slower response time to changes in outdoor temperature and higher indoor temperatures in the summer. The brick building had a lower thermal inertia and therefore had a more rapid response to changes in outdoor temperature, resulting in more stable indoor temperatures.
Overall, the paper provides useful insights into the importance of Construction materials in achieving thermal comfort in residential buildings.

[3] Noël Djongyang, René Tchinda, and Donatien Njomo (2010), "Thermal comfort: A review paper"

This review paper examines both logical and adaptive approaches to provide an overview of thermal comfort. The authors present a thorough examination of the thermoregulatory system of the human body as well as mathematical simulations of heat transfer

between the human body and its surroundings. The review includes both awake and sleeping people in a variety of scenarios. This paper clarifies the idea of thermal comfort and its implications in various contexts by reviewing pertinent literature.

[4] Spiru Paraschiv (2021), "Increasing the energy efficiency of a building by thermal insulation to reduce the thermal load of the micro-combined cooling, heating and power system."

The paper discusses the potential benefits of improving the energy efficiency of buildings through thermal insulation in order to reduce the thermal load of micro-combined cooling, heating, and power systems. The authors conducted a case study to analyze the thermal performance of building

and the effectiveness of thermal insulation in reducing energy consumption. The results indicated that thermal insulation can significantly reduce consumption of energy and improve the performance of micro-combined cooling, heating, and power systems. The authors also discussed the importance of considering various factors, such as climate conditions and building materials, when implementing thermal insulation measures in buildings. Overall, the paper provides valuable insights into the potential benefits of thermal insulation in improving the energy efficiency of buildings and reducing the thermal load of micro-combined cooling, heating, and power systems

IV.METHODOLOGY

The experimental aspect of the study is focused on comparing the performance of different building materials in enhancing building comfort. This involves selecting and installing specific materials in the three different rooms to create controlled conditions for data collection. By Manipulating the independent variable (building materials), we can observe and measure the effects on the dependent variables (temperature levels).

The observational aspect of the study involves continuously monitoring the temperature levels in each room using installed sensors. This allows for the collection of real-time data over a 21-day period, providing insights into the variations and trends in indoor environmental conditions.

This combination of experimental and observational design was chosen to achieve the research objectives effectively. By conducting controlled experiments, we can directly compare the performance of different building materials under consistent conditions. This enables us to identify and measure the specific impact of each material on indoor comfort.

The observational aspect complements the experimental design by capturing the natural fluctuations and dynamics of temperature levels in real-world settings. It allows us to analyze the long- term trends, diurnal patterns, and interactions between various factors that may influence indoor comfort.

By using a combination of experimental and observational approaches, we can obtain comprehensive and reliable data on the performance of different building materials in enhancing building comfort. This design aligns with the research objectives of comparing materials, analyzing their effects on temperature levels, and providing insights for informed decision-making in building material selection.

Avg. Temperature Data During Day from 06:00 AM to 06:00 PM

Date	Day	Avg. Temperature			Outdoor Temperature
		Room 1	Room 2	Room 3	
05-03-2024	1	32	31	30	34
06-03-2024	2	32	31	30	34
07-03-2024	3	31	30	29.5	33
08-03-2024	4	33	32.5	32	34
09-03-2024	5	32.5	32	31.8	33
10-03-2024	6	32	31.7	31	33
11-03-2024	7	32.6	32.1	29.8	33
12-03-2024	8	32.8	32.3	29.9	33
13-03-2024	9	32.9	32.6	31.5	33
14-03-2024	10	33	32.8	31.7	34
15-03-2024	11	32.4	32	31.5	33
16-03-2024	12	32.5	32.1	31.6	33
17-03-2024	13	33	32.5	32.1	34
18-03-2024	14	32.7	32.3	31	33
19-03-2024	15	33.4	33	32.5	34
20-03-2024	16	33.2	32.8	32	34
21-03-2024	17	33.5	32.9	32.1	34
22-03-2024	18	33.6	32.9	32.1	34
23-03-2024	19	32.6	31.8	30.9	33
24-03-2024	20	32.1	31.5	31	33
25-03-2024	21	33.5	33	32.5	34

Data Analysis

Table of Temperature Data During Day Period

Avg. Temperature Data During Night from 06:00 PM to 06:00 AM					
Date	Day	Avg. Temperature			Outdoor Temperatre
		Room 1	Room 2	Room 3	
05-03-2024	1	24.6	23.5	22.4	26
06-03-2024	2	23.9	22.7	21.5	25
07-03-2024	3	24.9	23.6	22.6	26
08-03-2024	4	22.7	21.7	20.6	24
09-03-2024	5	21.8	20.4	20	23
10-03-2024	6	22.8	21.7	20.4	24
11-03-2024	7	24	22.7	21.4	25
12-03-2024	8	22.8	21.5	20.4	24
13-03-2024	9	22.8	21.7	20.4	24
14-03-2024	10	22.5	21.4	20	24
15-03-2024	11	23.6	22.3	21.2	25
16-03-2024	12	22.5	21.2	19.9	24
17-03-2024	13	22.7	21.7	20	24
18-03-2024	14	23.7	22.4	21.3	25
19-03-2024	15	22.6	21.4	20.1	24
20-03-2024	16	23.5	22.2	21.2	25
21-03-2024	17	23.7	22.5	21.5	25
22-03-2024	18	23.6	22.5	21.2	25
23-03-2024	19	23.7	22.3	21.2	25
24-03-2024	20	23.6	22.6	21.3	25
25-03-2024	21	26.7	25.2	23.9	28

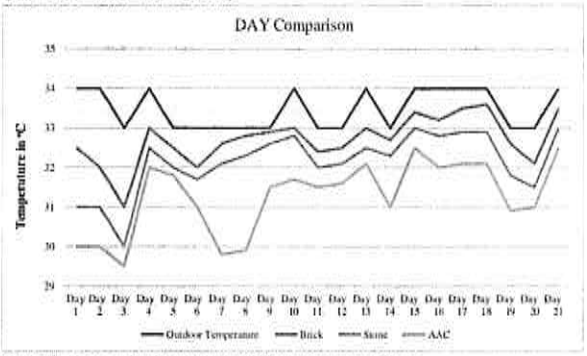
Table of Temperature Data During Night Period

Temperature Data at 12:00 PM					
Date	Day	Avg. Temperature			Outdoor Temperaure
		Room 1	Room 2	Room 3	
05-03-2024	1	31.8	30.8	29.7	33
06-03-2024	2	30	28.8	27.6	31
07-03-2024	3	30.9	29.5	28.5	32
08-03-2024	4	30.8	29.6	28.2	32
09-03-2024	5	29.7	28.3	27	31
10-03-2024	6	31	29.8	28.7	32
11-03-2024	7	30.6	29.6	28.1	32
12-03-2024	8	30.5	29.2	27.8	32
13-03-2024	9	30.9	29.9	28.6	32
14-03-2024	10	30.8	29.6	28.2	32
15-03-2024	11	30.6	29.5	28.2	32
16-03-2024	12	29.7	28.7	27.4	31
17-03-2024	13	31.7	30.4	29.4	33
18-03-2024	14	31.7	30.4	29	33
19-03-2024	15	32	30.9	29.9	33
20-03-2024	16	30.7	29.5	28.1	32
21-03-2024	17	30.6	29.3	28.3	32
22-03-2024	18	31	29.5	28.5	32
23-03-2024	19	29.6	28.6	27.1	31
24-03-2024	20	31	29.6	28.2	32
25-03-2024	21	31.6	30.6	29.2	33

Table 3.4 Table of Temperature Data at 12:00 PM

RESULT & ANALYSIS

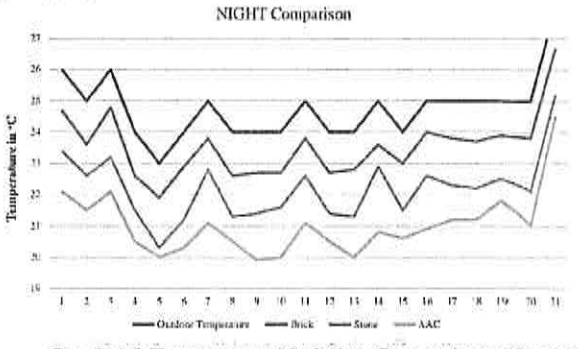
Comparison of average day-time temperature between outdoor and all rooms



Graph Temperature Variation Comparison (Outdoor vs All Rooms) Day

- The average temperature inside the room with a brick wall is consistently lower than the outdoor temperature, with an average difference of approximately 1.3 to 2.3 °C.
- The room with a stone wall also maintains a lower average temperature compared to the outdoor temperature, with an average difference of approximately 2.4 to 3.6 °C.
- The AAC block room shows the lowest average temperature among the three rooms, with an average difference of approximately 3 to 4.1 degrees Celsius compared to the outdoor temperature.
- The brick wall provides moderate insulation, as it demonstrates a relatively smaller temperature difference between the indoor and outdoor environments compared to the stone and AAC block walls.
- The stone wall exhibits slightly lower insulation performance, allowing more heat transfer from the outside to the inside, resulting in a higher indoor temperature.
- The AAC block wall, with its superior insulation properties, shows the highest level of thermal resistance, resulting in the lowest indoor temperature.

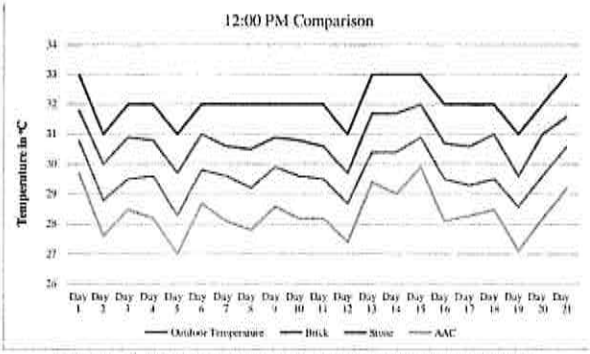
Comparison of average night-time temperature between outdoor and all rooms



Graph 4.8 Temperature Variation Comparison (Outdoor vs All Rooms) Night

- The brick room consistently maintains a lower average temperature compared to the outdoor temperature during the night, with an average difference of approximately 1.2 to 2.2 °C.
- The stone room also exhibits a lower average temperature compared to the outdoor temperature, with an average difference of approximately 1.8 to 2.9 °C.
- The AAC block room shows the lowest average temperature among the three rooms, with an average difference of approximately 2.6 to 3.5 degrees Celsius compared to the outdoor temperature.
- The temperature trends observed during the night follow a similar pattern for all three rooms, reflecting the impact of outdoor temperature variations on the indoor environment.
- The rooms with all three wall types show lower indoor temperatures compared to the outdoor temperature during the night, indicating improved thermal comfort.
- The brick and stone rooms provide better thermal comfort compared to the AAC block room due to their relatively lower temperature differences between indoor and outdoor environments.
- The AAC block room may require additional heating during colder periods to maintain optimal comfort levels

Comparison of temperature at 12:00 PM between outdoor and all the three rooms.



Graph 4.12 Temperature Variation Comparison (Outdoor vs All Rooms) at 12:00 PM

- Brick: The room temperature for the Brick material generally remains slightly lower than the outdoor temperature. This trend is consistent across most of the data points provided for Brick.
- Stone: Similar to Brick, the room temperature for the Stone material is slightly lower than the outdoor temperature in most cases. However, there may be a slightly larger temperature difference between the outdoor and room temperature compared to Brick.
- AAC (Autoclaved Aerated Concrete): The room temperature for the AAC material tends to be lower than the outdoor temperature, similar to Brick and Stone. However, there may be a slightly higher temperature difference between the outdoor and room temperature for AAC.
- All materials: Regardless of the material, there is a general trend of the room temperature being slightly lower than the outdoor temperature. This indicates that the materials used in the construction have a cooling effect on the indoor environment.
- There are differences in the room temperature among the materials for the same outdoor temperature.

V. CONCLUTION

Bricks are known for their high thermal mass, which means they can absorb and store heat effectively. However, in terms of thermal resistance, bricks alone are not very efficient. They have moderate insulation properties and tend to conduct heat relatively easily. To enhance the thermal resistance of brick walls, additional insulation materials such as polystyrene or mineral wool can be added.

Natural stone, like brick, also possesses high thermal mass. It can store and release heat slowly, which can help regulate temperature fluctuations. However, similar to bricks, stone itself is not an excellent insulator. Its thermal conductivity is relatively high, which means it can transfer heat readily. Stone walls may require additional insulation layers to improve their thermal resistance.

AAC blocks are lightweight, precast concrete blocks that have been infused with air bubbles during the manufacturing process. These air bubbles contribute to their excellent insulation properties. AAC blocks offer higher thermal resistance compared to traditional brick or stone. They have lower thermal conductivity, which means they are less prone to heat transfer. Consequently, AAC blocks provide better insulation against heat and cold.

In summary, between brick, stone, and AAC blocks, the latter, Autoclaved Aerated Concrete (AAC) blocks, generally provide better thermal resistance due to their lower thermal conductivity and superior insulation properties

VI. RECOMMENDATIONS

1. Polystyrene
2. Glass Wool Insulation
3. Polyurethane (PU) FoamInsulation
4. Cellulose
5. Reflective Insulation

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ANALYSE THE EFFECT OF USE OF PLASTIC WASTE IN BITUMINOUS MIXTURE ON ITS STRENGTH AND OTHER PROPERTIES

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Abstract The waste materials are always a problem for the environment, some waste may be disposed easily and some cannot. Plastic is also a kind of material whose disposal is always a tedious job. The disposal of waste effected the environment drastically, for minimizing this effect several research in various field is going on to recycle plastic safely. One of its ways is to use the waste plastic in the road construction Plastic Road is a need of an hour as they not only consume waste plastic in an eco-friendly way, but also helpful in increasing the quality of the road. In the review paper we will thoroughly study some of the methods and technique through which plastic is used in the road construction and how these technologies suits in various conditions. Significant environmental and economic problems are created because all forms of plastic like carry bags, wrappers, chocolates, chips, hand bags, cold drinks bottles and lids of all bottles. Utilization of waste plastic bags in bituminous mixes has proved that these enhance the properties of mix in addition to solving disposal problem. The processed waste plastic, when added to hot aggregate will form a fine coat of plastic over the aggregate and such aggregate when mixed with the binder is founds to give higher strengths, higher resistance to water and better performance over a time period. Therefore, plastic roads, is a simple way to make eco-friendly constructions. The innovative technology not only strengthened the road construction but also increased the road life as well as will help to improve the environment. The main objective of this Paper is to discuss the significant of plastic in terms of innovative methodology for treatment and disposing and to provide solution to reduce, recycle, reuse by applying it for pavement and road construction.

Key Words: Plastic, Road Construction, Environment, Binder, Strength , Disposal

1.INTRODUCTION

Plastic waste when properly processed and incorporated into bituminous mixtures, can enhance the strength and durability of the resulting material. This is particularly important for road construction, where the pavement needs to withstand heavy traffic loads and environmental stresses. The inclusion of plastic waste can also improve the flexibility of bituminous mixtures, making them more resistant to cracking and deformation. This can lead to long-lasting roads that required less frequent maintenance. Utilizing plastic waste in bituminous mixtures contributes to environmental sustainability by reducing the amount of plastic send to landfills or ending of in oceans and water ways. It promotes the concept of circular economy by repurposing waste materials into valuable construction components. In some cases, incorporating plastic waste into bituminous mixture can be cost effective compare to traditional materials. This is especially true in regions where plastic waste management is a significant challenge and disposal cost are high. However, there are challenges to overcome, such as ensuring proper compatibility between plastic waste and bitumen, addressing potential negative impacts on properties like fatigue resistant, and meeting regulatory standards for road construction material.

2.Overview of literature survey

Many research work has been done in the area of use of plastic waste in bituminous road construction. The research papers states, Durability of the road laid out with shredded plastic waste is much more compared with roads with asphalt with the ordinary mix. roads laid with the plastic waste mix are found to be better than conventional once the binding property of plastic makes the road last longer besides giving added strength to withstand more load to the normal highway quality roads lasts 4-5yrs it is claimed that plastic bituminous roads can last up to 10yrs. Rain water will not seep through because of the plastic in the tar. So, this technology will result in lesser road repairs.

3.THEROTICAL BACKGROUND

Plastics have become common man's friend. It finds its use in every field. 12 million tones is the expected consumption for the current year. Plastic is a material created by man but it's also something that can't be destroyed. A majority of the waste created by humans contains plastic waste which ultimately chokes stray animals to death, clogs drain and only leads to mess. The clogged drains lead to flood while the plastic in the fields blocks germination, thereby preventing rainwater absorption.

Plastic waste when properly processed and incorporated into bituminous mixtures, can enhance the strength and durability of the resulting material. This is particularly important for road construction, where the pavement needs to withstand heavy traffic loads and environmental stresses. The inclusion of plastic waste can also improve the flexibility of bituminous mixtures, making them more resistant to cracking and

deformation. This can lead to long-lasting roads that required less frequent maintenance.

Utilizing plastic waste in bituminous mixtures contributes to environmental sustainability by reducing the amount of plastic send to landfills or ending of in oceans and water ways. It promotes the concept of circular economy by repurposing waste materials into valuable construction components. In some cases, incorporating plastic waste into bituminous mixture can be cost effective compare to traditional materials. This is especially true in regions where plastic waste management is a significant challenge and disposal cost are high. However, there are challenges to overcome, such as ensuring proper compatibility between plastic waste and bitumen, addressing potential negative impacts on properties like fatigue resistant, and meeting regulatory standards for road construction material.

Table -1: (Comparing results of marshal value)

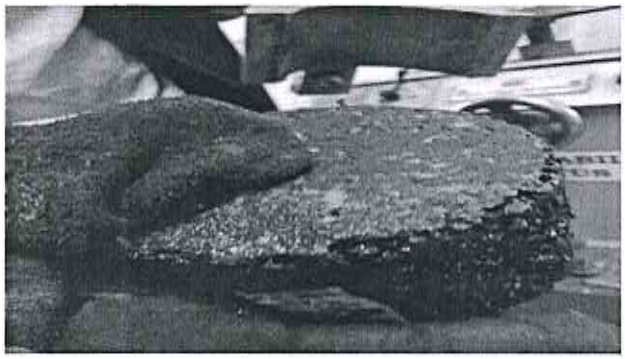
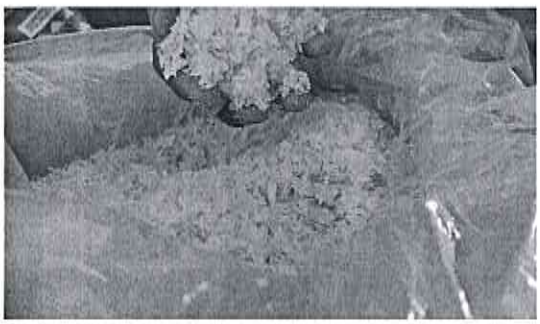


Fig -1: Figure



% Bitumen	Marshal Value	Marshal Value Plastic	Marshal Value	Marshal Value Plastic	Marshal Value Of 10% Plastic
4.8	-	1067.4	-	-	-
5	-	1140	-	-	-
5.2	992	**1242.6**	**956.8**	432	**270.4**
5.5	**1061.34**		935	475	230
5.8	1017.6	-	916	**525**	218.5

Comparing results of marshal value

4.Objectives of the project work

From the literature review following objectives are drawn,To obtain OBC for the proposed mix design.Partial replacement of bituminous mix by plastic waste.To reduce the % of OBC in plastic added bituminous mix.

5.MATERIAL USE

- AGGREGATE
- BITUMEN
- WASTE PLASTIC
- MATERIAL SELECTION:

6.TESTS CONDUCTED ON AGGREGATE

- Specific Gravity &Water AbsorptionTest
- Aggregate Impact Test
- Aggregate Crushing Value Test
- Aggregate Abrasion Test

7. TESTS CONDUCTED ON BITUMEN

- Penetration Test
- Ductility Test
- Softening Point
- Flash And Fire Point Test

8. TEST ON BITUMINOUS MIX

- Marshall Stability

9. CONCLUSIONS

• Recycled plastic waste exhibits behaviour as binding property like bitumen.

• To reduce the environmental impact of construction practices.

• To increase binding and better bonding of the mix.

• For 2.5% plastic waste better strength occurs at OBC 5.2% so it will use for highway construction

• The result of OBC in the 5% use of plastic waste in 5.2% where it is less content of bitumen as compared to bituminous mix OBC which at 5.5%

• It can be used for low volume roads.

• The result for 7.5% & 10% of plastic of bituminous mix are not proper as compare to the results of bituminous mix.

10. .FUTURESCOP

The main scopes of plastic roads are economic in terms of bitumen. The shredded plastic in form of polymer covers the aggregates and thus, occupies a larger portion of the road reducing the quantity of bitumen needed. Waste plastic is a harmful and non-biodegradable waste responsible mainly for land pollution.

In this project, VG 30 grade of bitumen was used. Therefore, other grades of bitumen can also be used for the same bitumen mix design to obtain better results than VG 30 grade of bitumen.

Above analysis is based on the dense bituminous macadam (DBM), Hence, one can change the pavement type and can see what may be the results.

Various software can also be used for determining the deflection characteristics of road pavement made with plastic aggregates.

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Soil Stabilization by Using Lime and Fly Ash

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Abstract: **Now a days, inefficient properties of soils are a critical issue in engineering projects. In some cases, improve the characteristic of unsuitable soil is a fundamental step for making construction. Pavement structures on poor soil sub grades show early distress causing the premature failure of the pavement. Clayey soil usually has the potential to demonstrate undesirable engineering behaviour, such as low bearing capacity, high shrinkage and swell characteristics and high moisture susceptibility. Stablilzation of this soil is a usual practice for improving the strength. Soil stabilization performed the use of technique to adding a binder to the soil in order to improve the engineering performance of soil. This study reports the improvement in the strength of a locally available cohesive soil by addition of both lime and fly ash. Researches were illustrated that adding the additives leads to progress in workability and mechanical behaviour of soil after stabilization lime and fly ash as local natural and industrial resources were applied for chemical stabilization. Lime alone has traditionally been used in clay-bearing, highly cohesive soil whereas fly ash has been used to bind non-cohesive soil, granular or poorly cohesive soil. Fly ash is mainly used to stabilize the sub base or base course.**

Keywords: **Atterberg's test, Black cotton soil, CBR, Fly ash, Lime, Maximum dry density, Optimum moisture content, Proctor compaction test, Stabilization, Water content.**

1. Introduction

Stabilization of soils is an effective method for improving the properties of soil and pavement system performance. The objectives of any stabilization technique used are to increase the strength and stiffness of soil, improve the workability and constructability of the soil and reduce the Plasticity Index. For any given soil many stabilization methods, using different stabilizing agents like cement, lime, motor, bitumen, plastic, fly ash, etc. may be effective to improve the soil properties in place rather than removing and replacing the material. Availability or financial considerations may also be the determining factor on which a stabilizing agent is selected. Every manmade structure resting on the ground needs safe and stable soil. To attain these safety and stability requirements the engineering properties of the soil beneath the structure or on the structure must be identified. However, obtaining these engineering properties of soils requires relatively more time and money. On the other hand, investigating the index properties of a soil is much easier than other engineering properties in terms of time, money, and efforts research dwells on how black cotton soil (BCS) could be stabilized and made into a suitable subgrade material using saw dust readily and cheaply available material. Fly ash mixed with BCS in varying proportions of 10%, 20%, and 30%. The BCS treated with optimum fly ash content was further stabilized with 5%, 10%, and 15% lime. Optimum reduction in liquid limit, differential free swell, plasticity index as wean all as an optimum increase in CBR was achieved treated tread with fly ash was stabilized with lime. Moreover, most of the engineering properties of soils depend upon their index properties. Therefore, by obtaining the index property of soil that involves a simpler and quicker method of testing, the engineering properties can beasties factors satisfactory. Soil compaction, California bearing ratio, and direct shear test are the most commonly used techniques in engineering projects such as highways, sub-grades, pavements, and foundations. The ins of these tests are to improve engineering proportion s of soils such as increase in dry density, reduction in compare sensibility the leading to reduction in the settlement, and reduction in permeability, reload-bearing strength and its load-bearing capacity Atterberg's limit.

2. Scope of the Study

The scope of the present work includes the addition of proportionally ash with different proportions to the locally available black cotton soils to enhance the engineering properties. The work presented in this paper aims to investigate the improvement of soil properties such as shear strength, maximum dry density (MDD), and CBR values by adding lime and the d fly ash which is collected from sugar cane factory. A series of laboratory tests are conducted on both virgin soils as well as on fly ash and lime reinforced soil to compare the improvement of soil properties. We have the chosen project because of its following advantages.

1. It improves the strength of the soil, thus, increasing the soil bearing capacity.
2. It is more economical both in terms of cost and energy to increase the bearing ca capacity of the soil rather than going for a deep foundation or raft foundation.
3. It is also used to provide more stability to the soil on slopes or other such places.
4. Sometimes soil stabilization is also used to prevent soil erosion or formation of dust, which is very useful, especially in dry and arid weather.
5. Stabilization is also done for soil water-proofing; this prevents water from entering the soil and hence helps

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Table 1
Liquid limit

Liquid limit	Only soil	5%lime &10%fly ash	10% lime & 20% fly ash	15% lime & 30% fly ash
Water content	43.33%	26.13%	22.18%	21.25%

Table 2
Plastic limit

Plastic limit	Only soil	5% lime & 10% fly ash
Water content	52.77%	47.22%

Table 3
Optimum moisture content

Optimum moisture content	Only soil	5% lime & 10% fly ash	10% lime & 20% fly ash	15% lime & 30% fly ash
Water content	9.39%	10.99%	14.21%	13.81%

Table 4
Maximum dry density

Maximum dry density	Only soil	5%lime &10%fly ash	10% lime & 20% fly ash	15% lime & 30% fly ash
Water content	0.68%	0.69%	0.57%	0.45%

the soil from losing its strength.

6. It helps in reducing the soil volume change due to changes in temperature or moisture content.

A. Objectives

The objectives of the present study are to

1) To determine the optimum content of fly ash. A tertiary section heading and lime by conducting the liquid limit test, plastic limit, and plasticity index.
2) To determine the optimum moisture content and maximum dry density by conducting the proctor compaction test.
3) To determine the CBR value of black cotton soil mixed with different percentages of lime and fly ash.
4) To compare the different parameters (liquid limit, plastic limit, standard proctor test) of black cotton soil for stability improvement.

B. Methodology

Stabilization of soils is an effective method for improving the properties of soil and pavement system performance. The objectives of any stabilization technique used are to increase the strength and stiffness of soil, improve the workability and constructability of the soil and reduce the Plasticity Index. For any given soil many stabilization methods, using different stabilizing agents like cement, lime, motor, bitumen, plastic, fly ash, etc. may be effective to improve the soil properties in place rather than removing and replacing the material. Availability or financial considerations may also be the determining factor on which a stabilizing agent is selected.

The various tests were conducted on the Geotechnical Parameters, which are following,

a) Water Content [oven dry method]: The knowledge of the natural moisture content is essential in all soil mechanics studies. To sight a few, natural moisture content is used in determining the bearing capacity and settlement.

b) Atterberg Limit: 1. Liquid Limit: If the natural moisture content of soil is closer to the liquid limit, the soil can be considered as soft if the moisture content is lesser than liquids limit, the soil can be considered as soft if the moisture content is lesser than liquid limit. 2. Plastic Limit: Soil is used for making bricks, tiles and soil cement blocks in addition to its use as foundation for structures. 3. Plastic index: in general, plasticity index depends only on the amount clay present. It indicates the fineness of the soil and its capacity to change shape, without altering its volume.

c) Compaction test (Standard proctor test): It is used to determine the compaction of different type of soil and the properties of soil with a change in moisture content.

d) California Bearing Ratio test: The California bearing ratio test is penetration test meant for the evaluation of sub grade strength of roads and pavements. This is the most widely used method for the design of flexible pavement.

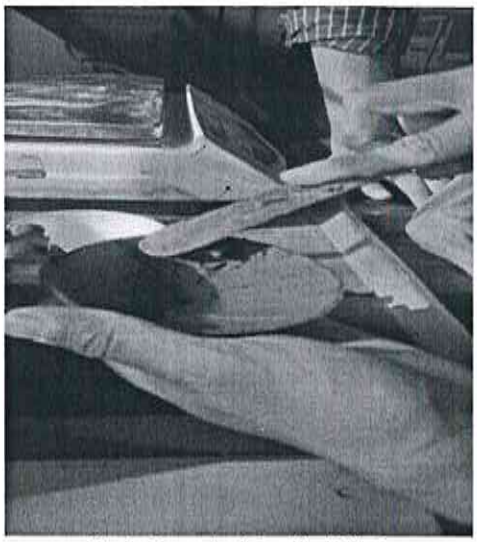

Fig. 1. Determination of liquid limit

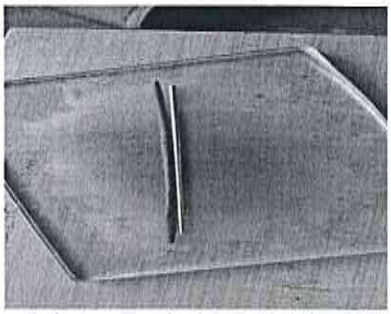

Fig. 2. Determination of plastic limit

3. Result

California bearing ratio (CBR):

Without lime and fly ash:

1. C.B.R. of specimen at 2.5 mm penetration: 189/1370*100=13.79%.
2. C.B.R. of specimen at 5 mm penetration: 235/2055*100=11.43%.

With lime 5% and fly ash 10%:

1. C.B.R. of specimen at 2.5 mm penetration: 202/1370*100=14.74%.
2. C.B.R. of specimen at 5 mm penetration: 248/2055*100=12.06%.

With lime 10% and fly ash 20%:

1. C.B.R. of specimen at 2.5 mm penetration: 211/1370*100=15.40%.
2. C.B.R. of specimen at 5 mm penetration: 258/2055*100=12.55%.

With lime 15% and fly ash 30%:

1. C.B.R. of specimen at 2.5 mm penetration: 216/1370*100=15.76%.
2. C.B.R. of specimen at 5 mm penetration: 266/2055*100=12.94%.

4. Conclusion

According to results obtained from laboratory tests, we have concluded that,

1) The liquid limit and plastic limit of Black cotton soil decreases with an increasing percentage of lime and fly ash.
2) Maximum dry density, and California bearing ratio of black cotton soil increase with an increase in the percentage of stabilizing materials.
3) With increase in percentage of lime and fly ash maximum dry density start increasing and optimum moisture content increasing up to 5%lime and 10%fly ash and after start decreasing.
4) As addition 5%lime and 10%fly ash gives maximum value. of optimum moisture content and standard proctor test.
5) With increase in percentage of lime and fly ash resulting from (5%, 10%, 15% and 10%, 20%, 30%) optimum moisture content and California bearing ratio of black cotton soil increases.
6) With increase in percentage of lime and fly ash, maximum dry density starts increasing & optimum moisture content starts decreasing.

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USE OF WASTE PLASTIC WITH BACTERIAL COATING AS A SUSTAINABLE BUILDING MATERIAL IN CONCRETE

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Abstract: The use of plastic is increasing day by day, although steps were taken to reduce its consumption. The suitability of recycled plastics shredded as coarse aggregate in concrete and its advantages are discussed here. Tests were conducted to determine the properties of plastic aggregate density, specific gravity and aggregate crushing value. As 100% replacement of natural coarse aggregate (NCA) with shredded plastic is not feasible, partial replacement at various percentage were examined. Higher compressive strength was found with 5% NCA replaced concrete.

1. INTRODUCTION

Landfill sites are becoming overcrowded and expensive for waste disposal, efforts are madeto minimize the quantities of materials that are delivered to landfills. The threat due to leaching of non-biodegradable materials like waste plastics, scrap tyres. If the production of waste cannot be prevented, then itis attractive to create an alternative use in another process instead of disposal. The benefits ofplastic recycling can be economically advantageous, due to abundant availability lower cost for mixing with other variants like concrete, bitumen etc. The project aims at use of recycled plastic in concrete as a partial replacement of Coarse aggregate. The maximum percentage of aggregate replaced by shredded plastic as been determined based on detailed experimental study. The waste plastic of LDPE (Low density 2 poly Ethylene) is collected from Gadhinglaj southwest localities and mixed with OPC.

2. Objectives-

1. To compare the compressive strength and density of recycled shredded plastic used as coarse aggregate for constructional concrete with the conventional concrete.
2. To reduce the pressure on naturally availability materials by replacing it with Shredded Recycled plastic.
3. To compare the physical characteristics of natural aggregate with Shredded Plastic.
4. To study the behavior of fresh and hardened concrete with Shredded waste plastic as aggregate and compare its properties to those of conventional concrete
5. To produce lightweight concrete for multi-purpose use.

3. Literature Survey

They have investigated the suitability of recycled plastic as partial replacement to coarse aggregate in concrete mix to study effect on compressive strength, modulus of elasticity, split tensile strength and flexural strength properties of concrete. Coarse aggregatefrom plastic was obtained by Shredding the plastic pieces at required sizes and crushed to required size of aggregate. Their experimental results shown that plastic aggregate have low crushing (2.0 as compare to 28 for Natural aggregate), low specific gravity (0.9 as compare to 2.74 for Natural aggregate), and density value (0.81 as compare to 3.14 for Natural aggregate), as

compare to Natural coarse aggregate. Their test results were based on 5% substitution of natural coarse aggregate with shredded plastic. Increase

in workability was reported when slump test for sample was carried out. Volumetric substitution of natural aggregate with plastic aggregate was selected best in comparison with grade substitution. At 400 centigrade temperature Shredded Plastic aggregate shown considerable decrease in strength as compare to normal concrete. An increase of 28% was observed in compressive strength but decrease in split tensile strength and modulus of elasticity was observed.

4. Study of Materials

Cement
Shredded Plastic
Fine Aggregate
Bacillus subtilis
Water

4.1 Cement-

Concrete is a homogeneous mixture of cement, sand, aggregate and water in proper proportion.

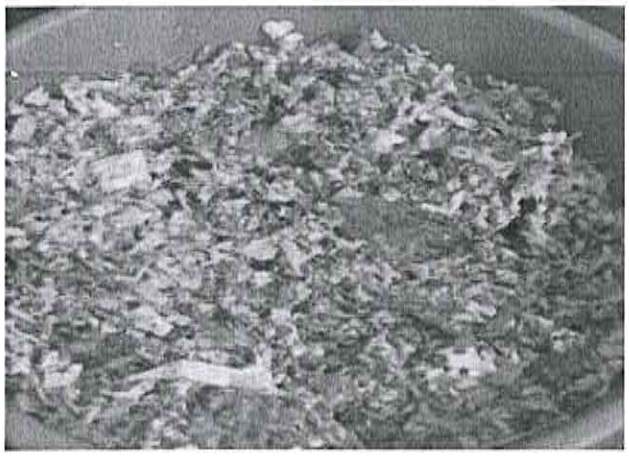
Concrete is composite construction material composed of aggregate, cement andwater formulation that have varied properties. The aggregate is generally course gravels or crushed rocks such as limestone, or granite, along with a fine aggregate such as a sand. The cement, commonly Portland cement and other Cementous materials such as fly ash, slag cement, granulated glass farness slag (GRANULATED GROUND FURNACE SLAG),serve as a binder for aggregate. various admixture to be added to achieve various properties.Water is then mixed with this dry composite which enables to be shaped (typically poured) and then solidified and hardened into rock-hard strength through a chemical process is known as hydration. The water reacts with the cement which bonds the other component together, eventually creating a robust stone like material. Concrete has relatively high compressive strength, but much lower tensile strength. For this reason, is usually reinforced with materials that are going to strong in tension (often steel).

Concrete has been damaged by many processes, such as freezing of trapped water concrete is widely used for making architectural structures, foundations, brick/block walls, pavements, bridges/overpasses, motorways/road, runways, parking structures, dams, pools/reservoirs, pipes, footing of gates, fences and poles and even boats.

Famous concrete structures include Bud Khalifa (world's tallest building ever), the Hoover Darn, the Panama Canal and Roman Pantheon. There are many types of concrete available, created by varying the properties of the main ingredients below. In this way or by substitution for the cementations and aggregate phases, the finished product can be tailored to its application with varying strength, density, or chemical and thermal resistance properties.

4.2 Shredded Plastic-

Plastics collected from the disposal area were sorted to get the superior one. These were crushed into small fraction and washed to remove the foreign particles. Then it was shredded at a particular size so that the necessary brittleness was obtained. After extrusion the shredded plastic was cooled down and collected in sizes of 100 mm size approximately. Properties According to the Indian standard specifications the property of aggregates such as specific gravity, aggregate Impact value and density were determined. From (Table 1) comparing the properties of aggregate for both NCA and Shredded Plastic it is observed that the specific gravity and density for shredded plastic is much lower than NCA which offers a light weight concrete. A lower crushing value indicates the complexity with which a shredded plastic concrete couldbe crushed under compressive stresses.



4.2.1 Properties of shredded plastic:

Table.no-1 Properties of shredded plastic

Sr.No.	Property	Average value
1.	Density	0.81kg/m3
2.	Impact value	4.54%
3.	Abrasion value	9.54%
4.	Specific gravity	1.06
5.	Water absorption	5%
6.	Melting point	75-100C

4.3 Bacillus subtilis-

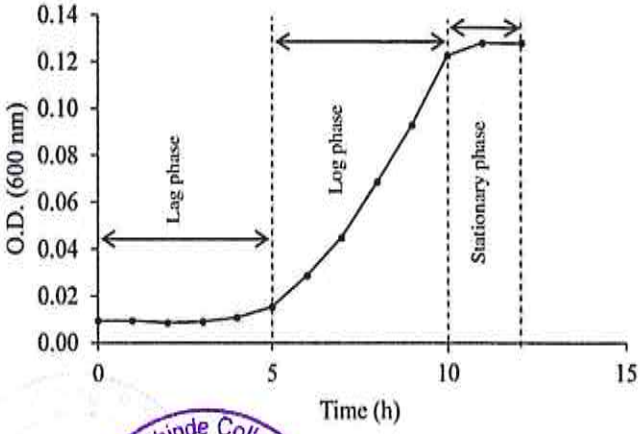
Due to rapid construction, necessity for raw materials of concrete, especially coarse aggregate, tends to increase the danger of early exhaustion of the natural resources. An alternative source of raw materials would perhaps delay the advent of this early exhaustion. Recycled shredded plastic coarse aggregate (RSPCA) plays a great role as an alternative raw material that can replace the natural coarse aggregate (NCA) for concrete. Previous studies show that the properties of RSPCA concrete are inferior in quality compared to NCA concrete. This article attempts to study the improvement of properties of RCA concrete with the addition of bacteria named as Bacillus subtilis. The experimental investigation was carried out to evaluate the improvement of the compressive strength, capillary water absorption, and drying shrinkage of RSPCA concrete incorporating bacteria. The compressive strength of RSPCA concrete is found to be increased by about 10% when the cell concentration B. subtilis is 106 cells/ml. The capillary water absorption as well as drying shrinkage of RCA are reduced when bacteria is incorporated. The improvement of RCA concrete is confirmed to be due to the calcium carbonate precipitation as observed from the microstructure studies carried out on it such as EDX, SEM, and XRD.

Experimental investigation

Culture of Bacillus subtilis B. subtilis (MTCC.736), which facilitates the precipitation of calcium carbonate, was collected from the National chemical laboratory pune, India, and was constantly maintained on nutrient agar slant. A single colony of the culture was taken and inoculated into nutrient broth and incubated at 37°C with constant shaking at 150 rpm. The medium composition of nutrient broth used for routine culture shown in **fig.2**

Table no -2. Cultures of Bacteria

Medium composition for bacteria	Composition amount (g/l)
Peptone	5
Nacl	5
Yeast extract	3
Urea	20
Calcium chloride	15
NH4Cl	2



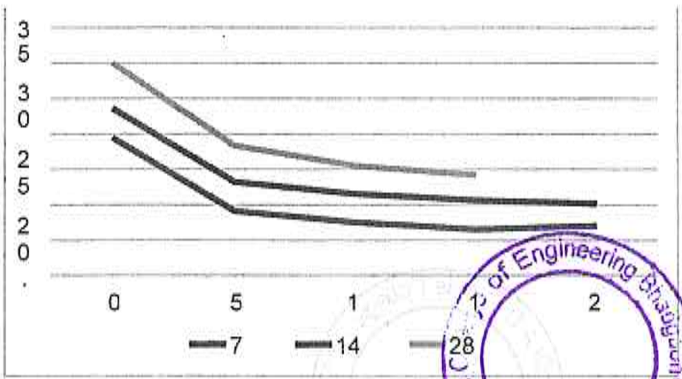
5.Methodology-

The successive steps that were followed to complete the study were as follows: Preparation of recycled shredded plastic. Various tests were conducted on cement, and coarse aggregate to determine its physical properties Test on Cement: Specific gravity, standard consistency, initial and final setting time, compressive strength of mortar cube. Test on aggregates: Specific gravity, sieve analysis. Mix design of M25 grade concrete. Cubes, were casted with control mix using natural aggregate for varying percentage replacement (0,5,10,15,20) of natural aggregate by shredded plastic. Workability, compressive strength of concrete where conducted. Optimum percentage of shredded plastic that can be replaced in concrete was determined.

6.Compressive strength-

Table no-4.
Replacement of shredded plastic with bacterial coating

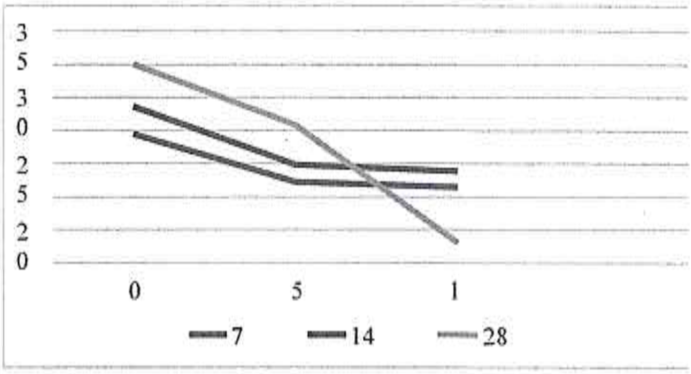
% of Aggregate replaced	7 Days	14 Days	28 Days
0%	19.5	23.6	30.04
5%	9.08	13.20	18.31
10%	7.51	11.5	15.47
15%	6.5	10.62	14.15



Graph no-1.
Compressive strength

Table no-4.
Replacement of shredded plastic with bacterial coating

% of Aggregate	7 Days	14 Days	28 Days
0%	19.5	23.6	30.04
5%	12.20	14.80	20.82
10%	11.40	13.80	19.20



Graph no-2 Compressive strength for bacterial coating

Discussion-

Thanks to new features to these materials present innovative technical solutions,semi-natural and ecological, for traditional construction problems allowing world wide of application in construction, architecture, decorative and even furniture.

Applications-

[1] Used as for construction of partion wall.

[2] Used for the construction of Pavement block.

[3] Used for the construction of compound wall.

Conclusion

[1] The modified concrete mix, with addition of plastic aggregate replacing conventional aggregate up to certain 5% gives strength with in permissible limit.

[2] The flexural strength at each curing age is prone to decrease with the increase of the waste plastic and aggregate ratio. This trend can be attributed to the decrease in adhesive strength between the surface of waste plastic particles and the cement paste.

[3] The density of concrete decreased when plastic content increased.

[4] Because plastic has more water tightness capacity when compared to natural aggregate thiscan help in arresting micro cracks.

[5] By using recycled shredded waste plastic in concrete can reduce the land fill and environmental issues.

[6] Shredded Plastic aggregate is a lightweight material with specific gravity 0.94.

[7] By using plastic shredded aggregate we cannot use it for structural construction.

[8] As percentage of plastic increases workability also increases because the plastic which is used as aggregate is smooth. As well as water absorption capacity of plastic is also low.

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"PROPOSED BY DISPOSAL OF MUNCIPAL SOLID WASTE BY BIO METHANATION IN GADHINGLAJ CITY"

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***Abstract*:**

In India Bio-Methanation in conventional biogas plant have been proposed as one of the appropriate alternative sources of energy which can counter the escalating demand of fossil fuels. In India large quantity of waste generates produce per day and hence the noof biogas installation of biogas plant is increasing rapidly and the trend is expected to continueat least for the foreseeable future. Biogas plant like many other energy generating technologies is not free from environmental problem.

Biogas production requires anaerobic digestion. The biogas plant creates an organic processing facility to create biogas which will be more cost effective, eco friendly, cut down on landfill waste, generate a high quality renewable fuel and reduce Carbon Dioxide and Methane emission. The anaerobic digestion of kitchen waste produces biogas, which primarily consist of methane (CH_4) and Carbon Dioxide (CO_2). Biogas can be used as energy source and also for numerous purposes. But any possible application requires knowledge and information about composition and quantity of constituent in the biogas produced.

INTRODUCTION

Energy is an essential need for human existence. There is shortage of energy due to fast depletion of fossil fuel and the increase in demand for energy .Due to scarcity of petroleum and coal it threatens supply of fuel throughout the world also problem of their combustion leads to research in different corners to get access the new source of energy, like renewable energy resources. Solar energy, wind energy, different thermal and hydro sources of energy, biogas are all renewable energy resources. But, biogas is distinct from other renewable energybecause its characteristics, controlling and collecting organic waste and the same time producing fertilizer and water in agricultural irrigation. Biogas does not have any geographical limitation nor those it require advanced

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technology for producing energy also is it very simple to use and apply.

The disposal of solid waste is a problem. This problem continues to grow with growth of population and development of industries. Disposal of waste in open pits how become routine in majority of places. Semi solid or solid matter that are

Created by human or animal activities and which are disposed because of they are hazardous or useless are known as a solid waste. Today solid waste disposal technology is needed for further survival and welfare of human being it is the fact 0.40 kg/capita/day of municipal solid waste (MSW) is generated in the urban areas similarly about 150 of per capitaper day sewage waste generate

1. Future scope

Renewable Energy Source:

Bio-methanation plants utilize organic waste such as agricultural residues, food waste, and sewage to produce biogas, primarily methane. With increasing concerns about climate change and the need to transition away from fossil fuels, bio-methanation presents a renewable energy source that can help reduce greenhouse gas emissions.

1.Energy Security:

As countries aim to diversify their energy sources and reduce dependence on imported fossil fuels, bio-methanation offers a locally available energy option. It can contribute to energy security by harnessing locally generated organic waste to produce

2. Objectives

1. Study of Bio Methanation process
2. Design the Bio Methanation plant for Gadhinglaj city
3. To calculate amount of electricity generated from the plant
4. To utilize solid residue as manure
5. To minimize the environmental impact

3.Need Of Project

Forestry, crops, sewage, industrial residue, animal waste, and municipal waste are all used to create the biogas renewable energy. Traditionally biogas was used for cooking and heating purposes but these days it is being used for a number of other things as well.

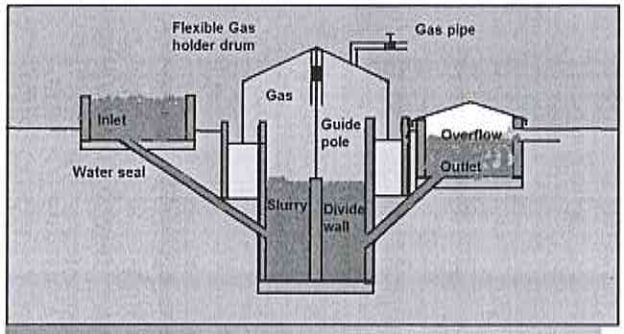
4.Methodology

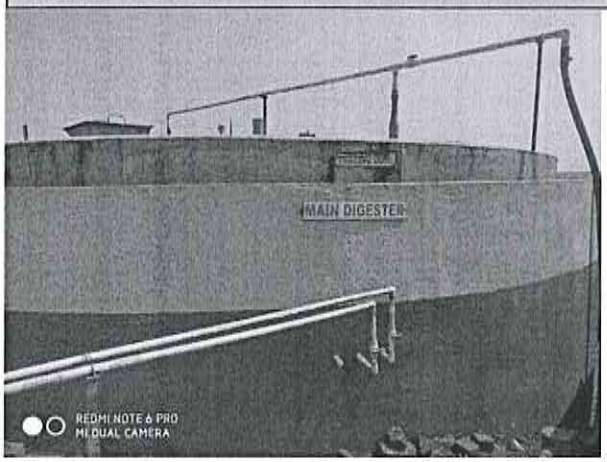
1. Collection of data
2. Analysis of data
3. Visit to nearby Bio Methanation plant near Kolhapur city
4. Design of Bio Methanation plant for Gadhinglaj city
5. Conclusion

Data collection and analysis:

Essential data for the study, such as waste amount, current waste management technique if adopted, net searching etc. There is one dumping site available for waste collection near the Gadhinglaj city. But there is no waste management technique is used to treat that waste collected from the city.Visit to nearest Bio methanation plant near Kolhapur:

5.FIGURES:





6.Results

Most benefits of biogas plants are environment-related, as they produce renewable energy for domestic and industrial use. This energy can be stored or injected into the electricity grid to reduce dependence on fossil-fuel energy, which can help reduce our carbon footprint.

7.Conclusion

After completion of this project, we are concluded that there are biogas energy is distinct from other renewable energy source because of its characteristics. The biogas is effectively used for cooking, lighting and various purposes in rural areas can drasticallyreduce the depletion of natural resource like forest. The emission of CH_4 and CO_2 , gas generate from municipal solid waste pollutes environment and create unhealthy condition for living being, so this municipal solid waste can effectively use for production of biogas under anaerobic condition. After this process the remaining part of the municipal solid waste is converted in good fertilizer which isused for gardening purposes.

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DESIGN AND PERFORMANCE ANALYSIS OF PASSIVE SOLAR ENERGY BUILDING

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***Abstract*:**
Global climate change increases heat loads in urban areas causing health and productivity risks for millions of people. Air conditioning is growing rapidly. There has been a drastic increase in the use of air conditioning system for cooling the buildings all around the world. The last two decade has witnessed a severe energy crisis in developing countries especially during summer season primarily due to cooling load requirements of buildings. Passive cooling systems use non-mechanical methods to maintain a comfortable indoor temperature and are a key factor in mitigating the impact of buildings on the environment. The aim of this study is to test the usefulness of applying selected passive cooling strategies to improve thermal performance and to reduce energy consumption of residential buildings and critically analyzes various passive cooling techniques and their role in providing thermal comfort and its significance in energy conservation.

***Keywords*:** Fundamentals of passive solar energy building, Elements of passive solar energy building, Types of passive solar energy building,Cavity wall,Guidelines.

1. Introduction

Modern societies are living on the Earth's resources at an increasingly rapid pace to satisfy certain needs and desires. In face of the present global climate change and related anthropogenic carbon emissions, the use of energy from fossil fuels becomes a main concern. At least three pathways to reduce energy consumption are at hand: first is to simply lower the demand and use less energy; second is to be more energy-efficient in our energy-based technology and systems; and third is to substitute fossil fuels with renewable energy sources to meet the demand. The same approaches apply to buildings. This thesis takes the first pathway as a fundamental approach towards energy-saving in buildings. Its focus is on passive cooling to fulfill indoor comfort needs.

Changes in our climate system today in the form of global average surface temperature increase, global average sea level increase and snow cover decrease are understood to be driven more by human activities than natural processes. These drivers, including atmospheric concentrations of greenhouse gases and aerosols, land surface properties and solar radiation, individually alter the energy balance of the climate system by imposing either a warming effect or a cooling effect known as radiative forcing.

2. FUTURE SCOPE

Cavity wall consists of an outer brick or block leaf separated by an inner brick or block leaf by the means of an air gap called as cavity. In cavity walls, the air gap inhibits the transmission of heat into or out of the building as air acts as a bad conductor of heat. In composite walls, the cavities are filled with insulating materials by adjusting its thickness. Cavity wall stands for a double wall that comprises of two individual walls of masonry known as skins or leaves which are detached with an air space and connected jointly through metal ties at proper distances . These walls are normally used as outside

*Corresponding author:

walls but sometimes used also as interior walls because of good sound.

3. Objectives

1. Our objective is to evaluate the thermal values of cavity wall and propose applications of these walls into real projects for its application and to introduce the passive cooling technique in the building to improve internal thermal comfort in building complex.
2. To study the current thermal behavior of walls with various orientation of clay brick and AAC brick wall.
3. To find out the passive cooling technique that can be useful, economical and cost effective. Since heat is a major factor which influences the thermal property.it is necessary to carry out the thermal analysis of these walls.
4. To prepare a model of a typical house with the help of cavity wall and shading concept, also considering other architectural factors such as orientation etc. to achieve passivity in the house.

4.Need Of Project

1. To examine the thermal adaptation of building. This thermal analysis will serve dual functions, as the main assessment criteria to evaluate the performance of the passive solar techniques studied in this work, and as an integral part of an energy-saving building standard to be proposed in the future.

2. To understand the existing situation of clay brick wall and AAC brick wall i.e current behavior related to heat flow and energy consumption among households.

3. To evaluate indoor thermal environments of houses and to find out their passive techniques that can be useful for the houses using effective shading in houses. Since climate has a major influence on thermal adaptation of occupants and also effectiveness of passive solar energy techniques.

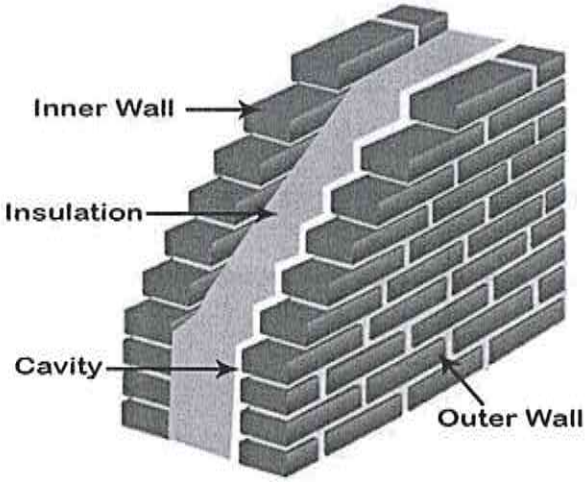
4. To initiate a numerical model of a typical house using effective shading taking the sun into the consideration and to simulate selected passive solar techniques to improve the indoor thermal comfort of the house. The basic questions, which passive solar technique is effective and how well the passive solar techniques work in urban climate compared to rural climate.

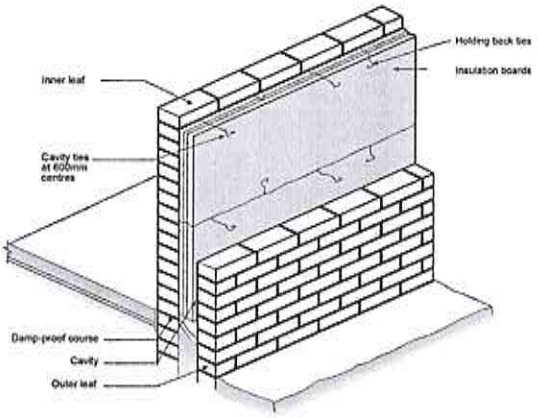
5.Methodology

Cavity wall consists of an outer brick or block leaf separated by an inner brick or block leaf by the means of an air gap called as cavity. In cavity walls, the air gap inhibits the transmission of heat into or out of the building as air acts as a bad conductor of heat. In composite walls, the cavities are filled with insulating materials by adjusting its thickness. Cavity wall stands for a double wall that comprises of two individual walls of masonry known as skins or leaves which are detached with an air space and connected jointly through metal ties at proper distances . These walls are normally used as outside walls but sometimes used also as interior walls because of good sound. Incorporation of sola passive techniques in a building design helps to minimize load on conventional systems such as heating, cooling, ventilation & light. Passive strategies provide thermal and visual comfort by using natural energy sources & sinks. Ex solar radiation, outside air, wet surfaces, vegetation etc means, in warm & humid climate: an architect's aim would be to design a building in such a way that solar gains are maximized in winter and, reduce solar gains in summer, and maximize natural ventilation

Once the solar passive architectural concepts are applied to design, the load on conventional systems (HVAC & lighting) is reduced. Architects can achieve a solar passive design by studying the macro and micro climate of the site, applying bioclimatic architecture design features and taking advantage of the existing natural resources on the site. The solar passive design strategy should vary from one climate to another. Since these buildings can also function independent of mechanical systems, in case of power failure they are still well lit by natural daylight and thermally comfortable.

6. FIGURES





7.Results

A detailed thermal analysis carried out reveals that type 3 orientation has the potential to act as a high-quality envelope solution to achieve passivity among building.

Based on results AAC brick wall has lower heat flow as compared with clay brick wall. also the type 3 i.e clay brick wall (outside) and AAC brick wall layer with EPS present inside cavity observed less change in retained temperature compared with orientation.

8.Conclusion

Both cavity walls and effective shading within the building envelope will promote the concept of passive solar energy building.

Air tightness should not be a problem on a condition that a wall is plastered so that the thermal transmittance maybe lowered.

Based on the result shown above it is possible to analyze the base orientation which reduces the thermal gain and provides better thermal insulations and comfort.

Though the initial cost of construction is higher than conventional construction of a typical house. But it will be economical to individual in terms of electricity cost and comfort over long term.

The research finding appear to have prevailing problems by many residents in rural and urban regions who struggle to keep their Room cool during Summers and also in the regions of hot weather.

1.The level of poorly insulated homes is extremely Concerning and has major social implications in terms of cost, health, environmental issues.

2.The best orientation was clay wall with AAC Brick with EPS filled the temp change was very nominal in this case thus, it can be said that, with 50mm cavity width EPS filled AAC Brick & clay brick wall Orientation is best suitable for better thermal insulation.

It can be performed effortlessly and quietly without mechanical and electrical appliances. It also improves the comfort of living spaces The economical solution to the solution to the warmer house in winter and cooler house in the summer is to provide better insulation.

4.It is advisable to educate/train contractor, developer and individual to encourage this method of construction.

To guarantee that very good overall performance, a series of practices, when designing and brick-laying filled cavity walls, should be respected.

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Green Energy and Indoor Technology for Smart Building

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Abstract: **Buildings all-round the planet consumes a significant quantity of energy that is about one third of the entire primary energy resources out there. This has semiconductor diode to loads of challenges with regard to provides of energy, energy resources fast depletion, increase in building service demands, jury-rigged comfort life-style in conjunction with time increase pay in builds; this all has exaggerated the energy consumption. Even the planet-wide property is in addition pushing the implementation of inexperienced buildings at intervals the world. Researchers and scientists square measure acting on this issue for a very whereas, however still the issue is rife. The aim is to gift comprehensive and significant analysis conducted to date with regard to inexperienced buildings. This provides in-depth analysis of style technologies (i.e., passive and active technologies) that lay a sturdy foundation for inexperienced building and conjointly highlights the good automation technologies that facilitate in energy conservation in conjunction with varied performance metrics. The renewable sources square measure domestic sources of energy. It enhances the protection of energy provides. The main goals of property style were to scale back depletion of essential resources like energy, water, and raw materials; forestall atmospheric degradation caused by facilities and infrastructure throughout their life cycle; and make engineered environments that square measure safe, productive and effective utility of the water and solar power.**

Keywords: **Renewable energy, Zero-energy buildings.**

1. Introduction

The beginning of the twenty-first century has ushered in the era of green buildings. Normal buildings use energy inefficiently, generate large amounts of waste in their construction and operation and emit large quantities of pollutants and greenhouse gases. In contrast to conventional buildings, green buildings seek to use land and energy efficiently conserve water and other resources impure indoor and outdoor air quality- and increase the use of recycled and renewable materials While green buildings still constitute a tiny subset of existing buildings their numbers are increasing rapidly. Green building (also known as green construction or sustainable building) refers to a structure and the application or processes that are environmentally responsible and resource efficient throughout a building's life cycle: from planning to design, construction, operation, renovation, and demolition This requires close cooperation of the contractor, the architects, the engineers and the client at all project stages_ The Green Building practice expands and complements the classical building design exonerees of economy utility durability and comfort. Green building brings together a vast array of practices, techniques and skills to reduce and eliminate the impacts of buildings on the environment and human health. It often emphasizes taking advantage of renewable resources. using sunlight through passive solar active solar and photovoltaic equipment and using plants and trees through green roofs, rain gardens and reduction of rainwater run-off- Miny other techniques are used such as using low impact building materials or using packed permeable concrete instead of conventional concrete or asphalt to enhance replenishment of ground water.

2. Future Scope

The future scope for Green Energy and Indoor Technology for Smart Buildings is highly promising, driven by global sustainability goals, rising energy costs, and advancements in AI and IoT. Here's a breakdown of future directions and opportunities in each domain, along with their integration:

A. Green Energy in Smart Buildings – Future Scope

1. Decentralized Energy Production
2. Energy Storage Solutions
3. Smart Grid Integration
4. Sustainable Building Materials
5. Green Certifications & Regulations

B. Indoor Technology for Smart Buildings – Future Scope

1. IoT & Sensor Integration
2. AI-Driven Building Management Systems (BMS)
3. Healthy Indoor Environments
4. Touchless and Voice-Controlled Interfaces
5. Digital Twin Technology

3. Objectives

Here are clear and structured objectives for a project or initiative focused on 'Green Energy and Indoor Technology for Smart Buildings'

1. Energy Efficiency and Sustainability

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2. Smart Technology Integration
3. Indoor Environmental Quality
4. Cost Reduction and ROI
5. Data Collection and Analytics
6. Regulatory Compliance and Innovation

4. Necessity of the Project

The necessity of a project focused on Green Energy and Indoor Technology for Smart Buildings arises from the urgent global need to address energy efficiency, sustainability, and human comfort within the built environment. Here's a breakdown of why such a project is essential:

- Increasing Energy Demand and Environmental Concerns
- Sustainability and Regulatory Compliance
- Advancements in Smart Technology
- Improved Indoor Environmental Quality
- Economic Benefits
- Integration and Resilience

5. Methodology

A solid methodology for Green Energy and Indoor Technology for Smart Buildings should blend sustainability, smart systems integration, and human-centric design. Here's a structured methodology you can follow, often suitable for academic or practical projects:

1. Define Objectives and Scope
2. Literature Review & Benchmarking
3. System Design & Integration
   a. Green Energy Technologies
   b. Indoor Technology Solutions
   c. Building Management Systems (BMS)
4. Simulation and Modeling
5. Implementation & Deployment
6. Testing & Validation
7. Feedback & Optimization
8. Reporting and Documentation

Fig. 1.

6. Conclusion

The integration of green energy and advanced indoor technologies in smart buildings represents a crucial step toward a more sustainable and efficient future. By harnessing renewable energy sources such as solar and wind power, and combining them with intelligent systems for lighting, heating, ventilation, and air quality monitoring, smart buildings significantly reduce environmental impact while enhancing occupant comfort and productivity. As urbanization accelerates and climate concerns intensify, the adoption of these innovations is not only a technological advancement but a necessary evolution toward resilient, eco-friendly living and working environments.

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Tunnel Formwork Technology

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Abstract: **Winds of change are blowing across every industry in India but the construction Industry is still reluctant to utilize the advanced techniques that can enhance the Productivity and efficiency of the construction industry. In recent years construction Industry is witnessing increased demand in multistory construction and repetitive Modular structures are becoming an integral part of it. Real estate construction industry has a reputation of not begin very technologically sophisticated, generally lagging in innovation, construction techniques & management. But now a day's lot of research is carried out in this sector. These structures require detailed planning in order to save cost and time. As formwork accounts for about 25-40% of the total project cost and almost 60% of the time in concrete construction, we need to pay attention to the development in formwork techniques and replace Conventional formwork with new formwork techniques like tunnel formwork. This Paper aims at focusing on the benefits and limitations of tunnel formwork in contrast to conventional formwork thus changing the mind set of local construction industries that are still dependent on conventional formwork techniques.**

Keywords: **Tunnel formwork.**

1. Introduction

The increase in population and the limitation of space has leaded the way to multistorey or high-rise buildings. In order to make these structures sound, we need to focus on factors that impart strength to concrete and this is where formwork plays an integral role. Formwork is a temporary structure like a die or mould, used to contain poured concrete, to give concrete the desired shape and support it until it attains sufficient strength to carry its own weight. Formwork should be capable of carrying all imposed dead and live loads apart from its own weight. Pantheon, a former Roman temple and now a church in Rome, is the earliest example of use of mould for concreting. Formwork should be properly designed, fabricated, and erected to achieve high quality concrete finish. If this is not done properly the desired shape and strength of concrete is not achieved. Advanced Tunnel formwork is one of the new formwork techniques to hit Indian construction industry. It is found to be suitable for mass construction in Indian conditions. It delivers quality and speed at a rate which is higher than the speed achieved by most of the formwork systems. The labour in coordination with heavy machineries like tower crane speeds up the construction, assures quality control and durability. This reduces overall time and cost of the structure. This paper mainly focuses on advanced tunnel formwork systems, its components, working cycle, cost involved, its benefits and its limitations based on speed and economy.

2. Objectives

1. To introduce advanced tunnel formwork systems to Indian construction industry and lay emphasis on the high quality, speedy construction and if used effectively the economically which tunnel formwork yields.
2. To present comparative study of tunnel formwork and conventional formwork system on the basis on,
   - Slab cycle time
   - Cost parameters.
   - Quality parameter
3. To eliminate the reasons which act as barrier for the local construction industries while opting for new formwork techniques like tunnel formwork.

3. Detailed Study

Tunnel form is a box sized steel fabricated form that allows the wall and the slab to be casted in a single operation. Once reinforcement is placed, concrete for walls and slabs can be poured in a continuous pour. An arrangement of hot air blowers accelerates the setting of the concrete and one slab is achieved in one day i.e. 24 hours slab cycle. 300- 400 m2 of floor area can be poured on a daily basis. A crew of 10 people can achieve a daily cycle of casting 1-2 apartments per day depending on the type of structure. A 10 storied building can be completed in 20-30 days maximum. For low-rise buildings e.g. 5 storeys, total weight of the building can be designed 1.10 – 1.20 tons/m2 lighter than compared to 1.30 in conventional method. Precast element is one of the critical activity at the time of using tunnel formwork, it results in increased productivity at very short period of time which results in time and cost saving. It is particularly effective in projects suited to repetitive cellular construction involving huge symmetrical work such as residential blocks, hotels, student accommodation, barracks and prisons. Tunnel form is also used in several housing projects especially for earthquake resistant projects as the construction time is reduced. Tunnel form systems are used to construct repetitive cellular structures (such as hotels and apartment blocks) and enable the construction of horizontal and vertical

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elements (floors and walls) together. Each unit is in the form of an inverted L, the vertical leg being the formwork for one face of a wall and the horizontal leg being soffit formwork. Several units are erected together to create the formwork for a number of 'tunnels' consisting of walls and ceiling slab. The normal dimensions of tunnel form units are 8 to 11m long and 2.4 to 6.8m wide, but individual units can be joined to give tunnels of greater length.

4. Machine Requirement

- Require 10 ton capacity Tower Crane.
- A 60 to 80 m3 batching plant.
- Mesh Welding Machine.
- Gas heaters (for cold climate).
- Hydra
- Concrete Distributor
- Other Routine Machineries

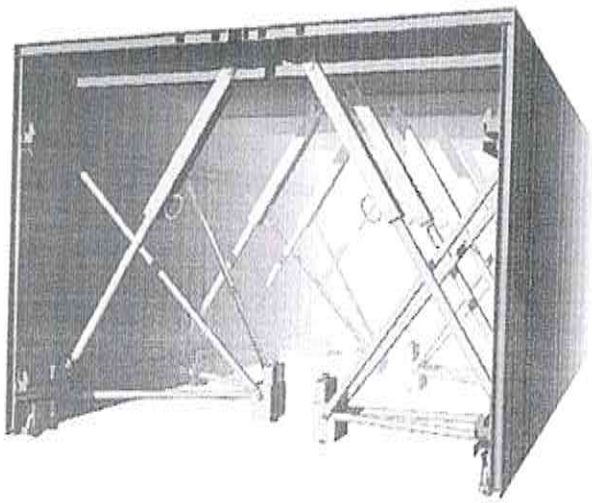
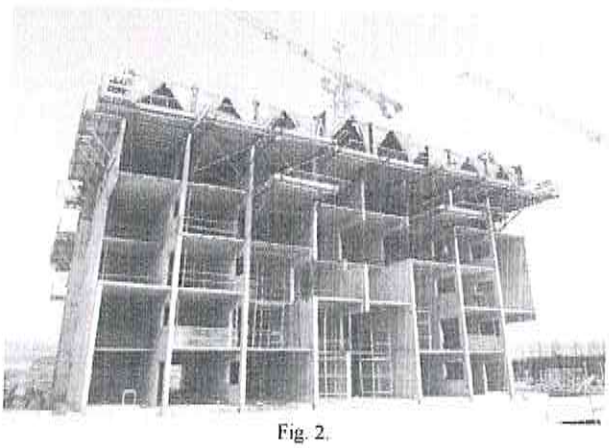


Fig. 1.



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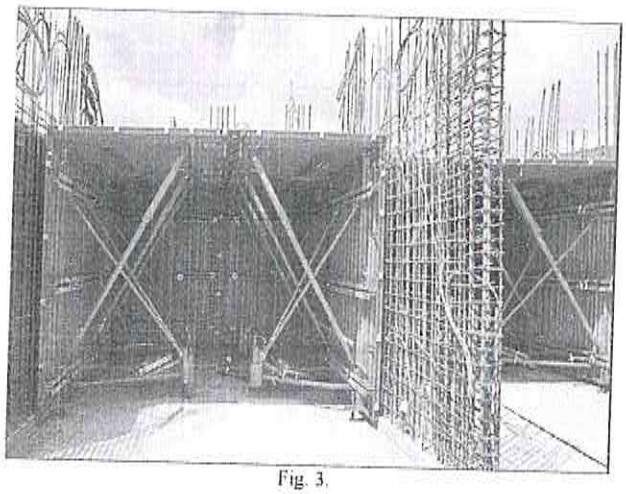

Fig. 3.

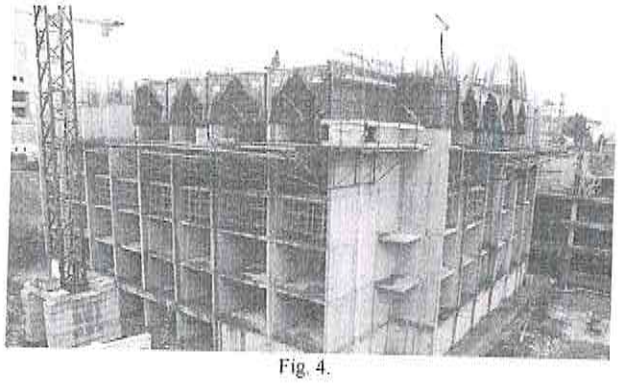

Fig. 4.

5. Role of Management

Coordination plays an important role in process of concreting with tunnel formwork. Cost and time constraints are always impacting design and quality considerations. In order to achieve conformity with design and maximum quality with reduction in cost and time, management comes into picture.

1. Responsibility of training the labours to ensure smooth execution.
2. Building should be so planned that maximum tunnel from can be done with the help of one location of tower crane. Positioning of the crane, precast workshop, material storage, etc. are to be planned to reduce transportation time and idle time.
3. Detailed planning is required. All the activities are to be planned before the commencing of the project. This will reduce the lag time. The activities dependent on one another can be foreseen and executed in sequence this helps in providing space for ducts and facilities.
4. Alternatives should be decided beforehand incase barriers are faced in tunnel form especially in very short and very large spans of slab. This will help in speedy construction.
5. Tunnel form system comes with highest jobsite safety due to full perimeter platform system but risk management should not be ignored. Involvement of all the sectors is needed. The designing team, execution team and architectural team need to be in sync so that tunnel.

Table 1

Characteristics	Conventional Formwork Technology	Mivan Formwork Technology	Tunnel Formwork Technology
Capital Cost	Less	High	Very High
Accuracy & Quality of construction	Less	Good accuracy	Superior
Plastering	Required	Not Required	Not Required
Cycle time for RCC work	21 to 28 days	10 to 12 Days	1 day repeat cycle possible
No. of repetitions of shuttering material	12-15 times	100-150 times	500+ times
Advantages	Low cost, Easy to operate	Low manpower, Moderate to fast construction	Long lifespan, Low manpower, Speedy Construction
Limitations	Short lifespan, Slow speed, Poor quality	Moderate lifepan and manpower required	High investment, Only work with tower crane
Cost of shuttering material	Around Rs.400 to 500/sqft	Around Rs.5000 to 6000/sqft	Around Rs.9000 to 10000 /sqft
Labour Cost	Around Rs.85 to 100 /sqft	Around Rs.175 to 250/sqft	Around Rs.250 to 300 /sqft

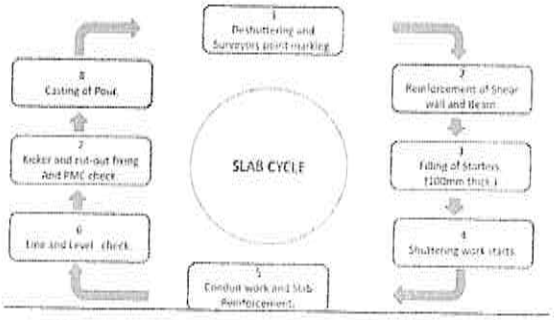

Fig. 5.

6. Conclusion

1. We can achieve 1-3 days slab cycle by 'Tunnel Formwork System',
2. Considering Indian conditions tunnel formwork if used 100% quantum of slab, as it involves heavy investment in procurement, heavy machineries, specialized expert labour it becomes uneconomical. In case project involves more than 20 storied building over large area, total economics may change considerably.
3. Also, after studying and comparing both the systems it can be concluded that, though initial investment and per day operational cost in Tunnel Formwork is more than Conventional and Mivan formwork System, due to more reuses and reduced slab cycle time Tunnel Formwork works out ultimately economical.
4. Also returns from initial investment regained due rapid completion of project Hence in long term consideration Tunnel Formwork System is beneficial than that of Conventional and Mivan formwork System.

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Comparative Study of Waste Material in Paving Block

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Abstract
Paver blocks, a non-traditional pavement material, are increasingly being used in open areas due to their ability to bear traffic and non-traffic loads. The construction industry has led to increased consumption of natural resources for cement production, contributing to the greenhouse gas effect. Additionally, industrialization has led to a significant production of waste materials. With the popularity of paver blocks and their growing demand, there is a potential to incorporate waste materials like glass Fiber and Fly ash into their manufacturing. Experimental works have shown successful waste incorporation in paver block manufacturing, with fly ash being a promising cement replacement material. Slag has also been used to replace up to 40% of cement with satisfactory results, resulting in a strength increase of over 3% compared to normal

Keyword-Paver Block, Waste Material, Non-Traditional, Replacement, Fly ash

INTRODUCTION:

The construction industry is facing a big challenge right now. People are realizing that the way we build things, like houses and roads, is not very good for the environment. We use materials like concrete and asphalt, which are not very friendly to the planet. We make a lot of pollution, use up a lot of natural resources, and create a lot of trash. But there's hope! This project has a cool idea to make things better. They want to make special paving blocks that are good for the Earth. These blocks are made from stuff that we usually throw away, like stone dust, rice husks (the outer part of rice), and bagasse ash (a waste product from making sugar from sugarcane).
These special blocks are much nicer to the environment. They don't make as much pollution, and they don't waste so many resources. Plus, they help get rid of some of the waste we have lying around. As more and more people realize that we have to stop hurting the Earth, the construction industry needs to change. This project is a step in the right direction. It shows that we can use things that we would normally throw away to build things that are better for the planet. It's like turning trash into treasure! So, in simple words, this project is trying to make the construction industry greener by using waste materials to make paving blocks. This is good for the environment because it reduces pollution and waste. It's a smart idea for a better, more eco-friendly future

1.FLY ASH:

The use of fly ash in Portland cement concrete (PCC) has many benefits and improves concrete performance in both the fresh and hardened state. Fly ash use in concrete improves the workability of plastic concrete, and the strength and durability of hardened concrete. Fly ash use is also cost effective. When fly ash is added to concrete, the amount of Portland cement may be reduced. Hence it gives economy for the project. Fly ash is a versatile material used in concrete, improving durability and workability while reducing permeability. It can form cement when mixed with water if its calcium content is high. It can also be mixed with lime and water to create a substance similar to Portland cement. Fly ash can be divided into Class F and Class C, with Class F containing melted glass particles to reduce concrete expansion risk and increase resistance to sulphates and alkali-aggregate reactions. Class C contains more calcium oxide, making it more effective in strengthening structural concrete.

2.GLASS FIBER:

Glass fibers added to the concrete mix boost the material's compressive strength by a small amount after 28 days. The amount of glass fiber used in concrete gives some positive effect on
the material's compressive strength, flexural strength, and splitting tensile strength. In the context of composite materials, glass fiber serves as a reinforcing agent due to its high strength, lightweight, and resistance to corrosion2. It's commonly used in various industries, including the marine industry, piping industries, and in the manufacturing of products like grouts, masonry products, cellular concrete, roofing tiles, and more.

I. OBJECTIVE:

1. To determine the suitability of constructional waste in the development of paver blocks
2. To evaluate the compressive strength of paver blocks.
3. Comparative Evaluation of Material Replacement.
4. Analysis of Cost Comparison of Paving Block with conventional block
5. To study of Comparison of Strength & weight of Paving Blocks

Conclusion :

- The utilization of waste materials in production of paver block has productive way of disposal of waste.
- Market paving block having cost of rs17 and paving block having is 15 Rs only
- Fly ash is polluted ingredient in the nature so used in the paving block to reduce the pollution in the area.
- The finishing, shape, interlocking and appearance of the paving block are good as compare to conventional paving block.
- As compare to the concrete paving block our paving block strength is lightly less but we can use this block in low traffic areas or where the intensity of traffic is less.

II. LITERATURE REVIEW:

1.1.Koli et al. (2016), Manufactured concrete paving block by using waste glass material. They investigated the density of concrete decreased with increase in waste glass content and making light weight concrete. The unit weigh of fine aggregate is also decreasing by use of waste glass content. Water absorption is also deceased with increase in waste glass content. A decrease in flexural strength can also be seen. Increase in compressive strength by increase in glass % from 15% to 30% glass replacement and after 45% glass replacement strength decreased. Due to internal voids strength reduced. A decease in cost of paver block is observed.

2.2. Joshi Rohit R. et al. (2015). A comparative study on compressive strength of blocks made by waste paper sludge as partial replacement of with cement, concluded that the mix proportion suitable for partial replacement of waste paper sludge is 5% to 10% strength obtained is 24.97% increased as compared to 20% & 30% replacement in 28 days. Water absorption increased by increasing waste paper sludge content. Weight of block also increased by 2.94% in waste paper sludge ratio 0% to 10% and weight decreasing 1.01% in waste paper sludge ratio 10% to 30%. Workability decreased by increase in waste paper sludge. Maximum use of waste paper sludge can be made with cement provides a solution to disposal of waste paper sludge and also helps in controlling harmful emission of pollutants by burning the waste paper.

III. METHODOLOGY

Step-1: Material Collection and Preparation:

Step-2: Experimental Design
Step-3 Paving Block Production.
Step-4: Testing and Analysis
Step-5: Environmental Impact Assessment.

IV. RESULTS

- As concrete is strong in compression, it is seen that the results of the proportions which taken are comparatively good against the proportion of conventional mix.After 28 days of curing, the compressive strength is 19.46 N/mm2
- The finishing, shape, interlocking and appearance of the paving block are good as compare to conventional paving block.
- As compare to the concrete paving block our paving block strength is lightly less but we can use this block in low traffic areas or where the intensity of traffic is less.
- We use these blocks in surrounding
the temples, garden areas, foot path etc

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Experimental Study of Concrete Canvas

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Abstract

The present generation has a huge demand for construction materials to follow different conventional methods. Due to a rapid increase in the materials widely used in construction, it also needs an enormous number of economical investments in materials. There is no provision for very rapid and emergency workable concrete installation methods. Worldwide, there is an increasing demand for construction and construction materials. Because of that, concrete is the most extensively used material in construction. These days, concrete is being used for so many purposes in different adverse conditions. Concrete has many advantages, but there is one drawback which is that it is not flexible when it is hardened. That's why a UK-based company introduced a solution called "Concrete Canvas" to overcome this drawback. It is hardened by hydration to form a thin, durable, waterproof, and low-carbon concrete layer. CC effectively worked to save time and money. CC is the most up- to-date fiber material in construction worldwide. CC is a flexible material. Due to this advantage, the use of CC is rapidly extended. The life span of the CC is 15 to 20 years. Countries like India import CC, which is costly because of differences in materials, the process of manufacturing, and taxes. So, we genuinely tried to prepare the CC using locally available materials, namely fibrous air mesh, artificial sand, and pozzolana portland cement (PPC). The materials used for the CC were dry mix as well as the 3-D matrix in the middle and an impermeable membrane at the bottom. Various tests such as permeability test, compressive strength test, and flexural strength tests were conducted on specimens. Although the required compressive strength is less than the actual compressive strength that has to be obtained after 28 days of curing, it is near the required value. But due to the difference in the cement content, the actual value of the compressive strength of the refereed specimen's mix is way more than the compressive strength of the preferred mix. But at last, the maximum flexural strength of the prepared CC is more in comparison with the referred specimen. Along with that, the success of the cost reduction has been seen in the end. This report expresses the theoretical, experimental, and analytical results of CC along with the comparative study of product performance based on the results and study of cost.

Keyword- ASTM, ACI, CAC, CC

I. INTRODUCTION:

We are in an age where is an increasing need for understanding and researching how things can be made more durable with ease and with speed. The textile industry is one of the fastest-growing industries in the world. The textile industry is one of the focused areas for research and development.

Since from a very long time the construction field is playing a very important role in the development of any country and it is a well-known fact that the concrete is the most commonly used construction material in a scenario in which we are working for a long time. But as the concrete is not flexible so it creates many difficulties in certain essential works in construction.

1. CONCRETE: AN INTEGRAL MATERIAL

Concrete is regarded as one of the most widely used materials in construction which in terms has increased the demand in the construction field. In this continuously expanding world, the demand for new construction techniques has been increased to complete the construction in less time with less cost and more effectively. The conventional method of concrete has raised some queries regarding the cost, flexibility of concrete, and whether it can be used in very rapid and emergency work. So, to overcome these problems of traditional concrete leads to the evolution of concrete canvas.

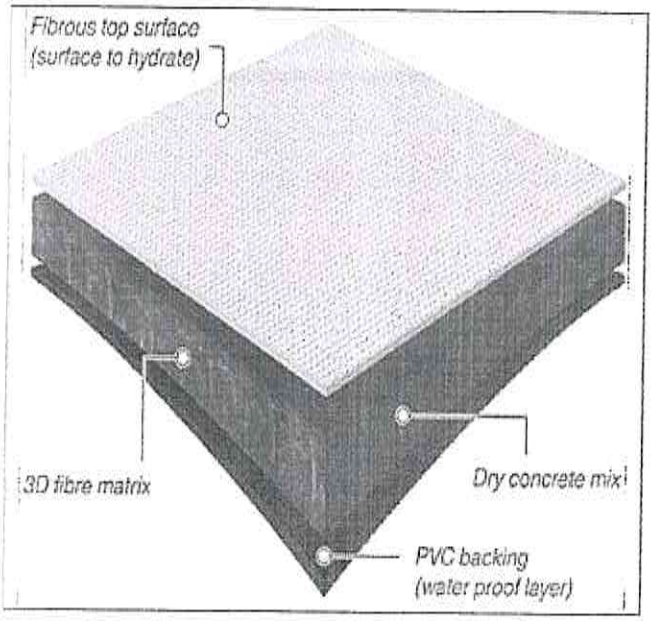
The main issue is that concrete loses its flexibility while it hardened. It loses its tensile strength. Now a day, composite material is being increasingly used because of their specific strength, flexibility, and stiffness and this can be altered easily by changing fiber orientation and some other property. Thus, the behavioral study of the composite flexible concrete sheet is important. The concrete sheet is an upcoming revolution in the field of civil engineering.

2. CONCRETE CANVAS:

In 2005, Peter Brewin and William Crawford from the United Kingdom developed a replacement material consisting of a special sort of material that makes it flexible and named it 'Engineered Cementitious Composite' (Concrete Canvas). This material possesses flexibility as compared the traditional concrete. Within the flexible concrete, the coarse aggregates are eliminated.

Concrete canvas includes a 3-D spacer fiber matrix containing a specifically formulated dry concrete mix. A polyvinyl chloride (PVC) backing on one floor of the cloth guarantees the cloth is absolutely water-evidence, at the identical time as hydrophilic fibers (polyethylene and polypropylene yarns) on the opposite surface resource hydration with the useful resource of drawing water into the aggregate. The material can be hydrated either by way of using spraying or by being immersed in water. It may be effortlessly nailed, stapled through, or covered with an adhesive for smooth attachment to

different surfaces. Once set, the fibers fortify the concrete, stopping crack propagation and imparting a secure plastic failure mode. Concrete canvas is to be had in three thicknesses; CC5, CC8, and CC13, which can be 5, 8, and 13 mm thick respectively



II. OBJECTIVE:

1. To prepare the prototype of concrete canvas.
2. To perform the tests on prototype of concrete canvas.
3. To compare the results and cost with conventional concrete canvas.

Conclusion :

- The maximum compressive strength of concrete canvas is obtained from the cement and sand mix of about 21 N/mm2 which is less in comparison with actually referred specimen.
- The maximum flexural strength of concrete canvas is obtained from the cement and sand mix of about 12.05 N/mm2 which is more in comparison with actually referred specimen.
- The PVC backing shows great stability against water penetration, so it serves concrete canvas as a layer that gives an extra advantage when used at sites.
- The approximate cost required to prepare 1 sq. m. concrete canvas of 8 mm thickness in India with locally available material is 1304/- only, meanwhile the actual price of referred specimen varies from Rs.3600/- to Rs 6890/-.

III. LITERATURE REVIEW:

Article No. 1 "Influences of geometric patterns of 3-D spacer fabric on tensile behavior of concrete canvas".

Published by and year:- Fangyu Han, Huisu Chen, etc. all; (2014). The designed formulation of dry cement powder for concrete canvas, which was expected to have both high mechanical strengths and short setting times, was obtained by partially replacing calcium sulfoaluminate cement (CSA). The influence of anhydrite fineness

on the mechanical properties of concrete canvas and its mechanical anisotropy were both investigated. Results revealed that increasing anhydrite content or fineness improves the mechanical strengths of concrete canvas and shortened its setting times.

2.2. Article No. 2 "Concrete Cloth".

Published by and year:- Narayanan V. Vedha; (2015). The author briefly narrated the history of the concrete canvas. He also gave the market availability of canvas with the help of data available on the internet.
According to data available he described the strength of concrete canvas in means of compression test (ASTM C473-07), 10-day compressive failure stress is 40 MPa; bending test (BS EN 12467:2004), 10-day bending failure stress 3.4 MPa, abrasion resistance (ASTM C1353-8) and tensile strength (DIN 52108).
Also given the method of hydration.

IV. METHODOLOGY

Step-1: Making of product with mix design by trial & error method.

Step-2: Conduction of laboratory testing on the product.

Step-3: Repetition of step 1 with different mix design.

Step-4: Actual placement of product on required site.

Step-5: Study of cost benefit ratio.

V. RESULTS

- As concrete is strong in compression, it is seen that the results of the proportions which taken are comparatively good against the proportion of conventional mix.After 28 days of curing, the compressive strength is 21 N/mm2
- From the flexural test results, it has been found that the material is not flexural rigid material and hence it has been concluded that it is an elastic material.
- After 28 days of curing, the flexural strength is 12.05 N/mm2 with 7.5 mm maximum displacement.
- The permeability test is conducted by simple observation by pouring water into the previously

mould PVC layer with a measuring jar underneath the mould. It is observed that no leakage of water takes place through the PVC backing layer.

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Road Safety Audit on National Highway 40 From Nandyal to Kurnool

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Abstract
India has a road network of an estimated 3.3 million km, which carries nearly 65 percent of freight and 85 percent of passenger traffic. The road traffic is estimated to be growing at an annual rate of 7-10 percent, while the vehicle population is growing at a rate of 12 percent per year. A Road Safety Audit (RSA) qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users. The Road Safety Audit consists of safety principles to the design of a new or a rehabilitated road section, to prevent frequent occurrence of accidents or to reduce their severity. In this project we have taken a stretch on NH-40 from Nandyal to Kurnool. Road safety audit is carried with the help of field survey reports on road merger or di- verger, road curves, truck or bus lay by, culverts, institutions, median, road intersections. This study follows MANUAL ON ROAD SAFETY AUDIT (IRC:SP:88-2010). The scope of study is to identify the accident prone areas, minimize accidents on the road and need for costly remedial work is reduce.
Keyword – RSA

INTRODUCTION

1.1 GENERAL

In todays world road and transport has become an integral part of every human being. Everybody is a road user in one shape or the other. The present transport system has minimized the distances but it has on the other hand increased the life risk. Every year road crashes result in loss of lakhs of lives and serious injuries to corers of people. In India itself about eighty thousand people are killed in road crashes every year which is thirteen per cent of the total fatality all over the world. The accident is of three types due to their effects or seriousness, fatal accident, injury and property damage only. Man behind the wheel plays an important role in most of the crashes.in most of the cases occur either due to carelessness or due to lack of road safety awareness of the road user. Hence, road safety education is as essential as any other basic skills of survival.

Road traffic safety refers to methods and measures for reducing the risk of a person using the road network being killed or seriously injured. The users of a road include pedestrians, cyclist, motorists, their passengers, and passengers of on road public transport, mainly buses and trains. Best- practice road safety strategies focus upon the prevention of serious injury and death crashes in spite of human fallibility. Safe road design is now about providing a road environment which ensures vehicle speeds will be within the human tolerances for degree of safety shall be ensured when transporting goods by road. It is of vital importance to monitor and validate the road transportation safety, including comprehensive checks on drivers, vehicle and safety processes. Road safety is a complex issue and there are a high number of factors and indicators involved in the accidents. The problem itself is underestimated in many countries, especially in developing countries where the issue is challenging.

In India transportation is heavily dependent on the road network. In 1990s, India was among the top nations with raising economics due to urbanisation. It has influenced in the rise of traffic volume on road. National highways of India are only 2% of the total road network but carries about 40 percent of the total road traffic. It influenced in increase of the total worlds vehicles and road accidents. Through, India has only 1% of the total worlds vehicle which accounts for 16% of the total worlds accidents deathson road traffic accidents which are

generally unintended and preventable are a common risk every day to life that can happen to almost every one, any- where. The problem of road traffic accident is increasingly becoming a threat to public health and national development in many developing countries. Road traffic accident contributes to poverty by causing deaths, injuries, disabilities, grief, loss of productivity and material damage.

Statistical projection show that during the period between 2000 and 2020, fatalities related to traffic accidents will decrease with about 30%in high income countries. The opposite pattern is expected in developing countries, where traffic accidents are expected to increase at a fast rate in the years to come. A study done in Calcutta India, Reported that there are some host (human) factors (such as the behaviour of drivers, pedestrians and cyclist behaviours) and seasonal factors (weather and time) that contribute to fatal road traffic accidents . Overall, most traffic accident occurred on main roads (highways) and in the majority of cases pedestrians were found to be at fault during crossing the road.

1.2 NEED OF STUDY

India has the second largest road network in the world with over 3 million km of roads in which 60% are paved. On the whole, the facilities for roads users are not up to the mark, leading to the high toll of the death victims. Road safety is emerging as a major social concern in the country in the country. The statistics are mind boggling with an average rate of 100,000 persons dying in road accidents.

According to the report, the number of road traffic deaths across the world was unacceptably high at 1.24 million per year and another 20 to 50 million sustain nonfatal injuries as a result of road traffic crashes. The report says that only 28 countries, representing 449 million people (7% of the worlds population), have adequate laws that address all five risk factors speed, driving under influence, helmets, seat belts and child restraints, India has poor record on all the above five fronts.

Following are some of the facts related to India:

1. 85% of all road accident deaths occur in developing countries and nearly half in the Asia-Pacific region.
2. India accounts for about10 percent of road accident fatalities.
3. An estimated 1,275,000 persons are grievously injured on the road every year. Social cost of annual accidents in India has been estimated at Rs.660000.
4. Professionalism in driver training is absent, proportion of untrained drivers is continually on the rise and a positive driving culture is lacking.

1.3 SCOPE OF STUDY

This study includes identification of the deficit of traffic signs/markings, geometrical deficit and other road accessories in the existing scenario of accident occurrence, and identify the need of speed regulation / alternate measures of traffic management to access the existing section with respect to the standard IRC/HCM. . Identification of the Black spot by using an accident data and prioritizing the hazardous zone for intervention

1.4 SUMMERY

This chapter contains small introduction about study, need of study, objective of study and scope of the work

OBJECTIVES

Identify engineering defects and suggests interventions. Identify and recommend facilities that can be used to extend medical support to accident victimes quickly as possible. Identify and evaluate how technology can be used to reduce road accidents.

CONCLUSION

Road and transportation has become an integral part of every human being. The tremendous growth of both road network and road traffic in India has minimized the distances but it has on the other hand increased the life risk. This accident situation in general is serious. From the study carried out in the Nandyal to kurnool on NH-

40 for road safety audit, the following conclusion are summarized after carrying out different surveys and physical observations ofthe situations pertaining to the different typical conditions and completing the detailed analysis as shown in above chapters

From this study we have collected required data of study area. We have given some suggestions regarding to discrepancies from the accident data

- fatality is 20% of the total accidents .
- grievous injury is 29.9% of the total accidents.
- minor injury is 50% of the total accidents .
- motor cycles ,autos, cars are mostly involved in the accidents.
- motor cycles involved 25% of total accidents.
- autos involved 22% of total accidents.
- cars involved 22% of total accidents.
- buses and trucks are involved 7% of accidents in each of total accidents.
- heavy trucks involved in 10% of total accidents.
- tractors involved in 4% of total accidents.
- bicycles involved in 3% of total accidents.
- the maximum accidents involved in 2016.
- the minimum accidents involved in 2012.
- the age limit for the maximum accidents is 30-34

LITERATURE REVIEW

1.1 GENERAL

Review of literature is important in any research work. Many researchers have carried out research work in the area of road accidents and safety. Some of them have analysed accident data in different ways. Some of them have done Identification of Black spot zones. Some of them have worked on Road safety audit and proposed strategies for road safety. In the present chapter literature review is carried out covering the different issues related to the road safety.

1.2 REVIEW OF RESEARCH PAPERS

Some of the literature in which analysis of accident data has been carried out and suggestions for road safety is given is briefly discussed here. They found some conclusion due to their research work.

Parikh V. and Dr. Jain A.M. (2014) has carried out a Road Safety Audit: Develop- ment of an accident model for Urban area on Narol-Naroda National Highway of Ahmedabad city and developed an accident model for urban area. The paper is having a main two goals, first is to carry out a road safety audit on a selected corridor of urban area and second is to develop an accident model taking time of accident as a main parameter. To achieve both of the goal- Accident data, Classified Volume count survey, spot speed survey, Road Inventory Survey has been carried out and remedial measures are given for the corridor. The linear regression model is developed, for that total accidents, fatal accidents, major accidents and minor accidents are considered as dependent variable and accidents per month respected to time is considered as independent variables. After conducting Road Safety Audit they have concluded that there is a deficiency in geometric design of corridor, absence of traffic police, not working traffic signal, unauthorized parking at intersection. Based on accident data majority of accidents occurred at the Narol circle, Isanpur, Ghodasae, C.T.M and

Expressway cross road. There are no traffic signals provided at any those five intersections, no provision of service lane and parking lane from Ghodasar to Jasodanagar road. The heavy volume of auto is parked at narol circle, Insanpur intersection and expressway Tran Rasta, this reduction in the available road space for the through traffic congestion and ultimately leads to accidents at various critical locations. There is a need of tapering at entrance of service lane.

A. Shalon Hakkert and Victoria Gitelman (2014) has done survey on Thinking about the history of road safety research: Past achievements and future challenges in this they have done survey on the

development in road safety thinking and road safety research over the last century. This paper is giving the details about general evolution of safety thinking as it ap- plied to road user behaviour, vehicle and road design. From a historical consideration, a major change observed more recently both in road safety research and in road safety activities con- cerns the emphasis shift from segmented research focused on single areas such as the driver, the vehicle and the road, towards a systems view. Moreover examining various developments that have occurred over years regarding road user behaviour, vehicle design and infrastructure,a clos interrelation between road safety research abilities and road safety interventions applied can be observed. In terms of future research, a shift in modality towards more vulnerable road users and their needs, more attention to safety implications of denser cities, greater use of public transport, inter-modality and coordination between the spatial development and the transportation system, can be foreseen.

Joshua Reid Jones et. Al. (2013) presented the result of field data collection con- ducted by the Utah Local Technical Assistance Program (Utah LTAP) in conjunction with the Utah Department of Transportation. The first step of the research was data collection from 18 road safety audits conducted throughout the state of Utah. The purpose of this research was to provide quantification to the RSA process that would increase the benefits gained from implementing the RSA recommendations. Benefits derived from the implementation of RSA recommendations were found by assessing the change of risk from before and after safety improvements. The RSA quantification tool was developed to analyse projects in both urban and rural settings. The tool showed the different project alternatives. The quantification tool will be able to analyse the potential risk during the field observation and after the safety recom- mendations are made. This paper proposes a seven category decision making tool that can help quantify the potential risk observed on the roadway into a number that can be analysed. The result shows that all of the categories having potential risk reductions after the safety recom- mendations were made. The categories with the most reduction were centred on low cost safety improvements of maintenance and sign improvements. The tool will help decision makers in targeting areas of the roadway that showed high risk.

Mario De Luca et. Al. (2012) has proposed a procedure to identify these black spots. Four different road sections were selected in Southern Italy for the study. For each road section the accident data since 2004 to 2008 were collected.

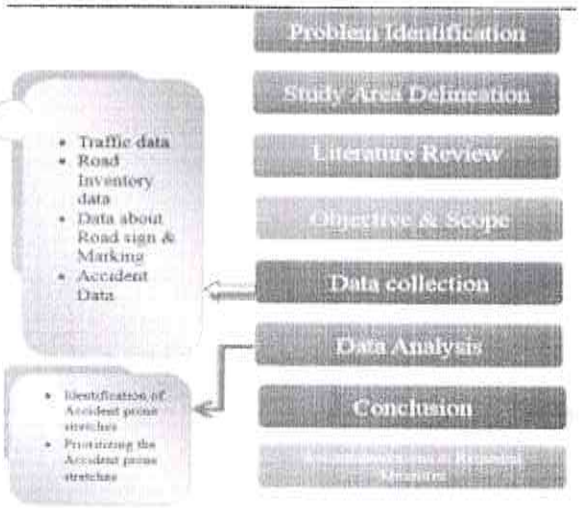
The good statistical fitting between the estimated parameters and those surveys confirms the validity of the models and, at the same time, their reliability to define road safety improvements. The procedure described has provided important clues to identify the Hazardous areas due to poor coordination of the track. The results have shown that the procedure also works on segment other than those on which has been obtained models (1) and (2). Developed model can be used to analyse more segments and to identify priority area of intervention

Thomas F. Golob et. Al. (2004) has developed a tool, called FITS (Flow Impacts on Traffic Safety) which can be used to assess the changes in traffic safety tendencies that result from changes in traffic flow. The tool use data from single inductive loop detectors, converting 30-second observation of volume and occupancy for multiple freeway lanes into flow regimes. Each regime has a specific pattern of crash types, which were determined through nonlinear multivariate of over 1,000 crashes on freeways in Southern California. This research may provide the foundation to forecast the crash rates, in terms of vehicle miles of travel, for vehicle that are exposed to different traffic flow conditions. Data covers that occurs in six major freeway routes in Orange county, California, during calendar year 1998 which were drawn from the Traffic Accident Surveillance and Analysis System (TASAS) database which covers all police- reported crashes on the California State Highways System. Other applications might be compare the same section of roadway during different time periods or under different weather/lighting condition. FITS applies only to urban freeways with at least three lanes in each directions but validation has not yet been conducted, so we cannot confirm the degree of spatial transferability. FITS provides information as to which types of crashes are more likely under different types of traffic flow, but does not forecast crash rates.

METHODOLOGY

The completion of any work needs planning before starting a work. The methodology of work is part of that planning phase and that is why it is necessary to develop methodology of work. It covers the whole work which is going to be carried out for the completion of thesis. The first step in methodology is to identify the problems; it covers the subject of work. The next is literature review, in this step the previous years works on that subject are collected and has been studied carefully. The third step is to select stud area for implementing thought of work and it should be suitable for the objective. After the selection of study area the work should be decided. For achieving that goal the data collection and data analysis is carried out. Once the data analysed, on the bases of analysis results some remedial measure for road safety is going to be suggested. Last step is to give conclusion of this work done. Complete flowchart of each activity showing various stages involved is shown in Fig.

RESULT



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Climatic Impact on Water Resources

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Abstract: **Climate change has emerged as a critical factor influencing the availability, distribution, and quality of global water resources. This project investigates the relationship between climatic variables such as temperature, precipitation, and extreme weather events—and their impacts on surface and groundwater systems. Using historical climate data and water resource records from selected regions, the study identifies significant trends in rainfall variability, river discharge rates, and groundwater levels. Using historical climate data, hydrological modeling, and case studies, the study analyzes regional vulnerabilities and potential future scenarios. The findings highlight the urgent need for adaptive water resource management strategies to ensure sustainability, resilience, and equitable access in the face of climate variability. This research underscores the importance of integrating climate science into water policy and infrastructure planning. This project studies how changes in climate, like rising temperatures and changing rainfall patterns, affect water resources such as rivers, lakes, and groundwater. It explains how climate change can lead to water shortages, floods, and changes in water quality. The goal is to understand these effects and suggest ways to manage water resources better for the future. Climate change poses significant challenges to global water resources, affecting their availability, quality, and distribution. This project investigates the relationship between climatic variables such as temperature rise, altered precipitation patterns, and extreme weather events and their impact on surface and groundwater systems. It explores how these changes influence hydrological cycles, water supply for agriculture, industry, and domestic use, and the risk of water scarcity and floods. By analyzing data trends and case studies, the project aims to highlight the urgency of adaptive water management strategies and sustainable resource planning in the face of a changing climate.**

Keywords: **Climatic change, water resources.**

1. Introduction

Water is one of the most essential natural resources for life, agriculture, industry, and ecosystem balance. However, its availability and quality are increasingly threatened by the effects of climate change. Over the past few decades, significant changes in temperature, precipitation patterns, and the frequency of extreme weather events have disrupted hydrological cycles worldwide. These disruptions have led to altered river flows, shrinking glaciers, reduced groundwater recharge, and more frequent occurrences of droughts and floods. Understanding the climatic impact on water resources is crucial for developing sustainable water management practices and ensuring long-term water security. This project aims to analyze the extent to which climatic factors influence water resource availability and behavior. By examining historical climate and hydrological data, and reviewing current scientific literature, this study seeks to identify key trends and patterns that highlight the vulnerability of water systems to climatic changes. The objective is to inform policy recommendations and adaptive strategies that can help mitigate risks and promote sustainable water use in the face of a changing climate.

2. Future Scope

The study of climatic impacts on water resources opens several avenues for future research and practical implementation. The future scope of the project "Climatic Impact on Water Resources" is both vast and critical, considering the growing concerns around climate change and water security. As global temperatures continue to rise, this project can be expanded to include predictive modeling using advanced climate and hydrological data to forecast long-term changes in water availability. It can also explore regional and seasonal variations in climate impact, aiding in the development of localized water management strategies. The integration of remote sensing and GIS technologies can enhance the accuracy of watershed analysis and drought/flood prediction.

1. Advanced Modeling and Forecasting
2. Regional and Micro-Scale Studies
3. Integration with GIS and Remote Sensing
4. Climate-Resilient Infrastructure Planning
5. Policy and Decision Support Tools
6. Community Engagement and Education
7. Interdisciplinary Approaches

3. Objectives

1. To analyze the relationship between key climatic factors (e.g., temperature, rainfall, and extreme weather events) and water resource availability.
2. To assess the impact of climate variability on surface water and groundwater levels over a defined time period.
3. To identify trends and patterns in hydrological changes linked to climate change using historical data.
4. To evaluate the potential risks posed by climate change on regional water security and sustainability.

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5. To recommend adaptive strategies and policy measures for effective water resource management under changing climatic conditions.

4. Necessity of the Project

Understanding the impact of climate change on water resources has become increasingly critical due to growing concerns over water scarcity, extreme weather events, and unsustainable water use. As global temperatures rise and weather patterns become more unpredictable, the availability and quality of freshwater are being significantly threatened. This project is necessary to:

- Address Water Security Challenges
- Support Policy and Planning
- Promote Sustainable Resource Management
- Raise Awareness and Build Resilience
- Encourage Scientific and Technological Innovation

5. Methodology

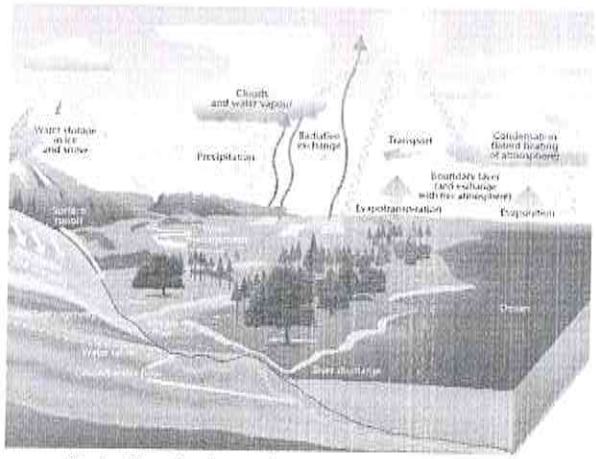

Fig. 1. Climatic changes in water resources (water cycle)

The methodology for this project involves a multi-step approach combining data collection, analysis, and interpretation to assess the climatic impact on water resources. The methodology for the project "*Climatic Impact on Water Resources*" involves a comprehensive approach combining data collection, analysis, and modeling. Firstly, historical climatic data such as temperature, precipitation, and humidity will be gathered from meteorological departments and satellite sources. Simultaneously, hydrological data including river flow, groundwater levels, and reservoir capacities will be collected from water resource management authorities. The study area will be selected based on climatic vulnerability and water resource dependency.

1. Problem Definition
2. Data Collection
3. Data Preprocessing
4. Trend and Correlation Analysis
5. Hydrological Modeling (if applicable)
6. Visualization and Interpretation
7. Conclusion and Recommendations

6. Conclusion

This project highlights the significant influence of climate change on water resources, emphasizing the growing challenges posed by changing temperature patterns, altered precipitation cycles, and the increasing frequency of extreme weather events. The analysis demonstrates that climate variability directly affects both the quantity and quality of water available for agricultural, industrial, and domestic use. It underscores the urgent need for adaptive strategies in water resource management, including better forecasting systems, sustainable usage practices, and climate-resilient infrastructure. By understanding these climatic impacts, stakeholders can make informed decisions that promote long-term water security. The study serves as a foundation for further research and policy development aimed at mitigating the risks and enhancing the resilience of water systems in a changing climate.

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"STUDY ON FIBER REINFORCED CONCRETE WITH M SAND"

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Abstract

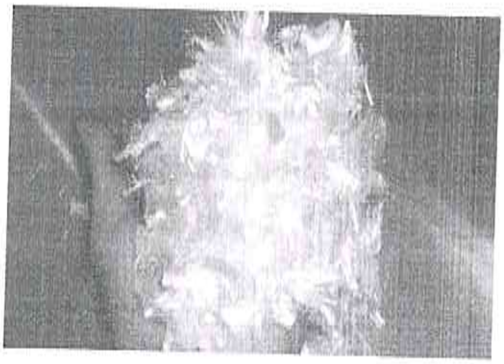
Monofilament fibers have emerged as a promising additive for concrete, offering significant improvements in strength, durability, and resistance to cracking and degradation. The primary Objective of this research is to provides an overview of the properties and applications of monofilament fibers in concrete, highlighting their benefits and potential uses. The effects of monofilament fibers on concrete's mechanical properties, such as tensile strength, flexural strength, and impact resistance, are discussed. Additionally, the research explores the role of monofilament fibers in reducing shrinkage cracking, improving thermal cracking resistance, and enhancing fatigue performance. Sustainability of concrete is affected by cracks which are proved to be detrimental for durability properties they tend to propagate under the influence of loads and result in entry of aggressive agents from surrounding environment. Monofilament fiber in concrete act as crack arrester along with altering the fresh and hardened properties due to improper packing and dispersion issues which has adverse effect on concrete.Finally, the abstract highlights the significance of continued research and development in this field to unlock the full potential of monofilament fibers in advancing the performance and sustainability of concrete structures.

INTRODUCTION:

Concrete is one of the most versatile building materials. The advantages of using concrete include high compressive strength, good fire resistance, high water resistance, low maintenance, and long service life. The disadvantages of using concrete include poor tensile strength, low strain of fracture and formwork requirement. The major disadvantage is that concrete develops micro cracks during curing. Hence fibers are added to concrete to overcome these disadvantages. Monofilament fibers is a type of synthetic fibers used in concrete to improve its strength, durability, and resistance to cracking. Here are some benefits and characteristics of using monofilament fibers in concrete.

Purpose of research work: The purpose of research on making concrete using monofilament concrete could be to explore its potential benefits, such as increased tensile strength, crack resistance, and durability compared to traditional concrete. Researchers might be investigating how the addition of monofilament fibers affects various properties of concrete and its performance .

Role of fiber: Polypropylene fibers hinder the generation and propagation of micro-cracks in concrete. It plays the role of supporting aggregate. And its effect is to prevent the settlement of the coarse and fine aggregate. That is the coarse aggregate sinks first. and then the fine bone material. Meanwhile, polypropylene fibers can also reduce water precipitation on the concrete surface



OBJECTIVE:

1.To study the mechanical properties and durability of FRC.
2.To examine FRC resistance to cracking,shrinkage and impact.
3.To assess FRC suitability for construction application.

LITERATURE REVIEW:

Kolli Ramujee (2013)

The interest in the use of fibers for the reinforcement of composites has increased during the last several years. A combination of high strength, stiffness and thermal favorably characterizes the fibers. In this study, the results of the Strength properties of Monofilament reinforced concrete have been presented. The compressive strength, splitting tensile strength of concrete samples made with different fibers amssounts varies from 0%, 0.5%, 1%, 1.5% and 2.0% were studied. The samples with added Polypropylene fibers of 1.5 % showed better results in comparison with the others.

Milind V. Mohad (2015)

This paper presents an experimental study on performance of Monofilament fiber reinforced concrete. In this study deals with the effects of addition of various proportions of polypropylene fibers on the properties of High strength concrete (M30and M40 mixes). An experimental program was carried out to explore its effects on compressive, tensile, flexural strength under different curing condition. The main aim of the investigation program is to study the effect of Monofilament fiber mix by varying content such as 0%, 0.5%, 1%, 1.5% & 2% and finding the optimum Monofilament fiber content. A notable increase in the compressive, tensile and flexural strength was observed. However, further investigations were highly recommended And should be carried out to understand more mechanical properties of fiber reinforced concrete.

METHODOLOGY:

Step 1-Design the concrete mix by recommended standards or established procedures.
Step 2- Measure all materials accurately using the weighing balance.
Step 3- Thoroughly mix the dry ingredients in a clean mixer. Gradually add water while mixing to achieve a uniform and workable concrete mix.
Step 4- Casting Specimens.
Step 5-Curing should be done.
Step 6- Carefully remove the specimens from the molds after 24 hours.
Step 7- Compressive Strength Testing.

Conclusion:

Using monofilament fibers in structural concrete offers several advantages. Firstly, they enhance the toughness and durability of concrete by reducing cracking and controlling crack widths. This helps in improving the overall performance and longevity of the concrete structure. Secondly, monofilament fibers can also improve the impact resistance of concrete, making it more suitable for applications where impact loading is a concern. Additionally, monofilament fibers can provide better resistance to shrinkage cracking, which is particularly beneficial in large concrete pours or in situations where drying shrinkage is a concern. Overall, the use of monofilament fibers in structural concrete can result in more robust and durable structures with improved mechanical properties and enhanced durability. However, it's essential to carefully consider the specific requirements of each project and consult with structural engineers to determine the most suitable fiber type, dosage, and mix design for optimal performance.

RESULTS:

In this study the value of compressive strength for different replacement of Monofilament fiber (0.5%, 0.75%, and 1%) at the end of the curing periods (7 days, and 28 days) are given in the above table.. This shows the variation of compressive strength with Monofilament fiber replacement at different curing ages respectively. The compressive strength at 0.75% Monofilament fiber replacement is satisfying. While the 1% replacement of Monofilament fiber does not fulfill the requirements.

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"LOW WEIGHT SUSTAINABLE CONCRETE WITH BAGASSE ASH"

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Abstract

The construction industry faces significant challenges due to the environmental impact of cement production, which contributes to high CO_2 emissions and the depletion of natural resources. This project investigates the development of low-weight, sustainable concrete by partially replacing Portland Pozzolana Cement (PPC) with Sugarcane Bagasse Ash (SCBA), a waste by-product of the sugar industry. SCBA, rich in silica and alumina, exhibits pozzolanic properties, making it a promising supplementary cementitious material.

Sugarcane bagasse is the fibrous residue left after the extraction of juice from sugarcane. This byproduct is often disposed of through burning, which generates ash (SCBA). SCBA contains a high proportion of silica, alumina, and other minerals that exhibit pozzolanic properties, making it a suitable candidate for replacing cement in concrete. As environmental concerns regarding waste disposal and resource utilization grow, SCBA offers a potential solution to both problems. Not only does it reduce the reliance on PPC, but it also helps mitigate the environmental pollution associated with sugarcane processing.

In this study, concrete mixes were prepared by replacing PPC with SCBA at different percentages (10%, and 20% by weight) and incorporating lightweight aggregates such as pumice and expanded clay to reduce the overall density of the concrete. The mixes were evaluated for key properties including workability, compressive strength, density, and water absorption.

The results showed that SCBA positively impacted the mechanical properties of the concrete up to 10% replacement, with an improvement in compressive strength and durability. The use of lightweight aggregates effectively reduced the density of the concrete, making it suitable for non-load-bearing structures and applications where weight reduction is crucial. However, beyond 15% SCBA replacement, a slight decline in strength was observed, suggesting an optimal replacement percentage of 10%.

This project demonstrates that the use of SCBA in concrete not only helps in the sustainable disposal of agricultural waste but also contributes to reducing the environmental impact of cement production. The findings highlight a feasible and cost-effective approach to producing eco-friendly concrete, offering a balance between strength, weight reduction, and sustainability for future construction applications.

Keyword- PPC, SCBA

I. INTRODUCTION:

1.1 Concept of light weight concrete-

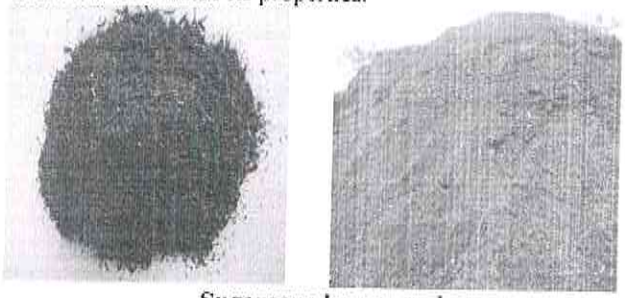
Lightweight concrete is a special type of concrete that has a lower density compared to conventional concrete. Typically, its density ranges from 300 to 2000 kg/m³, whereas normal concrete has a density of around 2400 kg/m³. This reduction in weight is achieved by using lightweight aggregates such as pumice, expanded clay, vermiculite, or by incorporating air through foaming agents or air-entraining admixtures. One of the emerging sustainable alternatives is the use of agricultural waste materials like Sugarcane Bagasse Ash (SCBA), which not only helps in reducing the weight but also promotes eco-friendly construction practices.

The main advantages of lightweight concrete include reduced dead load on structures, improved thermal and acoustic insulation, better fire resistance, and easier handling during transportation and construction. It is particularly useful in high-rise buildings, precast structures, roof insulation, and non-load-bearing walls. Despite being lighter, careful mix design and proper selection of materials can result in satisfactory compressive strength for various structural and non-structural applications. The use of SCBA as a partial cement replacement further enhances its sustainability by utilizing industrial waste and reducing the overall carbon footprint of construction. Lightweight concrete is thus an innovative and practical solution for modern, sustainable building projects.

1.2 Concept of Sugarcane bagasse ash-

Sugarcane bagasse ash is a byproduct of burning sugarcane bagasse in power plants or industrial processes. It contains silica and alumina, making it a pozzolanic material that can react with calcium hydroxide to form cementitious compounds. As a supplementary cementitious material, sugarcane bagasse ash can be used in concrete production, reducing the amount of cement required and promoting sustainable construction practices. This can lead to cost savings, improved durability, and reduced environmental impact.

Utilizing sugarcane bagasse ash in construction also helps :duce waste and promotes a more circular economy. However, its properties can vary depending on the source and processing conditions, and it may require processing and treatment to enhance its properties.



Sugarcane bagasse ash

1.3 Sugarcane bagasse ash

The construction industry is a leading consumer of natural resources and a major contributor to global environmental concerns, particularly due to the widespread use of cement in concrete production. Cement production alone accounts for approximately 8% of global CO_2 emissions, leading to an urgent need for sustainable solutions to reduce the environmental footprint of construction materials. As part of the global effort to develop more sustainable building materials, the construction industry is increasingly turning towards agro-industrial by-products as partial substitutes for traditional cement. Among these, Sugarcane Bagasse Ash (SCBA), a by-product of the sugar industry, has emerged as a promising material due to its pozzolanic properties, making it an ideal candidate for cement replacement in concrete. Sugarcane is one of the most widely grown crops globally, with India and Brazil being the largest producers. The sugar industry generates significant amounts of waste, with Sugarcane Bagasse (the fibrous residue left after juice extraction) accounting for about 30% of the sugarcane mass.

While a portion of this bagasse is used for energy generation, a large amount is discarded, contributing to environmental pollution. The controlled combustion of bagasse results in Sugarcane Bagasse Ash (SCBA), which contains high levels of reactive silica, making it a valuable resource for enhancing concrete properties when used as a partial substitute for cement. SCBA not only provides a sustainable solution to manage this agricultural waste but also helps reduce the carbon footprint associated with cement production.

In addition to the environmental benefits of utilizing SCBA, another critical aspect of sustainable concrete is reducing its weight, particularly for applications that require non-load-bearing or lightweight structures. This is especially crucial for the construction of high-rise buildings, precast concrete elements, and structures in seismic zones where lower density materials are preferred. Lightweight aggregates such as pumice, expanded clay, or perlite can be incorporated into the concrete mix to reduce the overall weight without compromising its structural integrity. By replacing a portion of conventional cement with SCBA and using lightweight aggregates, this project aims to develop a form of concrete that is both environmentally friendly and structurally efficient.

This research investigates the use of SCBA as a partial replacement for cement in lightweight concrete mixes. The study explores various replacement percentages, such as 10%, and 20%, and their effects on the compressive strength, density, durability, and workability of the concrete. The project also examines the use of lightweight aggregates to further reduce the weight of the concrete while maintaining its strength and durability. The overall goal is to find the optimal mix that strikes a balance between strength, sustainability, and reduced weight.

The significance of this research lies in its potential to contribute to the development of more sustainable, cost-effective, and eco-friendly construction materials. By utilizing industrial and agricultural waste, this approach not only helps in reducing environmental pollution but also provides a viable solution to the growing demand for concrete in the construction industry, all while reducing the reliance on conventional cement production. The use of SCBA in concrete not only supports the circular economy by reusing waste materials but also contributes to the overall reduction in CO_2 emissions associated with concrete production.

Through this work, we aim to demonstrate how agro-industrial by-products like SCBA can play a key role in advancing sustainable construction practices.

1.4 Sugarcane Bagasse Ash (SCBA)

A by-product of the sugar industry, is gaining recognition as a viable substitute for cement. SCBA is produced by the controlled combustion of sugarcane bagasse, the fibrous residue left after the extraction of juice from sugarcane. With global sugarcane production exceeding 1.5 billion tons annually, the volume of bagasse ash

produced is significant, and its disposal presents an environmental challenge. SCBA is rich in reactive silica, which imparts pozzolanic properties to the ash, making it an ideal material to replace cement in concrete. Using SCBA not only addresses waste disposal issues but also contributes to lowering the carbon emissions associated with cement production.

In addition to reducing the carbon footprint, lightweight concrete has gained increasing importance in construction, especially in high-rise buildings, precast elements, and in earthquake-prone regions where reduced structural weight is desirable. The use of lightweight aggregates such as pumice, expanded clay, or perlite can significantly reduce the density of concrete without compromising its strength. When combined with SCBA as a cement replacement, lightweight aggregates can further enhance the sustainability and performance of concrete, making it both eco-friendly and structurally efficient.

Beyond environmental benefits, SCBA also contributes to improving the durability and performance of concrete. Several studies have shown that concrete containing SCBA exhibits enhanced properties such as increased compressive strength, water tightness, and resistance to aggressive environmental factors. As SCBA can replace cement in varying proportions, its incorporation provides flexibility in concrete mix design, allowing for tailored solutions to meet specific performance criteria.

The global production of sugarcane, particularly in countries like India, Brazil, and China, continues to rise, leading to increasing amounts of SCBA waste. In India alone, the sugar industry produces approximately 10 million tons of SCBA each year, much of which is left unutilized. As a result, finding viable uses for SCBA has become a priority, both to manage waste and reduce environmental pollution. The use of SCBA as a partial replacement for cement presents an effective solution, not only promoting the circular economy but also advancing sustainable construction practices.

The objective of this research is to investigate the feasibility of producing lightweight concrete by incorporating SCBA as a partial replacement for cement and introducing lightweight aggregates. The study aims to evaluate the effects of different SCBA replacement percentages on the compressive strength, workability, and durability of the concrete. By developing an optimal mix design, this research seeks to balance the benefits of reduced weight, enhanced sustainability, and improved performance, contributing to the broader goal of creating more environmentally friendly and resource-efficient construction materials.

Moreover, the global demand for concrete continues to increase, driven by the rapid pace of urbanization and infrastructure development. As a result, the use of alternative materials such as SCBA is becoming an essential strategy to ensure the availability of sustainable construction materials while minimizing the impact of concrete production on the environment. This research highlights the potential of agro-industrial waste, specifically SCBA, to help reduce the consumption of natural resources, lower CO_2 emissions, and contribute to the development of sustainable, low-carbon concrete.

1.5 Scope of the work-

The of the present work is to carry out a detailed analysis of the following sub-systems for the prescribed conditions

1. Concrete mix design for M35grade of concrete
2. Casting of concrete cubes of M35 grade of concrete with different percentages of Sugarcane Bagasse Ash (10%,20%)
3. Cubes are subjected to normal & Hcl curing.
4. Testing of specimens at various ages.
5. Plotting graphs and comparing the compressive strengths of sugarcane bagasse ash blended concrete cubes in normal and HCl curing.

OBJECTIVE

- To analyze PPC concrete for workability, setting time and mechanical property of concrete.
- To analyze the effects of SBCA on the workability, setting time and mechanical properties of concrete.
- To make low weight sustainable concrete.

CONCLUSION

The use of SCBA as partial cement replacement in lightweight concrete proved effective, achieving reduced self-weight and sustainable use of agricultural waste.

SCBA can be effectively used as a partial replacement for cement up to an optimal percentage (typically 10–20%) without significantly compromising the compressive strength of concrete.

The incorporation of SCBA contributed to the reduction in density, thereby producing lightweight concrete suitable for non-structural and low-load bearing applications.

SCBA, being a pozzolanic material, improved the long-term strength and durability characteristics due to the continued hydration process.

The use of SCBA in concrete promotes sustainable construction practices by reducing the dependency on Portland cement, lowering CO_2 emissions, and providing a value-added use for agricultural waste.

Overall, SCBA-based lightweight concrete offers a cost-effective and eco-friendly alternative for conventional concrete in appropriate applications

LITERATURE REVIEW

ENGINEERING SCIENCE AND TECHNOLOGY INTERNATIONAL RESEARCH JOURNAL, VOL.3, NO.3, SEP, 2019

Department of Civil Engineering Mehran University of Engineering and Technology Jamshoro 4Department of Civil Engineering Hyderabad College of Science & Technology Hyderabad

This experimental study explores the use of Sugarcane Bagasse Ash (SCBA) as a partial replacement for fine aggregate in concrete to reduce costs. SCBA was substituted at 0%, 10%, 20%, 30%, and 40% by dry weight of fine aggregates. A total of 60 concrete cylinders (1:2:4 mix, 0.50 water-cement ratio) were cured for 7 and 28 days and tested using a Universal Testing Machine (UTM). Results showed a decrease in slump value with increased SCBA content. The compressive and tensile strength of concrete improved by 7.90% and 14% respectively at 10% SCBA replacement after 28 days, demonstrating its potential as an effective partial replacement

material.

2.1 Sajjad Ali Mangi1 , Jamaluddin N1 , Wan Ibrahim M H1 , AbdHalid Abdullah1 , A S M Abdul Awal1 , Samiullah Sohu1 and Nizakat Ali2 1 Jamilus Research Centre, Faculty of Civil and Environmental Engineering, UniversitiTun Hussein Onn Malaysia, 86400 BatuPahat, Johor, Malaysia

This study examines the suitability of Sugarcane Bagasse Ash (SCBA) as a partial cement replacement in M15 and M20 concrete mixes. SCBA was substituted at 0%, 5%, and 10% by weight, and cylindrical specimens (150 mm × 300 mm) were tested after 7, 14, and 28 days. Results showed that incorporating SCBA increased compressive strength, with M20 concrete achieving a 12% strength gain at 5% SCBA replacement. The findings suggest that 5% SCBA replacement is optimal for strength enhancement while also improving concrete workability.

2.2 INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal Yuvraj Rathaur, "Yashshukla, Arpita Yadav, Anand Bhatt U. G. Student, U.G. Student, U.G. Student Assistant Professor Department Of Civil Engineering. Axis Institute Of Technology and Management, Rooma Kanpur, India 1. Bangar Sayali S. et al. (2017) [1]

Bagasse ash was sieved through a 150-micron sieve, and the passing fraction was used as a partial cement replacement in ratios of 2%, 4%, 6%, 8%, and 10% by weight. Ordinary Portland Cement (OPC) 53 grade was used. The study analyzed workability for fresh concrete and compressive strength at 7 and 28 days. Findings showed that replacing cement with SCBA improved strength while reducing cement consumption. The study concluded that SCBA is best utilized as a cement additive rather than landfill waste.

2.3 Lathamaheswari et al. (2017) [2]

Cement was replaced with SCBA in percentages of 2.5%, 5.0%, 7.5%, 10%, and 12.5%. Workability was not significantly affected by the increase in SCB replacement. The optimal replacement level for compressive and tensile strength as found to be 10%. Flexural strength increased at 12.5% SCBA replacement. The study concluded that SCBA can effectively replace cement up to 10% without compromising concrete properties.

METHODOLOGY

1.Material used for the research-

Cement. The ordinary Portland cement (ASTM C150 Type-I) was used in this research to prepare the control specimens.

Fine aggregate. Fine aggregate (commonly known as hill sand) free from debris were brought from nearby having 2.61 of specific gravity and size below 4.75 mm were used.

Coarse Aggregate. Coarse aggregate, commonly known as crushed aggregates, was also sourced locally. It had a specific gravity of 2.65 and a nominal maximum size of 20 mm.

Water. Palatable water available within the campus laboratory was used for mixing and curing the concrete cylinders.

Sugarcane Bagasse Ash.

2.Casting of specimen

For the experimental analysis, a total of 36 concrete specimens were cast . Each specimen was cylindrical in shape, with a diameter of 150 mm and a length of 300 mm. Concrete mixes were prepared according to the grades specified. The concrete cylinders were then cured for 7, 14, and 28 days. During the preparation of the concrete cylinders, the slump test was conducted for each grade of NSC and after replacing SCBA in the concrete.

3. Results and discussion

1.Slump test

2.Compressive strength of concrete

RESULTS

- A gradual decrease in compressive strength was observed with increasing SCBA content for 20-day curing periods.
- Despite this reduction, mixes with up to 10% and 20% SCBA replacement (M20) maintained a 20-day strength of 13 MPa, which is structurally sufficient for many general construction applications.
- The M20 mixes strike a practical balance between strength and sustainability, offering reduced cement usage while still achieving reliable compressive performance.
- The results support the feasibility of using SCBA as a supplementary cementitious material in lightweight sustainable concrete production, contributing to eco-friendly construction practices.
- Thus, SCBA can be recommended up to 10% and 20% replacement in concrete mix designs aimed at sustainability without significantly compromising compressive strength

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Lifting Trolley for Easy Mounting

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Abstract : Hydraulic Trolley is the device used or carrying load or to transport the material from one point to another. For different types of application various types of trollies are available in the market. Depending upon the specific use the one will select the trolley, but it is limited to do a specific work. To overcome this problem, a new trolley was designed which could be used for multi-purpose. There are many types of trolley available in the market for various fields like airport, shopping malls, industries, hospitals etc. to carry the heavy or light loads. This paper contains the development of trolley, which includes design on the basis of creativity skills and fabrication, which can be used for more than one type of task. The trolley designed is the integration of airport trolley and shopping mall trolley. One more advantageous feature added to the design was a motorized wheel which reduces the human effort for carrying of load and also it can be operated manually if required.

Index Terms **– Hydraulic, Trolley, Lift.**

I. INTRODUCTION

The structure of this thesis is planned as follows: in the first part, the theory is presented. It consists of several topics concerning overall of lifting tables of scissors type, things that are needed for the design, principles of working, technical characterization and others.

The first part is needed to give a general concept of the subject and after that comes the practical part which presents and explains how to perform the knowledge. It contains the 3D model of the lift, calculations of the load, several diagrams, charts, and stress calculations, which confirm the viability and validity of the theory part.

Such a thesis structure was chosen as the most appropriate and suitable for the chosen topic. It allows increasing knowledge by appealing to the literature and adding an individuality of the author by making him solve an actual practical problem using own approach.

The scissors elevator is an elevator with a system of levers and hydraulic cylinders on which the metal platform is capable of moving in the vertical plane. This is achieved by using of linked, folding supports in a crisscross pattern, called scissor mechanism.

The hydraulic lift was chosen as a subject of the thesis because it is a perfect example of mechanical engineering field. This mechanism combines a result of several main fields of engineering and at the same time, it is simple and accessible for understanding. The construction and load distribution represent statics and strength of material subjects, the hydraulic cylinder and the control unit involve knowledge of hydraulic systems and automation. Material science is important for selection of a suitable material as well as knowledge of 3D modeling.Also, scissors lift is an integral part of most of the workshops and building objects. The key advantage of lifts is that they even offer the best way to organise a technological and industrial process. Besides, almost all lifts give the possibility to change the place of their installation without much effort, which is important in the frequently changing conditions in the production process these days..

II. STATEMENT OF THE PROBLEM

A problem remains a problem until a solution is offered. With the limitations encountered in the use of Cranes, ropes, ladders, scaffold and mechanical scissors lifts in getting to elevated height such as the amount of load to be carried, conformability, time consumption, much energy expended etc. the idea of a hydraulically powered scissors lift which will overcome the above stated limitations is used.

III. LITERATURE REVIEW

Hydraulic lifting trolly is a device to raise something, such as worker, materials or objects to a certain height as desired. However, if the scissor lift is designed, manufactured and maintained in accordance properly, it will improve job performance, productivity and safety factor. Unfortunately, there are still many accidents that occur due to the lack of safety factors in the design. Some of these factors are scissor-speed, heavy load which not appropriate and the material strength. It is necessary to design highly appropriate to determine the sizes and strength on this device. (Ren G.Dong, 2012)

Every part of the machine cannot move to a position corresponding to the desired to move a component. Some of them are aerial lifts, boom lifts, scissorlift, towable elevator used to move a material or device to different directions as desired. A scissor lift is a portable, easily extended and compressed, used for safe operating machine. (M.Kiran Kumar, 2016)

Mans quest for improvement has never been satisfied. The drive towards better and greater scientific and technological outcome has made the world dynamic. Before now, several scientist and engineers have done a lot of work as regards the scissors lift in general. A review of some of that work gives the design and construction of a hydraulic scissors lift a platform.

IV. DEFLECTIONS IN SCISSORS LIFT

Deflection Defined

Deflection in scissors lifts can be defined as the resulting change in elevation of all or part of a scissors lift assembly, typically measured from the floor to the top of platform deck, whenever loads are applied to or removed from the lift.

ANSI MH29.1 - Safety Requirements for Industrial Scissors Lifts states that all industrial scissors lifts will deflect under load". The industry standard goes on to outline the maximum allowable deflection based on platform size and number of scissors mechanisms within the lift design.

What Causes Deflection?

Before attempting to discuss how to limit scissors lift deflection, it is important to understand the contributing factors to a lift's total deflection. An open, or raised, scissors lift acts very much like a spring would – apply a

load and it compresses, remove a load and it expands. Each component within the scissors lift has the potential to store or release energy when loaded and unloaded (and therefore deflect). There are also application-specific characteristics that may promote deflection. Understanding these Top 10 root causes helps to pinpoint and apply effective measures to limit deflection.

Scissors Legs

Leg deflection due to bending is a result of stress, which is driven by total weight supported by the legs, scissors leg length, and available leg cross section. The longer the scissors legs are, the more difficult it is to control bending under load. Increased leg strength via increased leg material height does improve resistance to deflection, but can create a potentially undesirable increased collapsed height of the lift.

Platform Structure

Platform bending will increase as the load's center of gravity moves from the center (evenly distributed) to any edge (eccentrically loaded) of the platform. Also, as the scissors open during raising of the lift, the rollers roll back towards the platform hinges and create an increasingly unsupported, overhung portion of the platform assembly. Eccentric loads applied to this unsupported end of the platform can greatly impact bending of the platform. Increased platform strength via increased support structure material height does improve resistance to deflection, but also contributes to an increased collapsed height of the lift.

Base Frame

Normally, the lift's base frame is mounted to the floor and should not experience deflection. For those cases where the scissors lift is mounted to an elevated or portable frame, the potential for deflection increases. To effectively resist deflection, the base frame must be rigidly supported from beneath to support the point loading created by the two scissors leg rollers and the two scissors leg hinges.

Pinned Joints

Scissors lifts are pinned at all hinge points, and each pin has a running clearance between the O.D. of the pin and the I.D. of its clearance hole or bushing. The more scissors pairs, or pantographs, that are stacked on top of each other, the more pinned connections there are to accumulate movement, or deflection, when compressing these running clearances under load.

Hydraulic Circuit – Air Entrapment

All entrapped air must be removed from the hydraulic circuit through approved "bleeding" procedures – air is very compressible and is often the culprit when a scissors lift over-compresses under load, or otherwise bounces (like a spring) during operation.

Hydraulic Circuit – Fluid Compressibility

Oil or hydraulic fluid will compress slightly under pressure. And because there is an approximate 5:1 ratio of lift travel to cylinder stroke for most scissors lift designs (with the cylinders mounted horizontally in the legs), there is a resulting 5:1 ratio of scissors lift compression to cylinder compression. For example: 1/16" of fluid compressibility in the cylinder(s) translates into 5/16" of vertical lift movement.

Hydraulic Circuit – Hose Swell

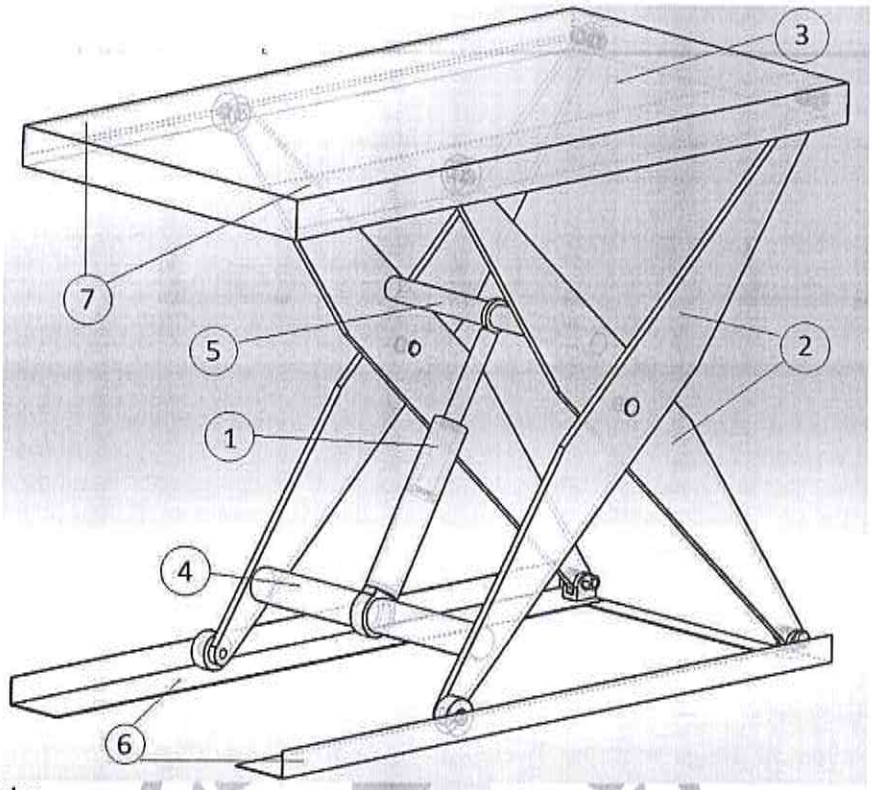
All high pressure, flexible hosing is susceptible to a degree of hose swell when the system pressure is increased. System pressure drops slightly because of this increased hose volume, and the scissors table compresses under load until the maximum system pressure is re-established. And, as with compressibility, the resulting lift movement (deflection) is 5 times the change in oil column height in the hosing.

Cylinder Thrust Resistance

Cylinders lay nearly flat inside the scissors legs when the lift is fully lowered and must generate initial horizontal forces up to 10 times the amount of the load on the scissors lift due to the mechanical disadvantage of their lifting geometry. As a result, there are tremendous stresses (and resulting deflection) placed on the scissors inner leg member(s) that are designed to resist these cylinder forces. And, as already mentioned above with any

changes in column length along the line of the lifting actuator(s)/cylinder(s), the resulting vertical lift movement is 5 times the amount of deflection or movement of cylinder hinge points mounted to leg cross members.

V. Components of Lift



1. Hydraulic Cylinder
2. Leg
3. Table-top
4. Supporting tube 1
5. Supporting tube 2
6. Base plates
7. Top plates

VI. Material selection

Material selection plays a very important role in machine design.
For example, the cost of materials in any machine is a good determinant of the cost of the machi8ne. more than the cost is the fact that materials are always a very decisive factor for a good design. The choice of the particular material for the machine depends on the particular purpose and the material for the machine depends on the particular purpose and the mode of operation of the machine components. Also, it depends on the expected mode of failure of the component.

Engineering materials are mainly classified as:
1. Metal and their alloys, such as iron, steel, copper, aluminum etc.
2. Non-metals such as glass, rubber, plastic etc. metals are further classified as ferrous metals and non-ferrous metal
3.Ferrous metals are those metals which have iron as their main constituent, such as cast iron, wrought iron and steels.
4.Non-ferrous metals are those which have a metal other than iron as their main constituent, such as copper, aluminum, brass, tin, zinc etc.

4.1 ANALYSIS OF MECHANICAL PROPERTY REQUIREMENT OF ESSENTIAL MACHINE COMPONENTS

It is necessary to evaluate the particular type of forces imposed on components with a view to determining the exact mechanical properties and necessary material for each equipment. A very brief analysis of each component follows thus:

Scissors Arms: this component is subjected to buckling load and bending load tending to break or cause bending of the components. Hence based on strength, stiffness, plasticity a hardness. A recommended material is stainless steel.

Hydraulic Cylinder: this component is considered as a strut with both ends pinned. It is subjected to direct compressive force which imposes a bending stress which may cause buckling of the component. It is also subjected to internal compressive pressure which generates circumferential and longitudinal stresses all around the wall thickness. Hence necessary material property must include strength, ductility, toughness and hardness. The recommended material is mild steel.

Top Platform: this component is subjected to the weight of the workman and his equipment hence strength is required, the frame of the plat form is mild steel and the base is wood.

Base Platform: this component is subjected to the weight of the top plat form and the scissors arms. It is also responsible for the stability of the whole assembly, therefore strength. Hardness and stiffness are needed mechanical properties. Mild steel is used.

Wheels: the wheels are position at the base part of the scissors lift and enable the lift to move from one place to the other without necessary employment of external equipment like car.

VI. DESIGN OF PARTS

In this section all design concepts developed are discussed and based on evaluation criteria and process developed, and a final here modified to further enhance the functionality of the design.

Considerations made during the design and fabrication of an acting cylinder is as follows:

1. Functionality of the design
2. Manufacturability
3. Economic availability. i.e. General cost of materials and fabrication techniques employed.

PRESSURE SUPPLIED TO THE HYDRAULIC CYLINDER

Pressure (P) = Force (P)/ Area (A) $P = F/A$

Construction Procedure

Assembling of various components of the hydraulic scissors lift.

The scissors assemblage was mounted on the base frame with one end hinged and the other fitted with roller (bearing) to produce the needed motion of rolling along the rail to cause lifting and lowering of the scissors lift. The scissors arm connected to the platform is also connected with one end hinged and the other fitted with roller to effect extension and contraction of the lit. The hydraulic cylinder is connected to the first arm of the scissors lift with both ends hinged. This cylinder provides the force needed to lift the load on the platform.

VII. CONCLUSION

The design and fabrication of a portable work platform elevated by a hydraulic cylinder was carried out meeting the required design standards. The portable work platform is operated by hydraulic cylinder which is operated by a motor. The scissor lift can be design for high load also if a suitable high capacity hydraulic cylinder is used. The hydraulic scissor lift is simple in use and does not required routine maintenance. It can also lift heavier loads. The main constraint of this device is its high initial cost, but has a low operating cost. The shearing tool should be heat treated to have high strength. Savings resulting from the use of this device will make it pay for itself with in short period of time and it can be a great companion in any engineering industry dealing with rusted and unused metals.

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Power Generation Using Gym Equipment's

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***Abstract*: This study explores the innovative integration of gym equipment as a means of generating renewable energy. With the growing demand for sustainable energy solutions, utilizing human kinetic energy during physical exercise presents a unique opportunity. The research focuses on converting the mechanical energy produced by various gym machines, such as stationary bikes, treadmills, and rowing machines, into electrical energy using generators and energy storage systems. By analyzing the efficiency of different equipment configurations, the project demonstrates how fitness enthusiasts can contribute to energy production while promoting health and wellness. The findings indicate that not only can this approach reduce energy costs in fitness facilities, but it can also foster a greater awareness of sustainability among gym-goers. The study concludes that implementing energy-generating gym equipment could serve as a viable model for green energy initiatives, bridging the gap between fitness and environmental responsibility, and highlighting the potential for community engagement in renewable energy practices.**

***Keywords*: Promote Renewable Energy and Encourage people for their fitness, Encourage Environmental Sustainability, Support Innovation and Smart Infrastructure, Reduction in Carbon Footprint.**

1. Introduction

In an era where energy efficiency is more important, the fitness industry is exploring innovative solutions to reduce its environmental impact. Our energy-harvesting system transforms traditional gym equipment into energy generators, converting the kinetic energy produced during exercise into usable electrical power. As users engage in physical activity in gym equipment, their movements create energy that can be captured and stored, offering a dual benefit: enhancing workout resistance (Work as a lifting weight) and contributing to energy sustainability. This integration not only supports gym facilities in reducing operational costs but also fosters a culture of eco-consciousness among fitness enthusiasts. By harnessing the power of exercise, we aim to create a healthier planet, one workout at a time. This dual-purpose system not only enhances the workout experience by providing resistance but also promotes sustainability by reducing the carbon footprint of fitness facilities.

2. Problem Statement

As the world faces increasing energy demands and concerns about sustainability, innovative solutions are required to reduce dependency on non-renewable sources of energy. One promising approach involves harnessing energy from everyday activities, such as physical exercise, to generate power. In modern gyms, people spend considerable time on exercise equipment, including treadmills, stationary bikes, elliptical machines, and rowing machines. These machines are typically powered by electricity to monitor workout metrics and run their motors. However, they primarily consume energy without contributing back to the grid or powering other devices. The goal is to develop a system that enables gym equipment to generate electrical energy from the human movement. The energy generated during exercise could be used to power the gym's lighting, electronic equipment, or even contribute to the local power grid. The challenge lies in designing an efficient energy harvesting mechanism that can convert mechanical energy from gym equipment into usable electrical power while maintaining the workout experience and ensuring the safety and comfort of the users.

3. Product Design

Utilizing Autodesk Inventor software, we developed a 3D model of gym equipment featuring a Chain-Sprocket arrangement.

By integrating the chain sprocket mechanism, we aim to enhance the efficiency and reliability of our power generation system, ensuring effective energy conversion during both the forward and return strokes of the gym equipment.

4. Methodology

The project aims to construct and manufacture an entirely unique electric generation system that fuses both form and function into a cost-effective and convenient solution. The methodology of the project is as follows: 1. At first the frame of the setup is built which is also called the body of the setup which consists of all the major components of the model. The frame is made of square tubes. 2. Chain-Sprocket Mechanism are mounted on the shaft of proper dimension and the shaft is inserted inside the bearing which then is supported in the frame.

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3. The upper end of the Chain-Sprocket mechanism is connected to weightlifting shaft whereas the other end is connected to dead weight with the help of cable. 4. Driver pulley of 300mm is also mounted on the same shaft. Driver pulley is attached on the shaft and smaller pulley (driven) is attached in the dynamo/Generator. 5. Dynamo along with pulley is supported on the frame is connected to the driver pulley via belt. 6. All the electrical connections are attached through the dynamo via electrical wires. 7. The output from the dynamo is being tested in various loading conditions and average power is calculated. 8. The output from the circuit is extended by using extension circuit and directly connected to LED bulb. 9. The output from the dynamo/Generator is gained by the output circuit at 12v. 10. While performing the exercise the weight is lifted by handle thereby rotating the main shaft with the help of a chain-sprocket mechanism which is then connected to the dynamo to produce the electrical current which can be used immediately or can be stored in the battery.

Table 1
Specification of parts used

Sr. No.	Part Name	Size (In MM where not mentioned)	Qty.
1	Body Frame (Sq. Tubes)	1650x620x450 (H x W x L)	1
2	Shafts	Dia.34x550L	1
3	(Flywheel) Pulley 1	Dia.300	1
4	Guide Pulley 2	Dia. 200	1
5	Sprocket	Dia.79x14T	4
6	Belt	2 Mtr.	1
7	Rope	5 Mtr.	1
8	Bearings	ID 34	2
9	Square plates	500x100x5 (H x W x T)	2
10	Chains	500 L.	2
11	Dynamo	12V	1
12	Dynamo Pulley	Dia.19	1
13	LED bulb/Wire	1.0W/ 5V	4

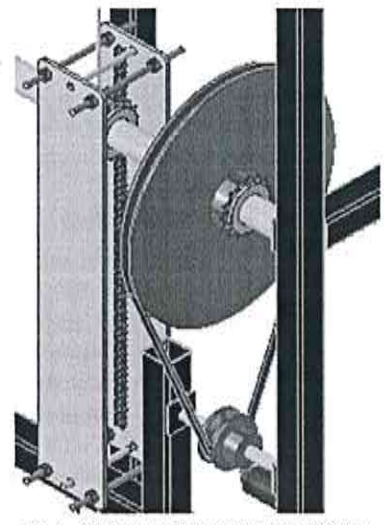

Fig. 1. Chain sprocket mechanism (CPM)

Fig. 2. Gym equipment with chain sprocket mechanism (bicep/ triceps machine)

5. Working Principle

The working of the project like that of the traditional gym Bicep/Triceps machine, which are being used in most of the gym Centre. It is an electro-mechanical project, which consists of a mechanical system combined with an electrical system. A dynamo/Generator will be mounted on the body, which is connected to the main shaft via pulley setup. All the operation acting on the model is like traditional gym Bicep/Triceps machine along with generation of electricity with help of dynamo.

The electrical energy generated depends on faraday day of electro-magnetic induction and the type of current depends on the type of dynamo used. If the dynamo is of AC type, then AC current is produced and vice versa. If AC dynamo is used the thus produced AC current can be used directly but if it is needed to be stored in battery, then rectifier circuit needs to be added to convert the AC into DC current.

The current producer, either AC or DC may not have sufficient voltage and may be of fluctuating type hence step-up circuit is used to get the required amount of out. The electricity produced can be used for various purposes directly or can be stored in battery and can be used whenever needed. However, the generation of electrical energy is based on principle of faraday law of electromagnetic induction. Faraday's laws of electromagnetic induction explain the relationship between electric circuits and magnetic fields.

This law is the basic working principle of most of the electrical motors, generators, transformers, inductors etc. Faraday's First Law states that whenever a conductor is placed in a varying magnetic field an EMF gets induced across the conductor (called as induced emf), and if the conductor is a closed circuit, then induced current flows through it.

Magnetic field can be varied by various methods.

- By moving magnet

- By moving the coil
- By rotating the coil relative to magnetic field

Faraday's second law of electromagnetic induction states that the magnitude of induced emf is equal to the rate of change of flux linkages with the coil. The flux linkages are the product of the number of turns and the flux associated with the coil.

6. Testing of Working Model

1. Frame Rigidity The fabricated frame is robust and designed to support the entire mounted arrangement, ensuring stability during use. This structural strength allows the system to withstand operational forces without compromising performance.
2. Workout Performance We tested the machine by performing a typical workout, and the movements were smooth and easy to handle. The machine operates effectively, providing comfortable user experience during exercise.
3. Power Transfer to Drive Pulley via Chain-Sprocket Mechanism the Chain-Sprocket mechanism operates efficiently, transferring power seamlessly to the drive pulley during both upward and downward movements of the handle or dead weight.
4. Power Transfer from Main Pulley to Dynamo/Generator. Power is transmitted from the main pulley to the dynamo or generator using a belt connection. This ensures consistent transfer of rotational motion to the generator.
5. Electricity Generation Finally, the system successfully generates electricity by converting the user's reciprocating motion into rotary motion, which is harnessed by the dynamo or generator to produce electrical power.

7. Calculation and Results

Pulley Calculation:

D = 294.5 mm (Driving pulley)
d = 19mm (Driven pulley)
ND=nd
n/N = D/d
n/N = 294.5/19
n/N = 15.5
n = 15.5N
Power = V*I=12V*0.3A = 3.6Watts
N= 64 rpm
n = 64*15.5
n=992 nearly equal to 1000 RPM

Theoretical Analysis of Power Generation in Bicep/Triceps Machine:

- Dynamo specifications: Rated as 12V and 0.3A.
- LED bulb specifications: Rated as 5V and 40mA

Under normal loading conditions, the machine generates an average power of about 3.6 watts. However, a typical person can produce approximately 100 watts of power during a full day's use of a single exercise machine. This means that the power generated during workout is sufficient to light up at least two LED bulbs simultaneously using just one machine. The energy generated by the user can be effectively harnessed to power small electrical devices, demonstrating the potential of the machine in energy generation through exercise.

8. Advantages, Disadvantages and Applications

A. Advantages

- It is clean and eco-friendly energy.
- Dual benefit system.
- Maintenance is not complicated.
- It does not require any fossil fuel.
- It does not produce harmful effects on the environment.
- Human health benefit.
- Electrical energy can be stored in battery.

B. Disadvantages

- Comparatively Less amount of power will be generated. Tread mills and stationary bicycles can produce at higher rates.
- Mechanical moving parts are more so, chances of mechanical loss is more.
- Weight of the model is very high so difficult to transport.
- Initial investment is high.

C. Applications

- Power generation using gym pulling can be used in most places such as home, Colleges, School and Gym center.
- It can be used for glowing plenty of lights, charging electrical devices and can also be stored in battery which can be used for multiple purposes.
- It can be used in public parks.

9. Conclusion

- This design and implement an innovative exercise equipment to generate electrical power for the house appliances.
- Energy storage is very necessary and important within renewable energy systems to ensure stability of the system. These models vary in complexity and accuracy and therefore the model chosen must match the application for which it is needed.
- This type of model can be used in many places and if it is operated throughout the day by many people, it can create enough energy.
- It will be very helpful for the rural areas. In this day where the world is challenged to be more responsible in its sourcing of electrical power, the method of human power generation could be a solution that also helps mitigate the issue of obesity and overweight.
- If additional design and study of this concept proves it effective in energy use reduction, localized energy delivery and sustainability education, it could efficiently answer the three great challenges: source of electrical power, reducing

the emission of CO2 to the atmosphere and the issue of obesity.

10. Scope for Future Work

Only one dynamo was used in the project so power generated was less, to order to get more power multiple dynamos can be made. The load in the current model is not detachable, hence it is very difficult to transport or move the machine. So, the load used for lifting can be made detachable so that it will be easy to transport. The energy generation from gym equipment can be also enhanced as now a day most of the population are health conscious and they are spending time exercising in a gym or another suitable place. If energy generation is large in amount, then it can be also used for commercial purposes also. To increase the speed of the shaft, a variable gear ratio can be applied. In future, if the flywheel speed control device and voltage protection devices can be added with large generation process, it would be a model all over the world. Whatever Energy generated during workout can be stored in battery and use as per requirement.

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SMART IOT BASED ROBOTIC NURSE WITH MULTILANGUAGE VOICE INTERACTIVITY

Dr. S. A. Mehta[1], Patil Akshay Vasant[2], Patil Siddhant Dattatray[3], Hundalevadkar Nikhil Subhash[4], Salokhe Aditya Arun[5], Devadkar Tejashri Ishwara[6].

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Abstract: In recent years, technology has become an integral part of everyday lives, particularly in healthcare. Despite advancements, the widespread acceptance of the Internet of Things (IoT) and robotics in healthcare applications remains limited. This study explores the transformative role of these technologies in healthcare services, focusing on the development of an autonomous robotic nurse. The project entails the creation of a robotic vehicle that can be remotely activated by a doctor using a bed number as a trigger. The robotic nurse autonomously navigates to the patient's bed, employing non-contact temperature sensors and oximeter sensors for medical diagnosis. Vital body parameters are transmitted to the doctor through IoT protocols. Additionally, the project incorporates a telemedicine system, enabling doctors to prescribe medications via an IoT panel, with the robotic nurse delivering the suggested medicines to the patients. Furthermore, the project implements a live video streaming system, facilitating wireless visualization of patients' conditions by doctors over the internet using the robot-mounted camera. To ensure safety, the robot includes a self-disinfection feature, providing a comprehensive solution for remote and autonomous patient care. This approach prioritizes safety by minimizing physical contact, thereby safeguarding the well-being of healthcare professionals. The speech based interaction system is included to interact with the robotic nurse in more user friendly way and multi language broadcast system is included so that voice broadcast in multiple languages can be used.

IndexTerms **- IoT, Robotic Nurse, ESP32, Healthcare Automation, Voice Interaction**

I. INTRODUCTION

The evolution of modern technology has empowered researchers and scientists to revolutionize healthcare services. Cutting-edge technologies have been extensively utilized in the development and implementation of various medical devices for diagnosis, treatment, monitoring, and testing. This progress is attributed not only to the advancement of clinical grade sensors but also to the integration of sensor networks within healthcare facilities. The amalgamation of sensors and networks has significantly optimized healthcare delivery from remote locations, enhancing adaptability, accessibility, and affordability. Prominent technologies driving the transformation of healthcare applications include big data analytics, machine learning, artificial intelligence, cloud computing, computer vision, and the Internet of Things (IoT). Data analytics, for instance, showcases potential in identifying patterns and hidden features within health data, contributing to efficient decision-making and improved healthcare quality. Artificial intelligence techniques, particularly machine learning, have augmented the work of healthcare professionals by processing vast amounts of electronic health records for applications such as respiratory condition diagnosis, early detection of cancers and heart diseases, and predicting overall human health conditions.

In surgical and therapeutic contexts, advanced imaging techniques like computer vision and computer tomography have been effectively employed. Cloud services in healthcare provide a platform for storing, processing, and sharing healthcare records, patient information, and reports, offering flexibility through intercloud infrastructures. Despite numerous technological advancements in healthcare, the Internet of Things (IoT) stands out as a promising avenue for integrating multiple technologies into a unified environment. Robotics and automation technologies have showcased potential in human replacement, remote operation in risky environments, and proxying social interaction.

As robotics plays a critical role in addressing crises, this project proposes an IoT-based robotic nurse for remote treatment and medication of patients. The robotic nurse, triggered by the Dept. Mechanical Engineering, DADSCOE, Bhadgaon Page 1 Smart IOT Based Robotic Nurse With Multi Language Voice Interactivity doctor, autonomously navigates to a specific patient's location within the hospital. It monitors the patient's health status and communicates updates to the doctor using IoT. The telemedicine feature facilitates doctors in providing medications to patients while maintaining social distancing and ensuring safety through IoT-enabled processes.

1.1 Problem Definition

There needs to be a solution to treat patients remotely as well as medicate them remotely to help the doctors stay away from infections.. Thus there needs to be a solution which can properly take care of patients as well as keeps the doctors and medical staff safe. The current healthcare landscape faces a critical challenge in optimizing remote healthcare services to ensure timely and effective treatment while prioritizing the safety of healthcare professionals and patients. Despite the advancements in healthcare technologies, there is a need for a comprehensive and adaptable solution that leverages the capabilities of a robotic nurse integrated

with IoT. This involves addressing challenges such as autonomous navigation within healthcare facilities, real-time health data monitoring, secure communication between the robotic nurse and healthcare professionals, and user-friendly telemedicine interfaces. The proposed project aims to fill this gap by developing an innovative IoT-based robotic nurse, providing a seamless and autonomous remote healthcare solution.

II. Literature Review

Before we start of the project it was necessary to study the literature review on the current topic. The number of solutions and research papers were studied to understand the scope of the topic. Some of the important ones are discussed in this chapter. A few research papers related to medical robots have been reviewed and the following references show influence on the design of the smart medical assistant robot. Marcin Zukowski et al [1] have developed a humanoid medical assistant and companion robot dedicated to children hospitals. They have focused on the robot being able to express emotions and communicate with the children by recognizing their faces and using pictures and text on the chest display to tell stories and present educational videos. The 'Bobot' autonomously navigates through hospital rooms and performs simple medical tests like measuring patient's body temperature or heart rate and sends live video feed to the doctors and nurses. The robot is run using ODROID XU and XU4 with Ubuntu 14.04 operating system and has a dedicated Raspberry Pi 2 computer to animate the robot's eyes. Marcin Zukowski et al [2] presented the implementation of patients' temperature measurement system for the medical robotic assistant. They have experimented with MLX90614 infrared thermometer and FLIR Lepton thermal camera and found out that the MLX90614 infrared thermometer cannot be used as the only input source of the system and to get more accurate results, robotwouldneed to come as close as less than 0.3 metres to a patient's face. To overcome this they created a hybrid system having infrared thermometer along with thermal camera to provide ambient temperature and approximate skin temperature that can be used to detect presence of humans in front of the robot. Kaveh Bakhtiyari, Nils Beckmann and Jürgen Ziegler [3] have proposed a non-invasive contactless Heart Rate Variability (HRV) measurement with Respiratory Sinus Arrhythmia (RSA) correction. They have incorporated Infrared and RGB cameras to measure the heart rate signal, and a 3D Depth sensor has been used to capture the human respiratory signal to correct the calculated HRV with RSA. They have performed correlation analysis by different methods and devices to find an appropriate method for HRV calculations based on the required accuracy and application. Contactless heart rate variability sensors can become an important part of sensors for preliminary health tests. Sachit Mahajan, Prof. Vidhyapathi C.M [4] have designed a medical assistant robot which helps the patienttocarry thenecessary medical equipment along with them. They have created a person following robot assistant which provides support to the patients. The robot uses a Pixy image recognition sensor for person detection and ultrasonic sensor for obstacle avoidance. Azeta Joseph et al [5] have presented an overview of the current and potential applications of humanoid robotics in healthcare settings. Their paper describes various characteristics required in humanoid robots in healthcare such as presence of vision system, sensing behaviour,mobile platform and the ability to perform dexterous manipulation tasks. We explored similar human assistant robots available in various roles as helpers for the patients in hospitals. [6-10]

III. OBJECTIVES

The main objective of the project is to develop autonomous Robotic Nurse which permits Multilanguage voice interactivity and helps remote monitoring of patients over IOT. The objectives of the project are:

1. Develop an intelligent robotic nurse capable of autonomous navigation within the hospital, allowing it to reach designated patient beds for treatment.

2. Implement an IoT-based triggering system that enables doctors to initiate the robotic nurse's movement remotely by selecting specific bed numbers from their cabins.

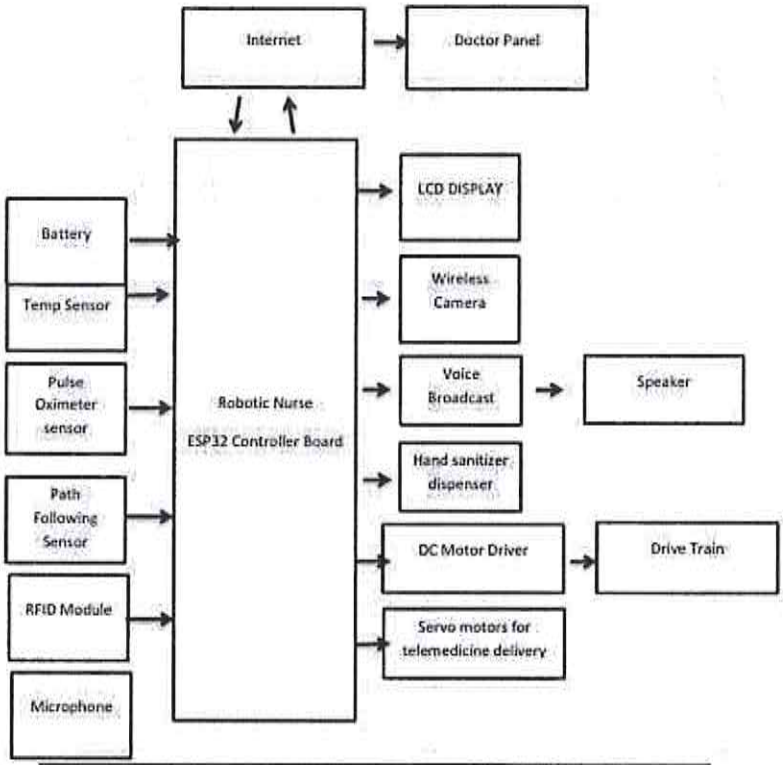
3. Create a body parameter measurement system to facilitate remote patient diagnosis through IoT connectivity. Integrate a non-contact temperature measurement system to reduce the risk of spreading contagious infections during patient interactions. . Incorporate an oxygen measurement system for comprehensive monitoring of patient health.

4. Establish a video streaming system that streams live patient videos to doctors' IoT panels for real-time observation. And Implement a telemedicine feature enabling the robotic nurse to deliver prescribed medications to patients after remote diagnosis.

5. Implement voice interactivity in multi-language and speech recognition system to activate services using speech recognition.

IV. SYSTEM DESIGN

The block diagram of the working of the project is as shown below.



The proposed project introduces an autonomous robotic nurse, equipped with IoT capabilities, to provide patient care effectively, functioning as an IoT-enabled virtual healthcare assistant. An IOT panel is developed to be managed by healthcare professionals. By entering the patient's bed number into the IOT panel, doctors can trigger the system, prompting the robotic nurse to autonomously navigate through the hospital to reach the patient's bedside. The temperature and oxygen measurement systems conduct initial assessments, relaying the results to the doctor via the developed IOT panel. Doctors can remotely prescribe medications through a telemedicine system, enabling the robotic nurse to deliver them directly to the patient using IoT. The system facilitates live video streaming of the patient to the doctor through the control panel, enhancing remote treatment capabilities. To prevent infection spread, the robotic nurse incorporates a self-disinfection feature after examining patients. Additionally, a Sanitization chamber for masks and a sanitizer dispenser for hands are integrated, ensuring comprehensive hygiene. To enhance accessibility, the robotic nurse incorporates multilanguage voice broadcast and speech recognition-based services for seamless communication and interaction with patients and medical staff.

V. METHODOLOGY

To implement the project in a planned manner and to minimize the errors, following methodology is implemented in this project. The project is carried out in modules step by step which will help minimize the errors at the end. The methodology to carry the project is given below.

1. Review of Existing Literature and Material Selection for Robotic Nurse Development
2. Defining the Problem in the Context of Robotic Nursing
3. Designing an Autonomous Robotic Nurse
4. Crafting Chassis and Drive Train Components for the Robotic Nurse
5. Establishing the Autonomous Path Following System for Robotic Nursing
6. Creating a Medical Diagnosis System for Robotic Nurse Applications
7. Implementing a Non-contact Temperature Measurement System for Robotic Nursing
8. Designing a Patient Oxygen Measurement System for Robotic Nursing
9. Installing an RFID-based Bed or Patient Recognition System for Robotic Nursing
10. Constructing an IoT-Based Control Panel for Patient Monitoring and Robotic Nurse Activation
11. Creating a Live Video Streaming System for Enhanced Patient Observation
12. Formulating a Telemedicine System Tailored for Robotic Nursing
13. Development of multilanguage voice interactive system.
14. Hardware Design Specific to Robotic Nurse Requirements
15. Printed Circuit Board (PCB) Development for Robotic Nurse Technology
16. Software Development Aligned with Robotic Nursing Applications
17. Assembly and Testing of the Robotic Nurse System

5.1 SOFTWARE USED

This section details the software used in this project. The table shows the software used for the development of the project.

WAMP server:

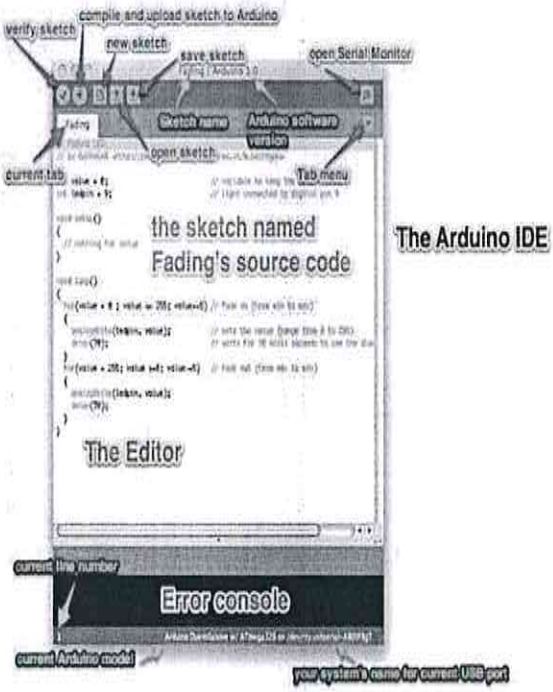
WAMP Server 2.0 is a collection of web development tools &software's. It provides an environment for developing web pages &applications. It contains Apache Web Server, MySQL Database Management System &PHP Programming Language. Sonow you can develop your applications locally on you home PC and once you havedeveloped you applications you can upload it to your webhost. Wamp Server 2.0 alsoprovides some nice little tools for easy management of your databases, php my adl I lin &SqlLite Manager are already installed. Interface of Wamp Server 2.0 is neat and clean.Being an open source software you can customize it the way you want. Most of thesettings of this software can be accessed using a menu. You can directly access thesesetting right from the taskbar. It is available in around 20+ languages.You can alsoupdate it automatically using the menu from the taskbar. Apache &MySQL are the mostpopular software used in web development and if you use PHP as your language for developing web application then this software is a must.

Brackets IDE:

Brackets is a lightweight, yet powerful, modern text editor. We blend visual tools into the editor so you get the right amount of help when you want it without getting in the way of your creative process. You'll enjoy writing code in Brackets.

Easy EDA: A great web based EDA (Electronic Design Automation) tool for electronics engineers, educators, students, market and enthusiasts. Easy EDA is free online software for creating circuit schematics, designing PCBs as well as simulating electronics circuits.

Arduino IDE: The software used to program the esp32 microcontroller is the arduino IDE. Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that can sense and control the physical world. Arduino boards may be purchased preassembled, or as do-it-yourself kits; at the same time, the hardware design information is available for those who would like to assemble an Arduino from scratch. The project is based on a family of microcontroller board designs manufactured primarily by SmartProjects in Italy, and also by several other vendors, using various 8-bit AtmelAVR microcontrollers or 32-bit Atmel ARM processors. These systems provide sets of digital and analog I/O pins that can be interfaced to various extension boards and other circuits. The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino platform provides an integrated development environment (IDE) based on the Processing project, which includes support for C and C++ programming languages.The arduino board is connected to pc Dept. Mechanical Engineering, DADSCOE, Bhadgaon Page 26 Smart IOT Based Robotic Nurse With Multi Language Voice Interactivity and the program is burnt onto the microcontroller board. The figure below shows the arduino integrated development environment for compiling and uploading the programs to arduino board



Before you can start doing anything with the Arduino, you need to download and install the Arduino IDE (integrated development environment). From this point on we will be referring to the Arduino IDE as the Arduino Programmer. The Arduino Programmer is based on the Processing IDE and uses a variation of the C and C++ programming languages Plug your arduino to your computer using the programmer as shown before.Select the board.Before compiling the programmer and feeding it onto the arduino board you

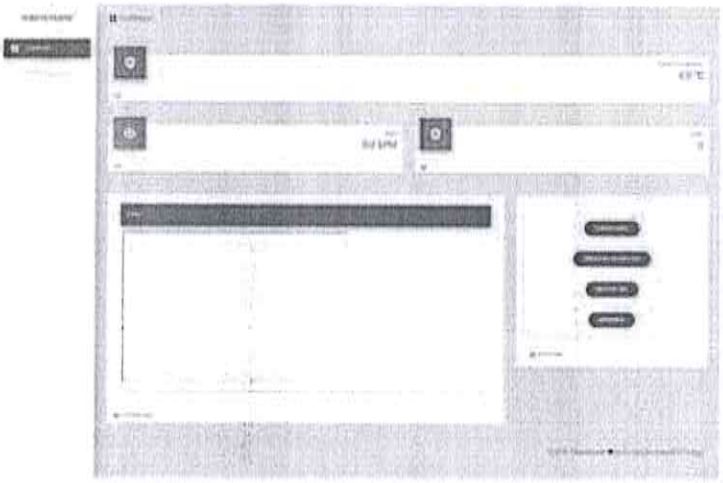
need to select the appropriate board into which you are feeding the program.To set the board, go to the following: Tools – Boards:Since we are using Arduino mega in our project we selected Arduino mega To set the serial port, go to the following: Tools --> Serial Port: Compile and upload the sketch to arduino board:

Android Studio is the official Integrated Development Environment (IDE) for Android app development, based on IntelliJ IDEA . On top of IntelliJ's powerful code editor and developer tools, Android Studio offers even more features that enhance your productivity when building Android apps, such as:

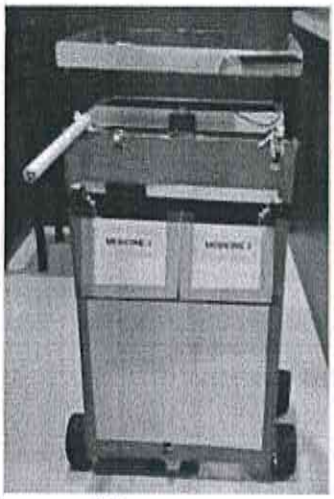
1. A flexible Gradle-based build system
2. A fast and feature-rich emulator
3. A unified environment where you can develop for all Android devices
4. Apply Changes to push code and resource changes to your running app without restarting your app
5. Code templates and GitHub integration to help you build common app features and import sample code
6. Extensive testing tools and frameworks
7. Lint tools to catch performance, usability, version compatibility, and other problems
8. C++ and NDK support
9. Built-in support for Google Cloud Platform, making it easy to integrate Google Cloud Messaging and App Engine

V. PROJECT SNAPSHOT

The web application is developed for the doctor panel using bootstrap which is hosted on cloud server. The frontend snap shot of the web application developed is as shown below.



Frontend snap shot of the web application



The completed project Photo

VI. APPLICATIONS AND ADVANTAGES:

1. Facilitates contactless patient care, ensuring treatment without direct physical contact.
2. Enhances safety for doctors and medical staff by eliminating the need for direct interaction.
3. Operates autonomously, minimizing the need for manual intervention in healthcare procedures.
4. Mitigates the risk of infection transmission between individuals, contributing to infection control.
5. Provides efficient and effective treatment for patients through advanced healthcare technologies.
6. Enables telemedicine services via IoT, ensuring timely and accurate delivery of prescribed medications.
7. Utilizes IoT video surveillance for remote patient visualization and diagnosis.
8. Applicable for implementation in multi-bed hospitals, enhancing healthcare delivery in diverse settings.
9. Incorporates a self-sanitization system, ensuring the robot is free from viruses and bacteria, contributing to a hygienic healthcare environment.

VII. CONLCUSION AND FUTURE SCOPE

In conclusion, the development and implementation of the robotic nurse system represent a significant advancement in the field of healthcare. By offering contactless treatment, the system ensures the safety of both healthcare professionals and patients, particularly in environments where infectious diseases pose a significant threat. The autonomous functionality of the robotic nurse streamlines healthcare procedures, minimizing the need for manual intervention and thereby increasing efficiency. The integration of telemedicine services and IoT-based video surveillance enhances remote patient monitoring and diagnosis, enabling more accessible and timely healthcare delivery. Additionally, the inclusion of a self-sanitization feature ensures a consistently hygienic

environment, further contributing to infection prevention. Overall, the anticipated outcomes highlight a transformative approach to healthcare that prioritizes safety, efficiency, and accessibility, setting a new standard for patient care.

The future scope of this project is vast and promising. As technology continues to evolve, the robotic nurse system can be further enhanced with advanced artificial intelligence and machine learning algorithms, enabling it to perform more complex medical procedures and decision-making processes. The integration of additional sensors and diagnostic tools could expand its capabilities in patient monitoring and early disease detection. Furthermore, with advancements in telecommunication technologies, the system can offer even more robust telemedicine services, making high-quality healthcare accessible to remote and underserved areas. The potential for interoperability with other healthcare systems and devices can create a more cohesive and efficient healthcare ecosystem. Finally, as the system gains widespread adoption, it will pave the way for more innovative applications in healthcare, ultimately leading to improved patient outcomes and a more resilient healthcare infrastructure.

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To,
Dr. S.A. Mehta
Published in : Volume 12 | Issue 12 | 2025-12-09

Subject: Publication of paper at International Journal of Emerging Technologies and Innovative Research .

Dear Author,

With Greetings we are informing you that your paper has been successfully published in the International Journal of Emerging Technologies and Innovative Research (ISSN: 2349-5162). Following are the details regarding the published paper.

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