WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design and Fabrication of Multipurpose Sieving Machine

Mr. Pise Sanket Madhukar[1], Mr. Mali Surendra satyawan[2], Mr. Kulkarni Shekhar Shrikant[3], Mr. Bankar Avinash Dahnanjay[4], Prof. Pawar. S. D.[5]

[1,2,3,4] UG Student, Guide[5]

Department of Mechanical Engineering, Karmayogi Institute of Technology Shelve, Pandharpur.

ABSTRACT:

The design and fabrication of a multipurpose sieving machine need for an efficient and cost-effective solution for sieving various materials in industrial and agricultural sectors. Traditional sieving methods can be labour-intensive, time-consuming, and inconsistent. This project aims to create a versatile machine capable of efficiently sieving materials of varying sizes, textures, and properties, including sand, grains, and construction materials. The proposed sieving machine incorporates a motor-driven, Key design features include a compact, adjustable structure, easy-to-replace sieve meshes, and low-energy consumption, making the machine user-friendly Through rigorous design calculations, material selection, the machine demonstrates high sieving accuracy and throughput. significantly reducing the manual labor required. Its versatility and low-cost construction make it an ideal tool for small to medium-scale industries emphasizing its impact on productivity and efficiency in the...

I. INTRODUCTION

The multipurpose sieving machine is versatile equipment designed for the efficient separation of materials based on size, shape, and other physical characteristics. Widely used across various industries including food processing, pharmaceuticals, chemicals, and construction these machines play a crucial role in ensuring product quality, consistency, and operational efficiency.

Historically, sieving has been a fundamental process for sorting and classifying materials, with techniques evolving from manual methods to advanced mechanized systems. Today's multipurpose sieving machines are engineered to handle a diverse range of materials, from fine powders to coarse aggregates, making them invaluable in modern production environments.

These machines typically utilize various mechanisms, such as vibration, rotation, to facilitate the movement of materials through screens or sieves. The design and functionality of multipurpose sieving machines allow for quick adjustments to meet different operational needs, enhancing their versatility.

Today's world requires speed in each and every field. Hence rapidness and quick working is most important. Now a day for achieving rapidness, various machines and the equipment are being manufactured. In such a modern era of liberalization, small scale industries are contributing in a big way to the growth of our country. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. This project focuses in design, fabrication of the mechanical part of machine and the system of the sieving machine. Sieving Machine mainly depends on converting rotary motion provided by AC motor. With the help of pulley attached to motor the Rotary Motion is converted into Reciprocating Motion with help of Connecting Rod and Wheels. The horizontal sieving machine is worked on the basis of crank and slider mechanism. 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. Sieving is an uncomplicated practice for sorting out the particles of different sizes. Generally, while preparing the concrete for construction purpose, the process of sieving is 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.

II. LITERATURE SURVEY

(1) Swapnil Bhote et.al. Title -Design and Fabrication of multi-purpose sieving machine. In the above research work a motorized sieving machine was designed and fabricated. The machine used a 1 HP motor. Pulley and belt assembly was used to transmit the power from motor to the sieving plate. The sieving plate was vibrated to sieve the sand. However, the machine was designed for only type of mesh.

(2) Sohans Hapsenkar, et.al. Title -Design and fabrication of industrial sand screening machine for green sand in this research work a cylinder was used to sieve the sand. The walls of the cylinder were fitted with mesh of required grid size. The cylinder was mounted on the frame with some

inclination. The cylinder shaft and motor shaft were linked through belt and pulley mechanism. When the motor rotated, the cylinder also rotated. The operator was supposed to load one side of the cylindrical opening with sand.

(3) Mr. Avadhunt Tigadikar .et.al.Title -Design and fabrication of Semi-automated solar powered sand sieving machine. In this project work a solar operated sieving machine was designed and fabricated. The machine had a vibrating sieving plate. The vibration was produced using the DC motor. The seving plate would sieve the sand due to vibrating action. This machine had a drawback i.e. it would not work in cloudy weather. The machine was also bulky and quite hard to transport.

(4) From The human community has been the most important thing for years. The majority of sediments, including sand, are comprised of fragments of rock that have been weathered by wind and rain (weathering). In general, they are created as larger fragments (gravel) that break down as rivers carry them downstream; the finer the particle, the further it has traveled. In other words, large pieces of gravel can be found close to the head of a river. Flowing downstream, gravel becomes finer and becomes cobble, pebble, granule, and eventually sand, then finally flowing into the ocean, where the sediments are deposited. Sediments formed in the ocean sub-duct to Earth's interior (mantle) from trenches with sub-ducting tectonic plates. Occasionally, pieces tear loose from the wall continental plate, becoming part of a new continent. .

III. RELATED WORKS

The design and fabrication of a multipurpose sieving machine is a process that involves creating a device capable of efficiently separating particles of different sizes from a mixture. Sieving machines have diverse applications in industries such as food processing, pharmaceuticals, mining, and construction. They are used to separate various materials, such as grains, powders, sand, and aggregates, based on particle size.

1. Traditional Sieving Methods:

Traditionally, sieving is done manually using mesh screens or sieves. These methods, while cost-effective, are labor-intensive and less efficient. They also have limitations in terms of the size of particles that can be separated and the speed of processing. Some traditional sieving methods include:

Rotary sieving: A rotating drum sieve that allows for the separation of different materials.

Shaker-based sieving: Manual or mechanically operated sieving.

2. Automated Sieving Machines:

Automated sieving machines have been developed to address the inefficiencies of manual sieving. These machines typically consist of a motorized system that allows sieves to vibrate or rotate at various speeds. Some key examples are:

Vibrating Sieves: These machines use vibration to move materials through the sieve, improving separation efficiency. The vibrating sieves are commonly used in industries such as food, pharmaceuticals, and construction for fine particles.

Rotary Sieving Machines: Rotary sieves continuously rotate material through the mesh screen. This design is widely used in bulk material processing.

Airflow sieving machines: These machines use airflow to help with the separation process, often employed in powdery materials and fine chemicals.

3. Multipurpose Sieving Machines:

Several recent innovations focus on making sieving machines more versatile, capable of handling multiple types of materials and sieving tasks. These multipurpose machines often come with adjustable sieve sizes, variable speeds, and other features to ensure efficiency across different materials. Some innovations include:

Interchangeable Mesh Screens: Modern multipurpose sieving machines come with interchangeable mesh screens that allow users to switch between different mesh sizes, making the equipment adaptable to different types of sieving tasks.

Dual-Vibration Systems: These machines incorporate multiple vibration frequencies that enhance sieving efficiency, allowing users to sieve multiple materials of different sizes or densities simultaneously.

Modular Designs: Machines designed with modular components allow for easy adaptation to different sieving needs, such as adding additional sieving stages or fine-tuning settings.

4. Recent Developments:

In the last few years, innovations have focused on improving the speed, efficiency, and versatility of sieving machines. Some of the developments in multipurpose sieving technology include:

Robotic Sieving Systems: Some advanced systems integrate robotic arms or automatic material feeders to reduce labor and increase precision in sieving, particularly in pharmaceutical or food processing sectors.

Energy-Efficient Sieving: Researchers are focusing on the energy efficiency of sieving machines. Some designs incorporate energy-saving motors or systems that reduce vibrations or power consumption while maintaining throughput.

Integration of Data Analytics: Some modern sieving machines now include sensors and IoT technology to monitor performance and provide feedback. For example, sensors can track material flow rates, sieve efficiency, and wear on mesh screens, helping operators optimize the sieving process.

5. Applications of Multipurpose Sieving Machines:

Food Industry: Separating flour, sugar, spices, or other powdered ingredients to ensure uniform particle size.

Pharmaceuticals: Sieving active pharmaceutical ingredients to ensure uniformity in tablet production.

Mining and Aggregate Industry: Separating fine aggregates or ores based on size for further processing or sorting.

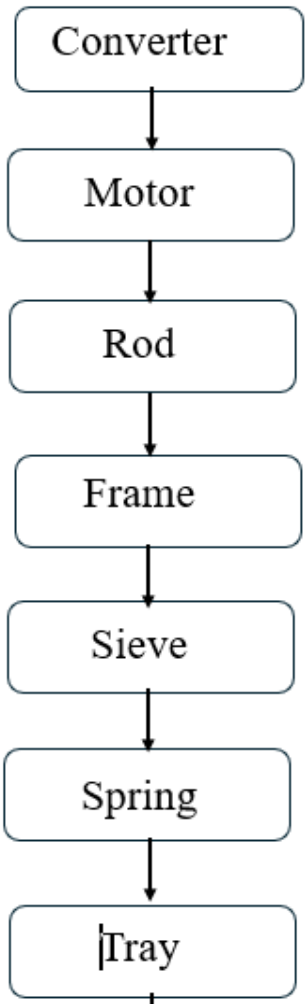
IV. MATERIALS AND METHODOLOGY

The design and creation of a multipurpose sieving machine aims to provide an efficient and affordable solution for sifting different materials in industries and agriculture. Traditional sieving methods can be hard work, take a lot of time, and often lack consistency. This project focuses on building a flexible machine that can easily sieve materials like sand, grains, and construction materials of different sizes, textures, and types.

The machine uses a motor to power the sieving process. Key features include a compact design, adjustable parts, easy-to-replace sieves, and low energy usage, making it simple for users to operate.

By carefully planning the design, selecting the right materials, and performing tests, the machine shows excellent accuracy and speed in sieving. It reduces the need for manual labor and is cost-effective, making it perfect for small to medium-sized businesses. This machine greatly improves productivity and efficiency in the sieving process.

Summary Process Flow Diagram



V. COMPONENTS:

1) Sieve

Fig.6.2.2 Sieve

Most of the things that we come across in our day-to-day life exist as a mixture of two or more pure substances. We need to separate these pure substances from the mixture in order to use them individually. For example, you must have noticed that we don't use the flour bought from the vendors directly for cooking chapatti. We use certain separation techniques in order to separate the flour from the impurities attached to

We generally use sieve plates for the separation of flour from the bran particles or other impurities. These sieve plates allow the fine flour particles to pass through the holes of the sieve plate while the bigger impurities are unable to pass through it and remain on the sieve. This method of separation of particles from a mixture based on the difference in size of particles is known as sieving. It uses sieve plates for separation of coarse particles from finer particles.

2) L-angle

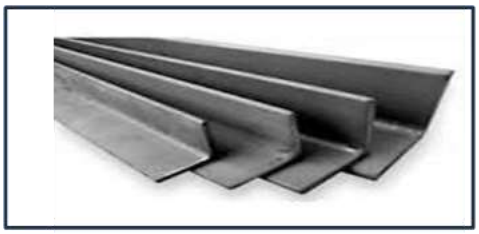


Fig. L -angle

1) **Definition**:

• An L angle is a type of structural steel that has a 90-degree angle, forming an "L" shape. It's commonly used in construction and manufacturing.

2) **Materials**:

Mild Steel.

3) **Dimensions**:

• Available in various sizes, with specific leg lengths and thicknesses. Common sizes range from 3"x2.5" to larger dimensions.

3) TRAY

Fig.Tray

Mild Steel Cable Tray is used to support insulated electrical cables used for power distribution, control, and communication. Cable trays are used as an alternative to open wiring or electrical conduit systems, and are commonly used for cable management in commercial and industrial construction.

4) CONTROL KNOB

Fig. Control knob

Control knobs are available in standard executions: knurled knobs or fluted knobs, embossed or lobe. This kind of control elements is suitable to adjust of machine shafts in both directions of rotation and to maintain the shaft in the selected position even when subjected to vibrations.

ADVANTAGES:

1) **Versatility**: Can handle different types of materials, such as powders and granular substances.
2) **Efficiency**: Can improve productivity and material quality.
3) **User-friendly**: Has a control interface that allows for real-time adjustments.
4) **Portable**: Can be easily disassembled and reassembled.
5) **Low maintenance**: Requires minimal maintenance due to its simple construction.
6) **Reduces labor**: Can reduce the need for multiple people to sieve at once.
7) **Economical**: Can be economical if produced in large quantities.
8) **No skilled labor required**: Can be operated without the need for skilled labor.

VI. LIMITATIONS:

1. Energy Consumption
2. Limited Handling of Materials

VII. APPLICATIONS:

a. Orchards (fruit and nut trees)

b. Vineyards

c. Pomegranate

d. Row Crops with Perennial Plants

VIII. Conclusion:

In this research study, the mild steel failure problems encountered by loads were successfully. Thus, a cost effective and simple design motor operated multipurpose sieving machine is fabricated. This machine reduces the human effort and hence we don't need multiple persons to filter/sieve at a time. Also, machine is portable as it can be de-assembled and assembled easil.

IX. REFERENCES:

Raja Kumar G., Achudhan M., SrinivasaRao G., Studies on corrosion behavior of borated stainless steel (304B) welds, International Journal of Applied Engineering Research, v-9, i-22, pp-7767-7772, 2014

Srinivasan V., Optimizing air traffic conflict and congestion using genetic algorithm, Middle - East Journal of Scientific Research, v-20, i-4, pp456-461, 2014

Ganeshram V., Achudhan M., Design and Moldflow analysis of piston cooling nozzle in automobiles, Indian Journal of Science and Technology, v-6, iSUPPL.6, pp-4808-4813, 2013

Ganeshram V., Achudhan M., Synthesis and characterization of phenolformaldehyde resin as a binder used for coated abrasives, Indian Journal of Science and Technology, v-6, i-SUPPL.6, pp-4814-4823, 2013

Saritha B., Ilayaraja K., Eqyaabal Z., Geotextiles and geosynthetics for soil reinforcement, International Journal of Applied Engineering Research, v-9, i22, pp5533-5536, 2014 [6]. Arun Kumar N., Srinivasan V., Krishna Kumar P., Analysing the strength of unidirectional fiber orientations under transverse static load, International Journal of Applied Engineering Research, v-9, i-22, pp7749-7754, 2014.