Design and Fabrication of Automatically Driven Sand Sieving 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. 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.

Key words: 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 machin 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.

PROJECT PROBLEM STATEMENT

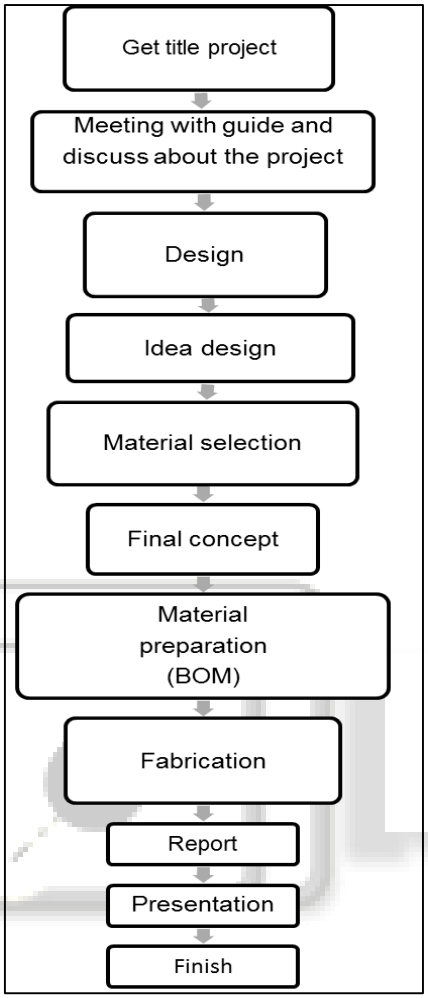
- The problem of size of sand in the market available. need to spend more money if we want the sand in specific size or category it will increase the budget and time to wait the supplier preparing the goods.
- Now days people always prefer the most suitable way to cut their cost and time. Example in 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.
- 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.

II. 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:

a) Durability: sieve machine must be durable when rotate and vibrate.
b) Material : The material that will be used must be suitable to fabricate the Sieve machine and easy to get.

III. RESEARCH AND METHODOLOGY



IV. 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.

V. COMPONENT

Components used in sand filter:
A. Slider crank arrangement
B. Caster wheels
C. Supported Frame
D. Shaft
E. Bearings
F. Metallic net (Sieve)

A. SLIDER CRANK MECHANISM

Slider-crank mechanism, arrangement of mechanical parts designed to convert straight-line motion to rotary motion, as in a reciprocating piston engine, or to convert rotary motion to straight-line motion, as in a reciprocating piston pump. This machanism is used in our project to provide reciprocating motion to sieve box

B. Caster Wheel

A caster (also castor according to some dictionaries) is a wheeled device typically mounted to a larger object that enables relatively easy rolling movement of the object. Casters are essentially special housings that include a wheel, facilitating the installation of wheels on objects. Casters are found virtually everywhere, from office desk chairs to shipyards, from hospital beds to automotive factories. They range in size from the very small furniture casters to massive industrial casters, and individual load capacities span 100 pounds (45 kg) or less to 100,000 pounds (45 t). Wheel materials include cast iron, plastic, rubber, polyurethane, forged steel, stainless steel, aluminum, and more.

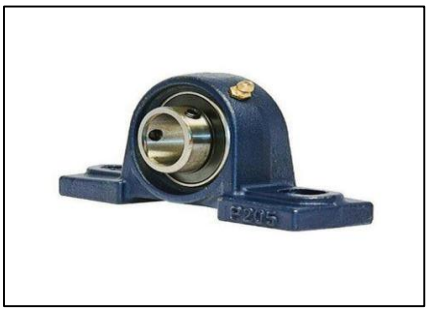
C. Supported Frame

The supported frame is used to support the components. The total arrangement is depends on this frame. This frame is made of iron or mild steel.

D. Shaft:

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to machine which absorbs power. The various members such as pulleys and gears are mounted on it.

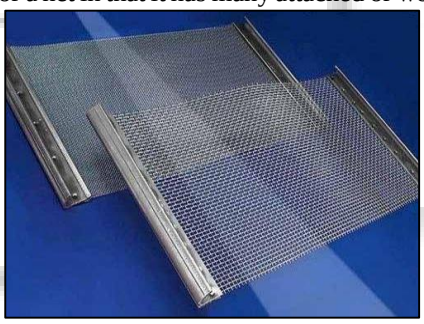
E. Bearings:



A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

F. Metallic Net:

A metal net is a barrier made of connected strands of metal, fiber, or other flexible or ductile materials. A mesh is similar to a web or a net in that it has many attached or woven strands.



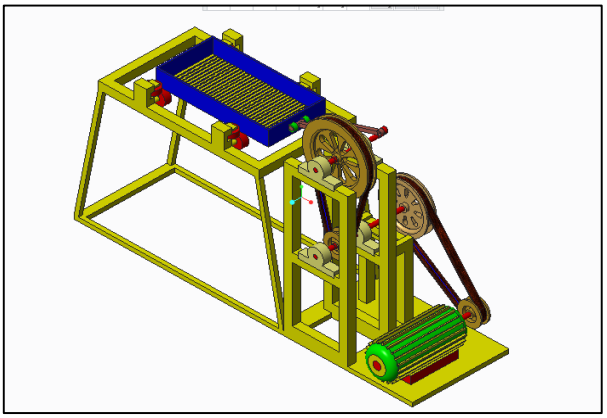
VI. WORKING PROCESS

The figure shows the sand filter and separator. In this the whole work is based on the mechanism of crank and slider mechanism. The rotation of the crank transfers the motion to the movement of rectangular shape filter.

It consists of the pulley and belt arrangement which rotates the crank and through it slider consists of oscillating mechanism. The power is transmitted to the crank and slider mechanism. This mechanism is used to rotate the crank, the pulley which is having an extended rod is connected to the sliding portion of the rectangular plate directly by means of a linkage. The rectangular plate is passed through the guide ways by means of maintaining the cutting axis. The rectangular sieve moves linearly on guided path.

The crank is connected to the flywheel which is transfer the motion from one to another. The flywheel is connected to another wheel which is connected to the rectangular filter plate through belt. The rotating motion of the electrical motor converts to the sliding motion using two flywheels and belt. The sliding crank mechanism is used in this project. The flywheel which is placed at the top is used as crank and connecting rod in between the rectangular plate and flywheel.

VII. CAD MODEL



VIII. 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

IX. CONCLUSIONS

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.

REFERENCES

[1] Machine Design, Robert. L. Norton, Pearson Education Asia, 2001.
[2] Machine Design, A CAD Approach, Andrew D Dimarogonas, John Wiley, Inc, 2001
[3] Design of machine elements by JBK Das and PL Srinivasamurthy, Sapna Book house, 2015.
[4] Ribbon blenders: A best practices guide by Charles Ross and son company.
[5] Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2012-13 Editions.
[6] Standard Classification for Cost Estimate Classification System, ASTM E2516-11.
[7] Bill of Materials. Inventory Interface. Gerald Drouillard, December 28, 2001. Retrieved June 7, 2011.
[8] Vatroslav grubisic, fatigue failure of automobile components, fraunhofer institute of reliability, 12th oct 2004. Tokyo, pp. 01-37.
[9] A.K.Nachimuthu, 2014 "Analysis and optimizing connecting rod for weight and cost reduction", International Journal of Research and Innovation in Engineering Technology.
[10] Ashok G.Ambekar, mechanism and machine theory, prentice-hall india, 2007, newdelhi, pp800-805.

