

Horizontal Axis Electric Operated Concrete Mixer

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ABSTRACT: This paper contains design and fabrication of concrete mixer. Mixer is widely used to make a concrete mixture which is used for construction and small scale construction to make a concrete block, pipe, sheets, houses etc. it is observed that for small scale construction and in rural area manual mixing method is used because of expensive mechanized mixer thus, design and fabrication of mixer have been done and presented. The time taken for mixing the concrete by this mixer is less as compared to existing mixers.

KEYWORDS: Electric motor, Concrete mixture, Blades, Horizontal axis, CATIA model, Design etc.

I. INTRODUCTION

A concrete mixer is also commonly called a cement mixer, is a device that homogeneously combines cement, aggregate such as sand or gravel, and water to form concrete. A typical concrete mixer uses a revolving drum to mix the components. In a rural area manual concrete mixing method is used to produce a mixture of components.[1] Manual mixing method takes a lot of time to produce a mixture and also it requires large human effort to mix it. But it cannot produce homogeneous mixture. In a market there are many concrete mixers which are too expensive and because of this small scale construction workers do not use a concrete mixer.

In this project with the title "Horizontal Axis Electric Operated Concrete Mixer", we were planning for design and fabrication of a concrete mixer. This project brought advantages over manual mixing and expensive mechanized concrete mixer. In this project Drum is stationary and blade is revolving inside the drum. We used 1 HP motor to blend the Concrete properly. We used a pulley and belt arrangement to transmit the power from a motor to shaft on which blades are fixed and this shaft is revolving inside the stationary drum. Ribbon type of blades is used to blend the components. By using ribbon type of blades we can easily produce homogeneous mixture throughout the batch. This project reduces the human effort compared manual mixing and brought great advantage over expensive mechanized concrete mixer. It mixes the cement, aggregate and sand properly and increases the productivity. It takes a less time to mix the concrete. Also it produces quality and homogeneous mixture in less time and effort.[2]



Fig.1 Manufactured Concrete Mixer

II. LITERATURE SURVEY

1] "Concrete Mixing Methods and Concrete Mixers: State of the Art Journal of Research of the National Institute of Standards and Technology. By Chiara F. Ferraris".

States that, The efficiency parameter of a mixer are affected by the order in which the various constituents of the concrete are introduced into this mixer, the type of mixer, and the type and magnitude of forces on the shaft and the direction they acted in. and used to improve the mixing quality, to reduce the stirring resistance, to reduce the failure of shaft and blades and power consumption.

2] "Design and fabrication of an industrial mixer: International Journal of practices and technologies ISSN 1583-1078 Issue 20, January-June 2012. By Thompson Aguheva"

States that, The machine was designed using AUTOCAD 2D/3D design software and proper material selection was done before the assembling and fabrication of parts and used to avoid the bending of shaft, failure of other components of machine."

3] "3D Motion mixer for material: International journal of pure and applied research in Engineering & Technology. By P. S. KULAT1, PROF. R. B. CHADGE".

States that, In order to improve both the mixing and time of mixing makes the surface layer known as the case significantly harder than the residual material known as the core and used mix different materials using shaft and different types of blades to make a good quality homogeneous mixture.

4] "Study of planetary concrete mixer: International journal of latest research in engineering and technology. By Siddhant Dange, Saket Sant, Anish Sali, Parthon Pethodam, Sandeep Belgamwar".

States that, The mixing is certainly the most critical phase of the concrete production process and the quality of the concrete depends heavily on the quality of the mixer. Due to the efficiency of the compulsory mixing action, the planetary mixers meet the requirements of various production processes. The mixing flow is highly efficient due to integrated action of central stars combined with different peripheral scrapers. This research paper aims to study the various types of concrete mixers, discuss the advantages of the planetary concrete mixer over all the other type of mixers, and study the various components of the planetary mixer in detail.

III. DESIGN AND SPECIFICATION

Drum:

A concrete mixer is a device that homogeneously combines cement, sand or gravel, and water to form concrete. A concrete mixer uses a drum which is stationary. And this drum is supported by a pedestals bearing and shaft is revolving inside it. The mixture is poured manually inside it and unloaded by tilting the drum. Hopper is provided to pour the components such as cement, sand and gravel and hopper also helps to unload the mixture from drum.

Calculations for Design of Drum:

Step 1: Total mass of Mixture:

Total mass of mixture in the drum = Mass of cement (kg) + Mass of Sand (kg) + Mass of Gravel (kg) + Mass of Water (kg)

= 10 + 20 + 30 + 5

= 65 kg = Apprx. 70 kg

For ease of operation,

Assumed mass = 1.5 *70= 105 kg

Step 2: Finding out volumetric capacity

Density of Concrete = 2400 kg/m^3

$$2400 = 105/v$$

$$V = 0.04375 \text{ m}^3$$

Step 3: Finding out diameter of drum

$$\text{Volume of cylinder (v)} = \pi/4 D^2 * L$$

Length of drum is assumed to 0.48 m

So, Diameter of drum, $D = 0.34 \text{ m}$

$$= \text{Aprx. } 0.35 \text{ m.}$$

New Volume of Drum = $\pi/4 D^2 * L$

$$= \pi/4 * 0.52 * 0.8 = 0.0461 \text{ m}^3$$

Step 4: selection of thickness of drum

We have selected thickness of drum from "IS: 8500-1977"

Thickness of drum = 6 mm

Drum Specifications:

- Thickness of drum = 6 mm
- Diameter of drum = 350 mm
- Length of drum = 480 mm

CATIA Model of Drum:

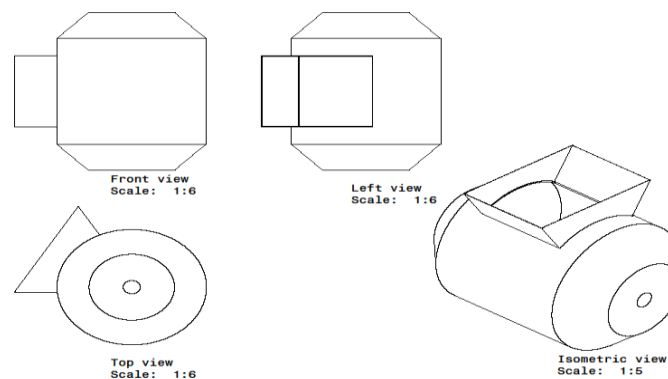


Fig.2 CATIA model of drum

Support and Frame Specifications:

- Height of support = 800 mm
- Width of support = 500 mm
- Length of frame = 580 mm

CATIA Model of Frame and Support:

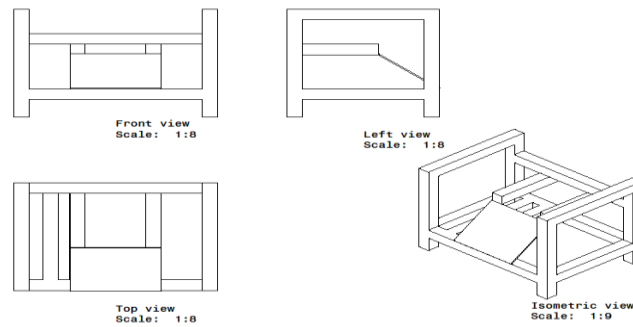


Fig.3 CATIA model of Frame and Support

Motor Specification:

- Electric motor 1HP
- RPM of motor = 1440
- RPM of shaft = 60
- Diameter of motor pulley = 50.8 mm

Torque Calculation:

Torque (T) = $9.5488 * \text{Power of Motor (HP)} / \text{RPM of shaft}$

$$T = (9.5488 * 1) / 60 = 0.16 \text{ N.m.}$$

Shaft:

Shaft of concrete mixer is placed at the centre of the drum. Blades are mounted on the shaft and shaft is mounted on the pedestal bearings. Also Pulley is mounted on the shaft. Intermediate pulley is used to reduce the rpm. We required a 60 rpm to rotate a shaft.

Position of Shaft: Shaft rotates inside the drum and blades are fixed on it.



Fig.4 Shape of Blade attached to shaft

Assembly of Machine:

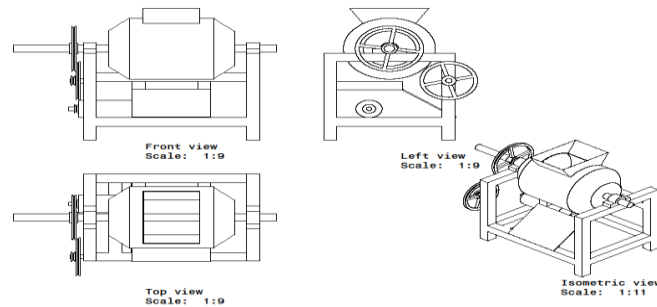


Fig.5 CATIA model of machine

IV. ADVANTAGES

Advantages:

1. Due to horizontal axis, lesser mixing time is required.
2. More homogeneous quality mixture is obtained due to compulsory mixing action.
3. Highly efficient in terms of power consumptions.
4. Less expensive to manufacture.

V. RESULTS

Comparison	Manual	Vertical mixer	Horizontal mixer
Method of mixing	Manual	Machine operated	Electric operated
Type of mixture	Concrete and mortar	Concrete	Both concrete and mortar
Time required	20 min for concrete and mortar	3 min for concrete	2 min for concrete and 1 min for mortar
Homogeneity	Uneven mixture	Homogeneous	Homogeneous

Table No.1

Table No. 1 shows the comparison of concrete mixing methods. This concrete mixer takes less time to mix the mixture of cement, sand and gravel as compared to manual as well as other concrete mixer. Its efficiency is high compared to other mixers.

VI. CONCLUSION

- With this Concrete Mixer, we can mix the mixture of cement and concrete by using electric power.
- The cost of mixer compared with the mixers used in daily practice is less.
- This mixer is portable and easy to operate.
- This mixer takes a less time to blend cement and sand.
- This mixer mixes cement and sand homogeneously and it also produces quality mixture.

- This mixer is useful in small scale construction and also in rural area where most of the workers uses a manually mixing method because of less expensive compared to other mixers.

REFERENCES

- [1] Ferraris, C.F., “Concrete Mixing Methods and Concrete Mixers: State of the Art”, Journal of Research of the National Institute of Standards and Technology, Vol. 106, No. 2, 391-399, 2001.
- [2] P. S. Kulat, PROF. R. B. Chadge. “3D Motion mixer for material”, International journal of pure and applied research in Engineering & Technology, International Journal of Pure and Applied Research in Engineering and Technology, Volume 2[9]: 97-102, ISSN: 2319-507X, 2014
- [3] Thompson Aguheva, “Design and Fabrication of an Industrial Mixer”, International Journal of Practices and Technologies, ISSN 1583-1078, Issue 20, January-June 2012.
- [4] Siddhant Dange, Saket Sant, Anish Sali, Partho Pethodam, Sandeep Belgamwar., “Study of planetary concrete mixer”, International journal of latest research in engineering and technology, ISSN 2454-5031, Volume 2, Issue 4, April 2016.
- [5] Amruta K. Wankhede, Dr. A.R. Sahu Design, “Modification and Analysis of Concrete Mixer Machine”, International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 3 Issue: 12 6613 – 6616, ISSN: 2321-8169, 2015.
- [6] Thompson Aguheva, “Design and Fabrication of an Industrial Mixer”, International Journal of Practices and Technologies, ISSN 1583-1078, Issue 20, January-June 2012
- [7] Chiara F. Ferraris, “The influence of mineral admixtures on the archeology of cement paste and concrete”, Cement and Concrete Research, Vol. 31, No.2, 245-255, 2001.
- [8] A. Annadurai, A. Ravichandran, “Development of mix design for high strength Concrete with Admixtures”, IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X, Volume 10, Issue 5, PP 22-27, Jan 2014

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