

Design and Fabrication of Portable and Foldable Sand Filter Machine

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Abstract: *In construction of buildings, sand plays a very important role as a ingredient needs for construction work. Sand is employed at completely different stages in construction right from the muse to the finishing work i.e., plaster. This sand needs to be filter properly according to their usage in construction, i.e., size of sand for construction work is slightly of large grain size whereas that used for plaster work is very fine. Conventionally screening is often done manually with the help of single inclined screen. This manual method is time overwhelming and takes a great deal of your time and value. it's conjointly determined that the standard machine prove of no or very little facilitate because the sand has to be manually transported and material handling takes place doubly to urge completely different sizes of sand. The paper reviews some machines which associate in nursing analysis within the same space then goes into the necessity and utility of a multi-screen machine for totally automatic multi-level screening.*

Keywords: Multi-Screen, Inclination, sieve/screen

I. INTRODUCTION

The building construction can't be barren of use of sand because the sand becomes the integral a part of the development method. Sand is employed at totally different stages in construction right from the inspiration building work to the finishing work i.e., plaster. it's obvious that demand of sand size at different stages at the location is required to be screened. Presently it's determined that the sand screening activity is finished manually or in some cases with the help of some machine. however, these machines are having single screen and so just one size are separated at a time thus it takes heaps of your time and labour. Taking this into thought a range of researches and developers have developed a spectrum of machines to resolve this drawback many of them are mentioned within the section below.

The procedure of sand separation was done physically. Separating of sand is completed by the inclined screened, the problem with this technique is that most of the sand pass by without touching the screen, which causes the sand to filter again resulting in lower cleaning efficiency. Sand is employed in development, manufacturing and diverse ventures. Sand needs to be separated from secondary particles, stones and alternative immense particles before it utilizes. Our framework advances management worked sand separating framework that naturally channels the sand utilizing responding movement of screen poured on that. the first sand separation is finished to get rid of the sand with a much bigger grain particles also the second sand separation is finished to get rid of the sand with a size. In case of agriculture purpose only there should be replacing of screened so that it can also be used as a grain filtration.

II. METHODOLOGY

The Method is followed to complete a project is as follows

SELECTION: Selection of Project

SURVEY: Existing product = Scope for Improvement

DESIGN: Design of Machine and Calculations

FABRICATIONS: Procurement of Material = Cutting and Welding

ASSEMBLY: Fitting all parts together

TESTING: Testing of machine

RESULT: Success of Project

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DOI: 10.48175/IJARSCT-4283

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III. PROBLEM STATEMENT

As in the previous technique of sand filtration by using incline screened, there is a problem with the sand filtration as most of the sand remain untouched and pass by over the screen which result in decreasing cleaning efficiency and the sand needs to be filter again.

IV. COMPONENTS DETAILS

There are many components used in the project which are as follows

1. **MS Bar**- Here the MS bar of L section is used to fabricated main machine frame and also different foundation used for supporting as per requirement. The thickness of this bar is about 3-4 mm. The flat MS bar is also used for making sieve frame.
2. **Aluminum Plate**- It is used for making the sieve's frame guides. because of its easy foldability and light in weight making it suitable for the frame work. The thickness of this plate is 1mm.
3. **Folding joints**- This folding joint is used for the folding mechanism in the legs of the main frame. It provides 90-degree rotation to the legs of the main frame.
4. **Sliders**- The drawer slider is used for reciprocating movement of the sieve frame over the main frame. two sliders are used on the both side of the frame.
5. **Springs**- The compression spring is used to hold another sieve which is bottom next to the main sieve. The total 4 springs are used to support the frame. The purpose of this spring is to provide support and allow frame to vibrate, if vibrating motion is provided.
6. **Sieve/Screen**- This sand filter machine uses the sand filter net with having suitable size. The size of the sand filter net hole is not too big and not too small. So, the sand might able to go through over the net. Here we have used two different sieves having different holes size.
7. **Motor**- There are two motors used in this project. One is having high torque with low speed to reciprocate first sieves and another motor is having high speed and low torque for vibration purpose in second sieve.

V. MACHINE DESCRIPTION

The automatic sand filter machine work on the principle of single slider crank mechanism. There is a frame on which sieve is mounted, the frame which is connected to the crank with the help of connecting rod, is rotate by the motor. The rotation of the motor is converted into the linear motion of the frame which result in sand filtration.

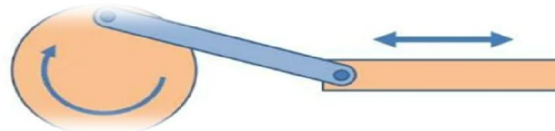


Fig.1 Single slider crank mechanism

The second sieve is provided with the vibration motor, as the motor rotate it's produced vibration in the seconds sieve which result in sand filtration. The second sieve is supported by springs so that it allows the sieve to vibrate as the motor spin with unbalance weight.

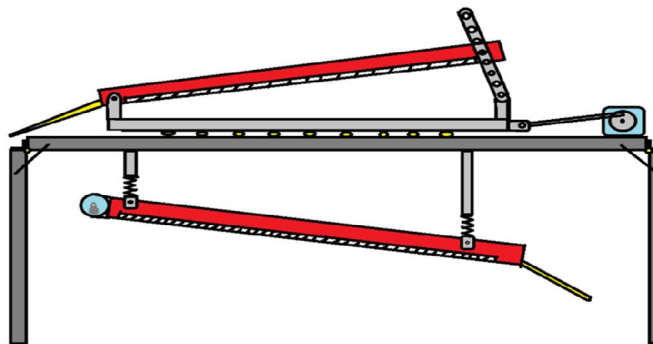


Fig.2 Simple sketch of Modified Project

VI. MODIFICATIONS

Here some modifications done in this Project as follows

1. **Foldable-** In this modification, we try to make main frame foldable by simply providing foldable joints on to the legs. So that whenever there is need of transport of machine it should be compact after removing all attachable.
2. **Inclination adjustment-** In most of the existing machine there is no inclination adjustment of sieve/screen is provided. It is necessary to provide so that we can change inclination as per our requirements.
3. **Attachable and removable sieve/screen-** In this modification, we make sieve frame in such a way that we can easily replace sieve/screen from sieve frame as per our requirement. Suppose if you want grain filtration instead of sand just simply change the sieve from sieve frame.

VII. CALCULATIONS

MOTOR CALCULATIONS- Suppose if you design for 20 kg of sand then,

Motor torque

$$T = \text{POWER}/\text{ANG. VEL} = 375/115.17 = 3.256 \text{ NM POWER} = 0.5 \text{ HP} = 375 \text{ W}$$

$$\omega = 2\pi N/60 = 2\pi \times 1100/60 = 115.17 \text{ rad/sec}$$

Required Torque

$$T = F \times R = 20 \times 9.81 \times 0.050 = 9.81 \text{ NM}$$

Torque provided by motor at frame

$$T = 375 \times 60/2\pi \times 343 = 10.44 \text{ NM}$$

Machine efficiency

$$\text{Power for 1 hr} = 375 \text{ WHR} = 0.375 \text{ KWHR}$$

$$\text{For 5 hr a day, then for a month} = 0.375 \times 5 \times 30 = 56.25 \text{ UNITS}$$

VIII. CONCLUSION

We have successfully done the modification in the existing sand filtering machine. We also make it suitable for grain filtration for agricultural purpose.

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