DESIGN AND EXPERIMENTAL STUDY OF AUTOMATIC SAND SIEVING MACHINE

[1]MIDTHUR A SALMAN KHAN, [2]MOHAMMED SUHAIB F, [3]NOUFAL ASHFACK J, [4]SAK SADAK AZARUDEEN, [5]M SALMAN KHAN
[1]Assistant professor, [2,3,4,5] Students,
[1]Department of Mechanical Engineering,
[1]Dhaanish Ahmed College of Engineering, Chennai, India

Abstract: Silicon dioxide is used in construction, manufacturing and many industries. It needs to be filtered from unnecessary particles like stones and dead leaves. In this project, a fully automatic sand sieving machine that separates waste particles is designed. The main theme of this concept is to overcome the human effort involved in the sand filtering process during construction and also to make the machine simpler. This machine works on the principle of slider crank mechanism. The project is more concentrated on safety as well as its ergonomic design.

Keywords: **Silicon dioxide, Sieving machine, Sand filtration**

INTRODUCTION:

Sieving machine is generally designed in order to reduce the time factor as well as the human factor involved in this teddy process. Sieving process is generally a long time role played in the construction and industrial areas. In metropolitan areas, the customers are expecting to have large production with minimum investment. Depending upon the types of particles to be separated, the holes in the mesh net may vary. Instead of spending money in the worker's wages, they could buy a simple machine which works electrically. From above all factors, the machine is designed more simple and its proved to work under high production rate. The main problem identified in this process is the unavailability of different sizes of sand in the market. We need to spend more money if we want a desired and specific size of sand. According to the customer's needs, the budget investment as well as the time consumption may vary to prepare the goods for the construction works. Our project finds a place in this key area. Instead of providing manual workers for sieving operation we motivate to provide automatic sieving machine which separates the waste particles is designed. Our paper concentrates on the usage of electrical motor for sieving operation. It consists of different types of layers, so the output sand may be obtained as per the required sizes.

WORKING PRINCIPLE:

This machine works on the principle of slider crank mechanism. Slider crank mechanism is a process of converting the rotational motion of a body into a reciprocating motion by means of a rotating driving beam, a connecting rod and a sliding body. The design of the sieve is based on material selection as well as to work safe and more efficient. The material used in each design influence the selection thing because we need an absolutely light material suitable with product size. Almost several numbers of designs were put in order to overcome the drawbacks that exist in the current models. Then the final design is selected and it is given proper dimensions in the Solid works design software. The criteria that are considered in design of sieve machine are: **Durability**: The machine must be durable when it's rotating and also when it's operating under high load condition. Therefore a suitable material having high strength and toughness is taken. **Cost**: It depends on the material and manufacturing processes. It should reduce the cost to the minimum. The sieve machine is designed to work in slider crank mechanism. The components which are used to produce

this machine are motor, crank, connecting rod and sieve net of different mesh sizes, supporting meshes, and base frame. The input rotary motion is provided by the DC electric motor. The crank is designed according to the suitable radius and it's connected to the motor shaft. One end of the connecting rod ids connected to the crank and another end is connected to the sieve net and the sieve net is allowed to slide freely over the wheels that are fixed in the collector box. So when the input is given, the power flows through the motor which actuates the motor shaft and the motor begins to rotate. As a result, the crank also rotates along with the motor. Now the rotating motion is converted into a reciprocating motion by means of the connecting rod. As a result, the sieve net begins to reciprocate in the sliding chamber. The filtered sand is collected separately in the collector box.

CONCEPTUAL DIAGRAM:

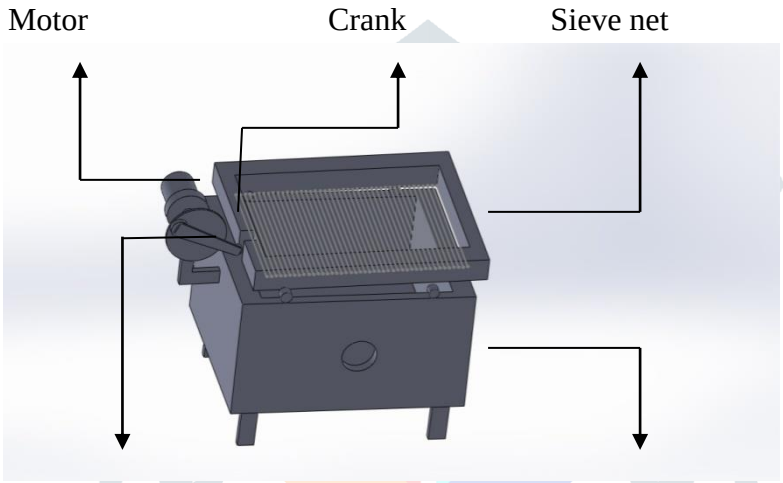

Figure-1

The conceptual diagram gives the idea about the working principle of this machine. In this paper as we described earlier, the machine works on the principle of slider crank mechanism. The primary electric motor is connected to the crank wheel externally and as a result, when the motor rotates on its axis, correspondingly the crank also rotates. The rotary motion of the crank wheel is converted into a translating motion of the sieve net by a means of a connecting rod. The collector box made up of cast iron is used to collect the pure sand which contains no impurities. To avoid the friction between the sliding mesh net and collector box, small rotary wheels are used. A small circular vent is provided in the walls of the collector box to collect the output sand.

VARIOUS VIEWS OF MODELLED DIAGRAM

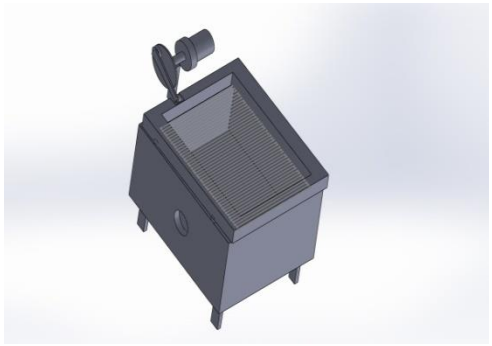

Figure-2

Figure-3

Figure 1 & 2 – It represents the left side view and the right side view of our proposed sand sieving machine diagrams.

TYPES OF SIEVE NETS

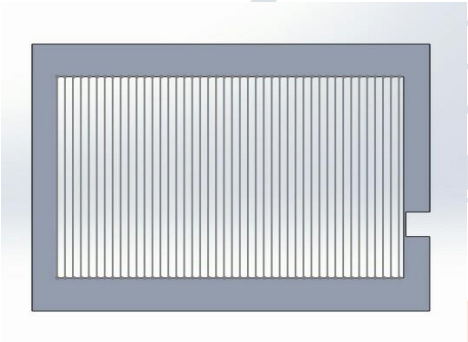

Figure-4

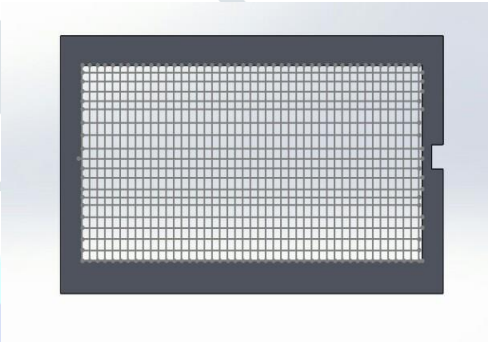

Figure-5

Figure 4 - This kind of sieve net is used to filter large sized stones and dead leaves and as a result it gives sand without stones and pebbles.

Figure 5 - This kind of sieve net is used to filter small sized impurities and as a result it gives a sand at micron level purity and as a result from two level filters, the output is completely pure and it is assured to be directly used in further constructional and manufacturing processes.

CONCLUSION:

1. The sieve machine designed is given the overall output efficiency of about 70% under normal working conditions.
2. Even though the machine is small, it proves to work under high production rates of pure sand up to 110kg/hr under normal working conditions.

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