STUDY AND DESIGN PARAMETER OF SAND SCREENING MACHINE

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ABSTRACT:- Construction of buildings requires sand as an important ingredient Sand is used at different stages in construction right from the foundation to the finishing work i.e. plaster. This sand is needs to be screened properly for various stages in construction, i.e. size of sand for construction work is slightly coarse whereas that used for plaster work is fine. Conventionally screening is normally done manually using fixed screens or machines. This manual process time consuming and laborious takes a lot of time and cost. It is also observed that the conventional machine prove of no or little help as the sand needs to be manually transported and material handling takes place twice to get different sizes of sand[1].

These processes are carried out manually. Sieving of sand is carried out using rectangular mesh which is inclined at certain angle. This causes a relative motion between the particles and the sieve. Depending on their size the individual particles either pass through the sieve mesh or retained on the sieve surface. There are different machines that are being used for sand sieving processes. In our project the process will takes place automatically. Thus the time consumed during the whole process of preparing the concrete is reduced.

Keywords: Sieve machine, Characterizing, Design, Fabrication, Ergonomic design.

I. INTRODUCTION

Generally while preparing the concrete for construction purpose, the process of sieving are carried out manually. Sieving of sand is carried out using rectangular mesh which is inclined at certain angle. In the present sand sieving method, the sample is subjected to horizontal movement in accordance with the chosen method. This causes a relative motion between the particles and the sieve. Depending on their size the individual particles either pass through the sieve mesh or retained on the sieve surface. There are different machines that are being used for sand Sieving, but we demonstrate the design & fabrication of automatically driven sand sieving machine which have low cost and simple in operation.

This project focuses in design, fabrication of the mechanical part of machine and the system of the sieve machine. To achieve this project objective, this sieve machine body structure and mechanical system needs to concern some other criteria such as strength, safety and ergonomic design. This project flow must start from design, analysis, and lastly fabrication process Before develop the sieve machine, it must compare with other product in market. It is because to study the customer need and to create a new design with new feature.

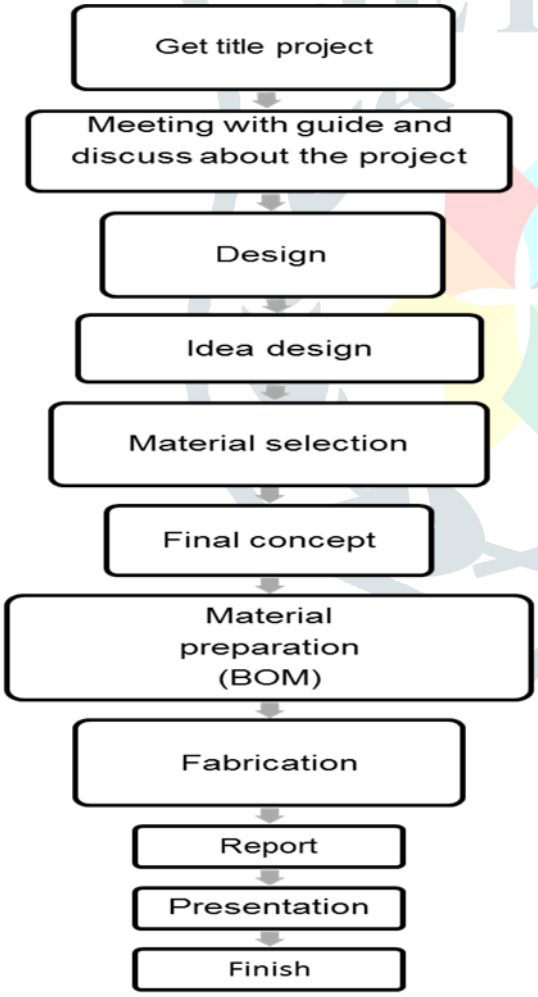
II. PROJECT PROBLEM STATEMENT

- The problem of size of sand in the market available. need to spend more money if we want the sand in specific size or category it will increase the budget and time to wait the supplier preparing the goods.
- Now days people always prefer the most suitable way to cut their cost and time. Example in a construction where they have to finish the work before the due date. His might be a problems. Since we have waiting long waiting for the good to arrive.
- However, sometime in big company there are high tech machine that can do this work sieving any sub stand or mixture. But sometime in construction required a special sieve machine that are comfortable and easy o use[3].
- Traditional method give low efficiency as it is operated manually but the automated sand sieving machine have higher efficiency
- Traditional method require more labour.
- Traditional method is more time consumed during the process of preparing the concrete.
- The cost of highly sophisticated machine is very high which is not affordable for small scale foundries and low level contractors.
- Modern machineries require high skill to operate.

III. DESIGN CONSIDERATIONS

- The device should be suitable for local manufacturing capabilities.
- The attachment should employ low-cost materials and manufacturing methods.
- It should be accessible and affordable by low-income groups, and should fulfil their basic need for mechanical power.
- It should be simple to manufacture, operate, maintain and repair.
- It should be as multi-purpose as possible, providing power for various agricultural implements and for small machines used in rural industry.
- It should employ locally available materials and skills. Standard steel pieces such as steel plates, iron rods, angle iron, and flat stock that are locally available should be used. Standard tools used in machine shop such as hack saw, files, punches, taps & dies; medium duty welder; drill press; small lathe and milling machine should be adequate to fabricate.
- The device should be able to transmit power to a variety of machines, and changing drive ratios should be as simple as possible. We decided that a V-belt and pulley arrangement would be most appropriate for this. Belts do not require the precise alignment that chains do. Belts can even accommodate pulleys that are slightly skewed with respect to each other. Changing drive ratios is as easy as changing pulleys. Also, belts are reasonably efficient.
- Excessive weight should be avoided, as durability is a prime consideration. The criteria that must be considered in designing the sieve machine are:

IV. RESEARCH AND METHODOLOGY



V. WORKING PRINCIPLE

The Horizontal sieving machine is very easy to construct and can be operated easily. It is very economic among this kind of machines. This project is fabricated with the help of parts like a motor, crank and slider link mechanism, bearing, caster wheels, sieving box. The horizontal sieving machine is worked on the basis of crank and slider mechanism. Here crank is attached to the sieve box the power is given by motor through pulley belt arrangement. The rail track is attached at the base in which the sieving box moves in it. The sieving box fixed with the crank shaft in order to move when the crank shaft is reciprocated. The sieving box is placed inside the rail track and the machine is started. When the sieving box moves in the reciprocating motion the sieving process is performed[5].

VI. COMPONENT

Components used in sand filter:
1. Slider crank arrangement
2. Caster wheels
3. Supported Frame
4. Shaft
5. Bearings
6. Metallic net (Sieve)

VII. CALCULATIONS

Speed (N_1)=1440rpm

D_1 = 3cm…….Dia. of motor pulley

D_2=20cm .....Dia. of Smaller pulley

$$\frac{N1}{N2}=\frac{D2}{D1}$$

N_2=216rpm

N_2=N_3=216rpm

D_3=3cm

D_4=26cm

$$\frac{N4}{N3}=\frac{D3}{D4}$$

N_4=216×(3÷26)

N_4=25rpm –cranks peed

w=angular velocity

$$w=\frac{(2\times3.14\times N1)}{60}$$

$$w=\frac{2\times3.14\times1440}{60}$$

w=2.61rad/sec

Displacement Calculation

l= Connecting rod lengh

r= Crank radius

X_{max}=Max displacement

$$X_{max}=r(1-\cos\theta)+\frac{(\sin\theta)2}{2n}$$

Where n $=\frac{l}{r}$ ==4.67

X_{max}=15cm=0.15m

Velocity Calculation

Velocity (v)=r×w

V=0.0075×2.61

V=0.1963m/sec

Acceleration Calculation

Acceleration=a=r×w^2 $(1+\frac{1}{n})$

a=0.6203m/sec^2

Work done

Work=m×g×x

work=2.5×9.81×0.15

Work=8.67 Nm

Stroke length (L)=2×R

L=0.15m

Shaft design calculation

P=0.18KW

N_1=1440rpm

P=(2×3.14×N×T)/60

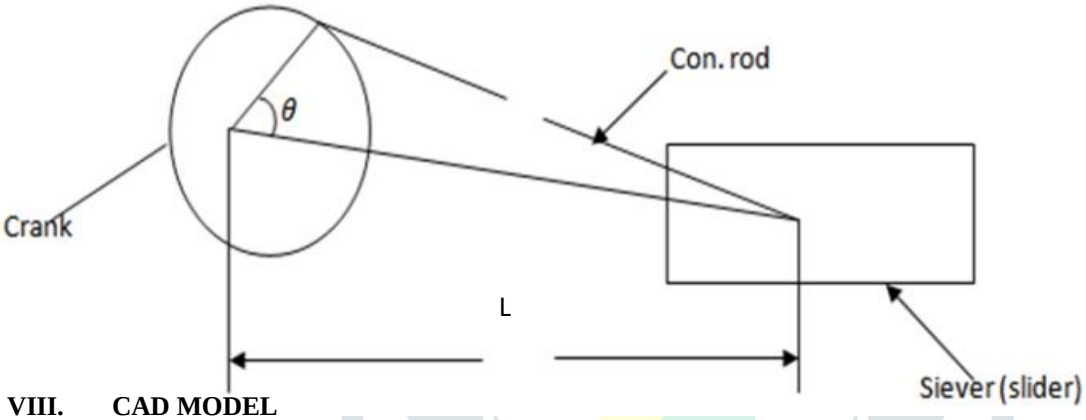
$0.18=\frac{(2\times3.14\times1440\times T)}{60}$

T=1.19Nm

$T=(\frac{\pi}{16})\times\zeta\times D_S^2$ .....(Where D_S=Diameter of shaft)

D_S=25.26cm

D_{std}=25cm



VIII. CAD MODEL

IX. SCOPE FOR FUTURE WORK

The project can be made for higher capacities by increasing the dimension and improving the design aspects. Based on the required sand particle size, the mesh can be changed. The machine can be operated using solar energy also which is economically useful.

X. CONCLUSION

In this research study, the mild steel failure problems encountered by loads were successfully. Thus a low cost and simple design motor operated sand filter and is fabricated. This machine reduces the human effort and hence we don't need multiple persons to filter the sand.

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