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"Design and Develop Portable Concrete Mixer"

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Abstract –

The **Portable Concrete Mixer** is a manually operated device designed to improve the efficiency of concrete mixing in small-scale construction projects. Traditional hand-mixing methods are labor-intensive, inconsistent, and time-consuming. This project aims to develop a lightweight, durable, and easy-to-use concrete mixer that eliminates these challenges while maintaining affordability and mobility.

The system consists of a rotating drum mounted on a sturdy frame, operated by a hand-crank mechanism. The manual operation allows users to mix concrete efficiently without the need for electricity or fuel, making it ideal for rural construction sites, small contractors, and DIY applications. The design focuses on ease of transportation, simple assembly, and ergonomic handling to minimize physical strain while ensuring uniform mixing.

Key design considerations include the selection of durable materials, an optimized drum shape for effective mixing, and a balanced crank system to reduce manual effort. The mixer enhances construction productivity by reducing mixing time and improving consistency compared to traditional hand-mixing methods. Additionally, its sustainable design promotes eco-friendly construction by eliminating energy consumption and minimizing material wastage.

This project provides a practical, low-cost, and efficient alternative for concrete mixing, benefiting small-scale builders and improving overall construction efficiency.

Keywords: mixture design,construction, testing, CAD software, safety protocol,eco friendly

1. INTRODUCTION-

A concrete mixer is a machine that helps in mixing homogeneously mixture of cement, aggregate (sand or gravel and water) to the appropriate ratio. The archeological evidence says that the romans are generally credited as the first concrete engineers. Concrete mixers are widely used in big construction project. The main objective of this project is to design the Concrete mixer which is portable and can mix the all ingredients properly.

To develop and design a manually rotating concrete mixer. Usually, concrete mixers are used for mixing concrete according to the required grade of concrete.

Concrete mixer gives proper and accurate mixing of concrete according to required Grade, Strength and also reduces time of mixing concrete compared to Hand mixing.

1.1 Problem Defination

1. In our Department of Civil Engineering, Concrete technology lab we don't have concrete mixer.
2. From 2014 till now the concrete is mixed with hand mixing method which does not gives a proper mixture of concrete.
3. Concrete mixer gives proper concrete of accurate grade as compared to hand mixing. Therefore, we need a concrete mixer in our Concrete Technology Lab.
4. Also, in our BKC campus we don't have concrete mixer. It will help in mixing concrete in other activities like maintenance of campus, etc.

1.2 Scope of Project-

The aim of designing and constructing a manually rotating concrete mixture in our college is to provide a hands-on learning experience for students in the field of civil engineering and construction technology. By working on this project, students will be able to apply theoretical knowledge of concrete technology and mechanics of materials in a practical setting, develop problem-solving skills, and gain a deeper understanding of the concrete mixing process. Additionally, the project promotes sustainability and energy efficiency by designing and constructing a manually rotating concrete mixture that is environmentally friendly. Overall, this project aims to contribute to the development of skilled and knowledgeable professionals in the field of civil engineering and construction technology, while fostering collaboration and teamwork among students from different disciplines.

Objectives-

- To study the different types of concrete mixers.
- To prepare design of portable concrete mixer.
- To prepare estimate for the portable concrete mixer.

- To prepare equipment on suggested method.

2. LITREATURE SURVEY

2.1Development of a Mixer for Concrete Production

- **Author: -** Daniyan Ilesanmi, Aderoba Adeyemi, Jimmy Daniel, Rominiyi Oluwashina, Adewumi Deborah.
- **Published on:** - 09/07/2017

In a bid to enhance concrete production and simplify the mixing process, a concrete mixing machine with a drum size of 700 mm × 530 mm was designed and constructed. The machine's components were fabricated from mild steel due to its accessibility and ease of machining. The machine's efficiency was tested using a combination of cement, sand, coarse aggregate, and water, which were blended to form a uniform paste. The results showed that the machine can effectively mix 50 kg of concrete, with a mixing time comparable to that of traditional concrete mixers. A comparison with manual mixing methods revealed that the developed machine offers superior efficiency, reduced processing time, and increased capacity, making it an ideal solution for batch concrete production in construction sites.

2.2 Designing, Remodeling and Analyzing the Blades of Portable Concrete Mixture.

- **Author: -** Timur Choban Khidir
- **Published on:** - 6/11/2018

This study explores the design and functionality of a concrete mixer, emphasizing its crucial role in blending cement, gravel, sand, and water in precise proportions to produce homogeneous concrete. Utilizing SolidWorks, the researchers undertook a comprehensive design of the mixer, with a particular focus on optimizing blade configuration.The design process consisted of three primary stages. Initially, the drum, blade, and blade holder were designed. The second stage involved creating an optimal blade holder to facilitate efficient mixing of cement ingredients. Finally, the blades were analyzed to identify potential failure points, ensuring a safe and reliable design.To achieve a safe, efficient, and cost-effective design, the researchers employed a multi-step approach. Single blades were initially used for mixing concrete to identify a safe and removable design. Subsequently, reusable blades were utilized in multiple mixing cycles to determine the optimal blade shape, minimizing failure rates, simplifying replacement processes, and reducing costs. This approach eliminates the need for replacing the entire drum when blade failure occurs, thereby enhancing the overall efficiency and sustainability of the concrete mixing process.

2.3 Design and fabrication of a concrete mixer.

- **Author: -** ADEDEJI Bukola Pete, Abiola Aderinto, Akano Isaac, Akinriola Temitayo, Olafimihan Emmanuel.
- **Published on:** - 15/05/2021

In large-scale construction projects, such as building, road, and bridge development, the utilization of concrete is crucial to ensure structural rigidity. Consequently, the design and fabrication of affordable, portable concrete mixers is essential, enabling individuals and small-scale contractors to access this critical equipment. The drum, shaft, and paddles form the core components of these mixers. Designed to cater to small-batch requirements or scenarios where large-scale, ready-mixed concrete delivery is impractical, these portable mixers offer versatility and convenience. Their applications are diverse, ranging from transporting concrete from ready-mix plants to job sites, operating as on-site batch plants, or being integrated into rental equipment fleets, thereby enhancing productivity and efficiency in construction operations.

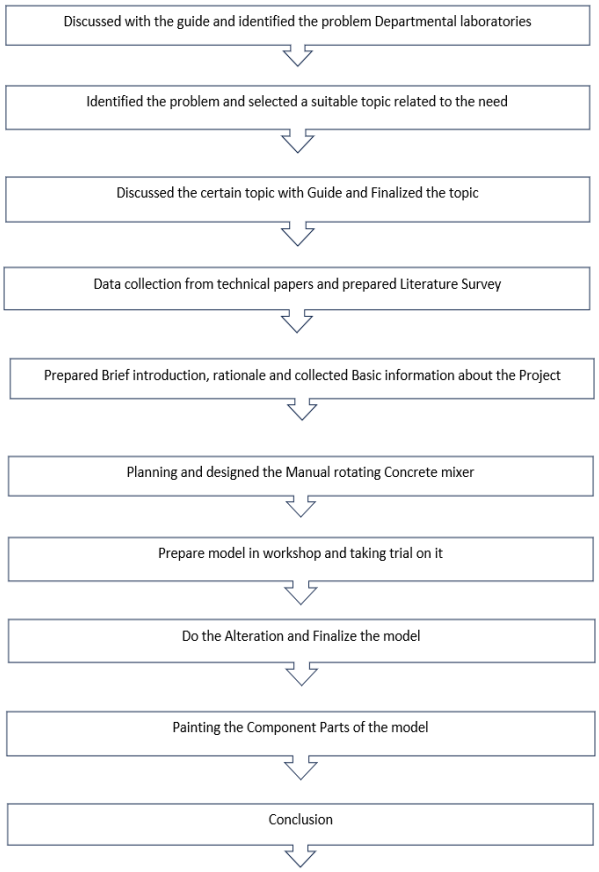
2.4 Design and Analysis of a Portable Concrete Mixer

- **Author: -** Arjun Desai, Harsh Bhutani, Abhishek Chavan, Atharva Chitnis, Dharmesh Chowdhary
- **Published on :** - 07/07/ 2021

Concrete is a fundamental construction material, widely regarded as one of the most extensively utilized building materials globally. Its demand surpasses that of steel, wood, plastics, and other metals combined, with a projected ready-mix concrete industry revenue of over $600 billion by 2025. The concrete mixer has become an indispensable machine on construction sites, ensuring the homogeneous blending of water, aggregate materials (sand or gravel), and cement to produce concrete. A crucial component of any concrete mixer is the drum, which facilitates the mixing process.

Portable concrete mixers are ideal for small-scale projects or low-volume applications, providing workers with sufficient time to mix and utilize the concrete before it sets. This project involved the design of a portable concrete mixer, with a subsequent safety analysis to verify the design's integrity. Specific boundary conditions were applied, and the deformation of each component was carefully observed to ensure the mixer's safety and efficacy.

3. METHODOLOGY



4.DETAILS OF DESIGN, WORKING AND PROCESSES

Stability – Provides a firm base, preventing the mixer from tipping over during operation.

Elevation for Easy Discharge – Raises the mixer to a convenient height, allowing easy pouring of mixed concrete into wheelbarrows or buckets.

Portability – Many stands come with wheels or are lightweight, making it easy to move the mixer around the worksite.

Reduced Vibration & Noise – A sturdy stand absorbs vibrations, minimizing noise and improving machine longevity.

Improved Operator Comfort – Elevating the mixer reduces strain on workers, making loading and unloading more ergonomic.

Better Durability – Protects the mixer's motor and components from direct contact with the ground, reducing wear and tear.

Fig -1: Based Framed Structure of Portable Concrete Mixture

Mixing Blade

Uniform Mixing – Blades help in thoroughly mixing cement, sand, aggregate, and water to achieve a consistent mixture.

Breaking Lumps – They break down clumps of cement and aggregates, ensuring even distribution.

Enhancing Workability – Proper mixing results in a concrete mix with good flowability and workability.

Reducing Segregation – The movement of blades prevents separation of aggregates and ensures a uniform mixture.

Speeding Up the Process – Compared to manual mixing, blades in a concrete mixer significantly reduce mixing time.

Ensuring Strength & Quality – Properly mixed concrete enhances structural strength and durability

Fig -2: Mixing Blade Of Concrete Mixture

Mixing Drum

Efficient Mixing – Ensures uniform blending of cement, aggregates, sand, and water for a consistent concrete mix.

Rotational Motion for Homogeneity – The drum rotates continuously, preventing material segregation and ensuring even distribution.

Time-Saving – Speeds up the mixing process compared to manual methods.

Durability – Made from heavy-duty steel or other sturdy materials to withstand continuous mixing and abrasion.

Tilt Mechanism for Easy Discharge – Many drums are designed to tilt for convenient pouring of the mixed concrete.

Prevents Material Wastage – Enclosed design minimizes spillage and material loss during mixing.

Calculation of DrumHeight of drum = 0.91m

Diameter of drum= 0.60m

Therefore,

Volume of the drum = πr^2 **h**

= π0.3² x 0.91

= 0.25 cu.m= 0.3 cu.m

Fig-3: Mixing Drum Mounted on Framed Structure

CAD DRAWING OF PORTABLE CONCRETE MIXTURE

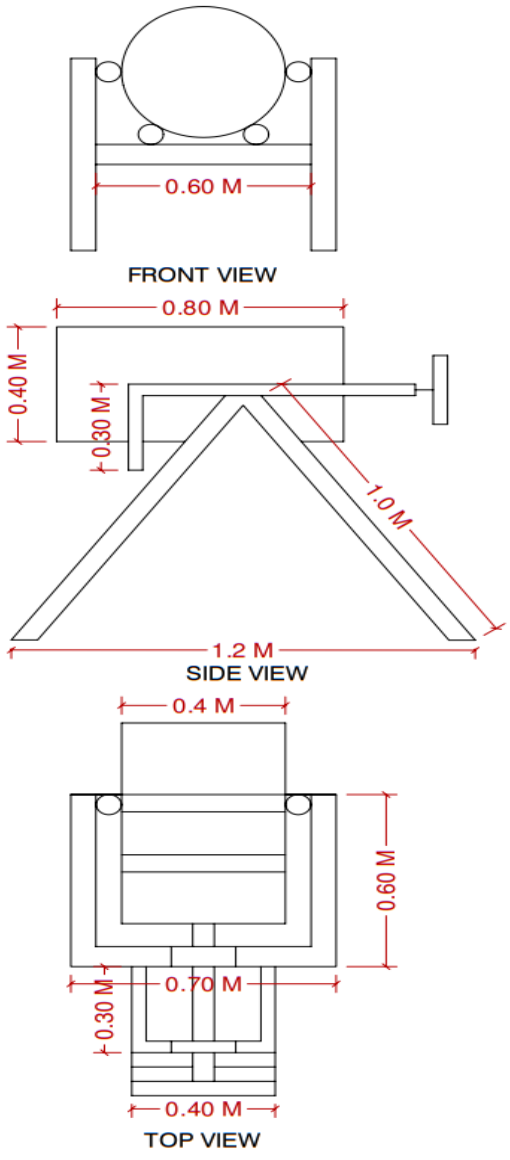


Fig-4 : Cad Drawing of Portable Concrete Mixture

Table -1 : Estimating and Costing of Materials

Sr No	Material Specification	QTY	Rates
1)	Square Tubes Size 2x2 inch Length 20 feet	2	2000
2)	Plastic Drum Capacity 100 litres	1	650
3)	Round Shaft rod 1 inch	1	750
4)	UPC Blog bearings	2	720
5)	Round Wheel	2	700
6)	Trolly wheels	4	400
7)	Steel plate Square Hinges	2	100
8)	Electrodes	30	500
9)	Nut Bolt 3inch	4	60
10)	Nut Bolt 2inch	8	70
11)	Nut Bolt 1inch	8	70
12)	Mseal for Steel	2	40
13)	Mseal for Plastic	4	40
14)	Steel Plate Washer	40	50
15)	Turpentine Thinner 500ml	1	90
16)	Red Primer 500ml	1	160
17)	Black Oil Paint 500ml	1	200
18)	Polish Blade	1	50
19)	Steel Round pipe 12 inch	1	200
20)	1 inch Thickness Steel plates	3	150
Total			**7000/-**

3. CONCLUSIONS AND FUTURE SCOPE

In conclusion, the study on portable concrete mixers has been successfully completed, achieving its objectives of investigating different types of concrete mixers, designing a portable concrete mixer, estimating its costs, and preparing the necessary equipment based on the suggested method. This comprehensive study provides a valuable reference for the design, development, and implementation of portable concrete mixers, offering a practical solution for construction projects that require efficient and cost-effective concrete mixing. The findings of this study can be used as a guideline for future projects, ensuring the creation of portable concrete mixers that meet the needs of the construction industry.

FUTURE SCOPE

1. Semi-Automation and Motorized Assistance:

- Integrating low-power electric motors or pedal-operated mechanisms to reduce manual effort.
- Introducing battery-powered or solar-powered options for areas without electricity.

2. Improved Drum and Blade Design:

- Developing self-cleaning drum surfaces to prevent material sticking and reduce cleaning time.
- Optimizing blade geometry to enhance mixing efficiency and reduce time required for a uniform mix.

3. Use of Lightweight and Durable Materials:

- Replacing traditional heavy steel with corrosion-resistant alloys, fiber-reinforced polymers, or composite materials.
- Making the overall structure more portable without compromising strength and durability.

4. Hybrid Mixing Mechanisms:

- Combining manual operation with alternative power sources like compressed air, hydraulic systems, or mechanical cranks for better performance.

5. Smart Monitoring and IoT Integration:

- Adding simple digital indicators or sensors to monitor mixing time, consistency, and ingredient proportions.
- Implementing mobile app-based tracking for small-scale contractors to improve quality control.

6. Eco-Friendly and Sustainable Designs:

- Using recycled or sustainable materials in construction.
- Designing mixers that require less energy and water for operation.

7. Multi-Purpose Functionality:

- Designing mixers that can also mix mortar, plaster, or other construction materials.
- Creating modular attachments for different mixing needs

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