International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

DESIGN AND FABRICATION OF AUTOMATED SIEVE MACHINE

Satyam Ganeshsinh Nakoriya[1], Anirudha Vinayak Pendke[2], Durgesh Yashvantrao Sonvane[3], Vishal Ishwar Patil[4], Asst Prof. Sandesh Gotekar[5], Asst Prof. Pratik Chaphale[6]

sandeshgotekar@gmail.com, chaphale.pratik@gmail.com

[1234]Student, Mechanical Engg. Department, VIT, Nagpur

[56]Asst. Professor, Mechanical Engg. Department, VIT, Nagpur

---

Abstract - The paper describes the basic model and operation of a smart multifunctional sieving machine. The sieving machine is a multi-layer sieving machine that can be used for a variety of tasks such as sieving sand, eliminating stone from grains, and so on. The size and number of sieves may be adjusted depending on the need. This article covers the idea of the Design and Fabrication of a Multi-purpose Sieving Machine, which was primarily completed for manufacturing-based enterprises. Because of technological innovation, every work in today's world has become faster and faster, and every industry aspires to retain a high production rate while preserving the quality and standard of the product at a low average cost. We created a conceptual idea of a machine that can conduct several tasks concurrently and quickly. In this machine, we drive to the main shaft with a motor that is directly connected to the slider-crank mechanism; the slider-crank mechanism is employed in the sieving operation. With the assistance of a wiper motor, the table is fastened with a crank that rotates the tray to vibrate it and function as a separator. Consequently, the purpose of designing and manufacturing the Sieving Machine is to assist industrialists and farmers on the global market. The benefit is the ability to easily separate objects based on mesh, as well as cost savings linked with power use, an improvement in productivity rate, and the production of less space, among other things. We have further automated this sieving process and can operate the machine via the blynk interface

Key Words: Sieving, slider crank mechanism, blynk, multi-purpose, multi-layer, technology, productivity

1.INTRODUCTION

A smart sieving machine is a network-based collaboration of technology and services to improve quality and productivity. A smart sieving machine allows the entire machine to be automated, providing simplicity and convenience to routine industry processes by decreasing human inference. A sieve is a device used to separate desired materials from undesired material or to characterize a sample's particle size distribution, generally using a woven screen such as a mesh or net. This project focuses on the design, construction, and integration of the mechanical element of the machine with IOT. Horizontal sieving machines are designed to filter particles based on mesh size at various levels. Because of its tiny openings, a little sieve is used to sift flour. Sieves with various sorts of holes are employed depending on the particles to be sorted. Huge sieves are used to separate the stones from the stand. A metallic plate or sheet, or another similar device, having regularly spaced perforations of consistent sizes set in an appropriate frame or holder, is used in size separation. The fine coarse particle is divided or broken up by grinding against one other and via screen apertures, eliminating undesirable particles. In its natural state, building sand comprises organic debris, stones, and gravels of all shapes and sizes. When we need sand of a precise specification for building work, we have no choice but to sift it. We may utilize this equipment to speed up the procedure and adjust it to the type of sand and site circumstances. We can also decrease human intervention by automating.

3. OBJECTIVES

- To design and fabricate the machine which has high productivity as compare to traditional ways.
- Develop the machine which is helpful to the small-scale foundries and low-level contractors.
- Screening of sand should be low time-consuming process.
- Design should have required low maintenance cost and easy to maintenance.
- Design should be fabricated with using locally available material tools and technique.

4. TYPES OF SIEVING MACHINE

1. ROTARY SAND SCREENING MACHINE

The sieving will be done by rotating the cylindrical section of the machine in this case. They can be operated by hand or by electricity. The gearbox for the mechanical machine is coupled to the shaft of the cylinder, which is powered by the needed capacity motor. In the event of a power outage, a handle is given at the other end to run them. The handle will be supplied to the shaft of the drum for spinning in the manually operated machine. Sand should be put into the hopper, and the sieved sand should be gathered beneath or in front of the cylinder. In certain areas, the cylindrical drum is also referred to as a trommel drum, and the apparatus is referred to as a trommel drum screening machine.

2. VIBRATORY SCREENING MACHINE

The vibration of the machine's screening table is used to sieve in this kind. These machines, unlike the rotary kind, are merely powered. Sand is poured over the vibrating table in a linear vibratory screening machine, and the sieved sand is collected in the sloppy tray at the bottom, which divides it in different directions.

3. SAND SCREENING CUM WASHING MACHINE

After screening the sand, washing will take place in the second layer at the same time to remove the silt, grime, and undesired compounds from the sieved sand. When the sand received from the supplier has to be washed, this equipment saves energy and labour expenses. Alternatively, you would need to build a separate sand washing machine to complete this operation.

5. LITERATURE SURVEY

1. Dilip Bhagat, ETAL1 wrote this work (2020) Screening is the separation of solid particles of varying sizes using a screen mesh or sieve. A number of machines are utilized in screening sand based on this mechanism for the user. It might be either vibratory or rotational motion.
2. Praveen R, and ETAL2 are the authors of this publication (2014). The idea may be expanded to include a series of mesh to continue the separation of different sizes of nuts. This project eliminates the need for time-consuming manual separation. With the inclusion of other forms of mesh, the project may be extended to additional sorts of separation of combination.

3. In this study, Dr. Anil Baliram, ETAL3, discusses (May 2021). This project may be used to implement all sorts of separation of combinations with various types of mesh. It was discovered that there is no unique way to separate different grain sizes. The primary results are that it improves grain quality, reduces human effort, and saves time and money.

4. Ganjar kurnia ETAL4 is used in this work (2019). A sand sieving machine powered by a crank, power transmission with chain, mixed sand input using the open tub, sand sieve using centrifuge idea, separating sand and stone with a sieve, and utilizing the sand container is the concept that has been carried out**.**

6. MECHANICAL WORKING

The Sieving Machine's operation is based primarily on translating the rotational motion produced by the wiper motor into a sliding motion or slider-crank mechanism. The slider-crank mechanism moves the mesh linked to the frame back and forth. When it moves or slides, the particles and other foreign particles of the requisite size are separated based on the mesh size. This technique can be repeated as many times as there are various particle sizes. A motor/drive receives an electric source. The particles to be sorted are first placed in a sieve. And sieve sizes are set in accordance with our specifications. Once the motor begins to turn on, the shaft rotates (main shaft). The driving pulley, which is connected to the main shaft, spins around its axis as well. The crank is linked to a driven pulley and a sieve bracket. The sieve bracket has four supports. The crank revolves in tandem with the driving pulley. By spinning the crank linked to the sieve bracket, the sieve bracket gains sliding motion (TWO and FRO motion). Small/thin particles pass through the sieve due to its continuous sliding, whereas large/thick particles remain above the sieve. Hence Finally, we have the desired outcome.

7. COMPONENTS OFSIEVING MACHINE

- Motor
- Bearing
- Pulley
- Wire mesh
- Frame
- Shafts
- Controller

We used a single-phase AC motor because the sieving machine required a lot of torque to manage the load. For many years, AC motors have been frequently employed in industry. We used a 375W 1400RPM AC motor. To assist the shaft rotatory motion, we used the UPC205 bearing with bore diameter of 2.5 cm To reduce the speed, four pulleys of various sizes are required. On the intermediate shaft, two pulleys with diameters of 7.6 cm and 35 cm are installed, and from another two pulley one is mounted on motor shaft and other one is mounted on the machine shaft with the diameter of 7.6 cm and 25 cm respectively. Many different methods for sieving have been used in the past, and practically every operation comprises a wire mesh sieve of small size of holes on it. It is varying according to the require size of sand particle. When a machine is subjected to a load, the frame ensures that the structure will not break. To support all of the loads of machine parts, the frame had to be extremely efficient. Our machine's framework is made of mild steel The shaft is used to transfer the rotary motion to the rotatory sieve, we used two shaft one as main shaft on which rotatory sieve is mounted and another as intermediate shaft on which two pulleys are mounted. We used the speed controller to control the motor's speed since different types and conditions of sand necessitate different speeds. A safety guard is utilized to protect the rotary sieve, which is covered by a GI sheet.

8. CALCULATION

8.1 Machine Efficiency

Let’s assume averagely we use machine for 5 hours a day, Then power consumption for 30 days (1 month) = 30×5×0.375 = 56.25 unit So Total cost of electricity for one month = 56.25×10 =562.5Rs.

8.2 Manpower Efficiency

Labor cost of a worker =Rs.50/hour For 1 month working 5 hour per day It will take around = Rs.50×30×5 =Rs.7500

8.3 RPM

Diameter of pulley on motor =5″
Diameter of larger pulley on intermediate shaft = 14″ Diameter of smaller pulley on intermediate shaft = 5″ Diameter of larger pulley on main shaft = 10″
Speed of the motor shaft = 1400rpm
Speed of the intermediate shaft = 300rpm
So, rpm of the machine = 90rpm

9. CONCLUSIONS

The project can be continuing separation of different sizes of sands by changing several meshes. The manual separation of sand which is time consuming is eliminated. This project is run by DC motor. The rotary motion of DC motor is converted into sliding motion to the mesh as result of back-and-forth motion of mesh different types & sizes of sands can be separated. Thus this project in real time is providing easy way of separation of different sizes of sands. The lifting of sand also reduces human interference. Thus lifting action makes machine Semi Automatic but only one thing is to remove course particles from sand sieve box is to be done by manual. A motorized multifunctional sieving machine with a low cost and simple design is created. This computer lowers human work; thus, we don't require numerous people to filter/sieve at the same time. Furthermore, the machine is portable since it can be readily disassembled and reassembled. With the involvement of various forms of mesh, the project may execute all other sorts of separation or combination. This project is powered by a motor driven rotating motion that is coupled to a crank and crankshaft, which provides a sliding motion to the mesh. Different types and sizes of grains can be separated as a result of the mesh's back-and-forth action. And hence, in real-time, this project provides a straightforward approach to separate different sizes of grains, sand, and any other mixture based on mesh size. We have developed this to the blynk interface, through which one may manage the operation of the machine using the phone and even acquire the live work status. We conclude that our automated sieving machine may be utilized in a variety of disciplines, such as the food industry or construction, and it can be operated manually or mechanically to decrease human participation in these domains.

REFERENCES

1. International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321- 9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 10 Issue III Mar 2022- Available at www.ijraset.com

2. Chakraborty, S., And Banik, D., Design of A Material Handling Equipment Selection Model Using Analytic Hierarchy Process, The International Journal of Advanced Manufacturing Technology, Vol. 28, Pp. 1237–1245, 2006.

3. Evaluation in Conceptual Design of Human Powered Sand Sieving Machine 3S Web of Conferences 125, ICENIS 2019

4. DESIGN, DEVELOPMENT AND SIMULATION OF ABRASIVE SIEVING MACHINE", International Journal of Emerging Technologies and Innovative Research (Www.Jetir.Org | UGC And Issn Approved), ISSN:2349-5162, Vol.8, Issue 5, Page No. Ppb370-b373, May-2021

5. Review on Multi level sand screening machine and analysis of vibration mechanism (IJARII : Vol-4 Issue – 3 -2018).

6. Review on multipurpose sieving machine (International Journal of Research Publication and Reviews, : Vol 2, no 12, pp 452-455, December 2021) 7. Design and Fabrication of Semi-Automated Solar Powered Sand Sieving Machine (International Journal of Engineering Research & Technology (IJERT)