IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 4, May 2026
Impact Factor: 8.2

Automatic Sand Filter Machine

Bhoir Rushikesh Suresh, Chavan Lalit Anantrao, Niungare Amit Dashrath
Yashwante Sahil Ravindra, Prof. Amol Dayma
Department of Mechanical Engineering
Vighnaharta Trust's, Shivajirao S. Jondhle College of Engineering, Asangaon

Abstract: *In recent years, the use of sand filter machines has gradually increased. But most of them are quite large and difficult to move. Besides that, the price to own it is quite expensive. With that, there are many construction workers who must exert their energy to make sand filters by themselves in the traditional way. However, there are some problems that come with using the traditional sand filter. Among these are, the construction workers must exert their energy to build the sand filter. In addition, refined sand will mix with foreign matter when refined sand falls to the ground. Therefore, we have created a product that can facilitate the construction work of the construction site. Our main goal of creating sand filter machines is to reduce the workload of construction workers when they want to filter or use sand filters. It runs using an electric motor that will shake the filter. We just need to put the sand on the filter, and the sand will be filtered with the shake that is produced. The sand filter machine is equipped with a funnel as a way for fine sand to fall. All we have to do is put the wheelbarrow next to the sand filter and the sand will drop into the wheelbarrow. It is different from the traditional sand filter where the refined sand falls; we must put it in the wheelbarrow. It will use more of construction workers' energy. Most important is that the filter machine is easy to move around in construction as it is equipped with two suitable wheels. It will make it easier for construction workers to filter sand in one place or another place.*

Keywords: *sand filter*.

I. INTRODUCTION

Today's world requires speed in each and every field. Hence rapidness and quick work are most important. Nowadays, for achieving rapidness, various machines and 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 based on 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 purposes, the process of sieving is carried out manually. 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 remain 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 machine which have low cost and simple in operation. For small scale farming in rural areas the main aim of the cultivator is over domestic use. The harvest is usually a small bulk. Therefore, they are not taken in for refining in major refining factories. Here we generate an idea to solve the problem of filtering or refining the harvested crops mainly grains, cardamom etc. This project is a domestic sieving machine which can be used to separate or sieve or filter

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 4, May 2026 Impact Factor: 8.2

out dirt and unwanted particles from the harvested crops. The machine is compatible and requires only a limited amount of space. The machine can also sort out stones and other unwanted particles from purchased goods or stored crops.

To increase productivity of work in construction field we must implement automation. In this project we are going to implement automation in the sand filtering work. In present system sand is filtered to required size manually. In this modernized world we require machines which reduce the time and finish up the work on or before time, machines and systems employed directly or indirectly in production of goods and services production machines play a critical role in making goods and services of higher quality faster and cheaper. There is great invention in this world of different machines for the ease of human efforts.

In this machine we have used principle of conversion of electrical energy into mechanical energy to achieve sand sieving filtering operation. We have used motors as prime movers which convert electrical energy into mechanical energy in the form of rotary motion. This rotary motion is converted into reciprocating motion using crank & slider mechanism.

1.1 OBJECTIVE

Main objective of this project is to transform manual work into automation work to yield productivity. In detail objectives are listed below.

- To increase productivity of sand filtering operation so that construction work will be made fast and with less time.
- To reduce manpower required for this sieving filtering work.
- To take care of construction work labor as in manual work minute particles of sand may enter in human body through nose and mouth to create health issues in labor.
- To develop remote machines that can be carried anywhere as per the construction site.

II. LITERATURE REVIEW

A. Design and Fabrication of Domestic sand Sieving Machine

Alan Biju, Alwin Thomas, Akash J Kalarickal, Jeswin Jose, Rittin Abraham Kurien,

Conventional practices like winnowing require highly expertise hand movements considering gravity, aerodynamics and centrifugal force. This is the major difficulty observed in the winnowing process. Nowadays people always prefer the most suitable way to save time and energy. This project proposes a domestic sieving machine which can easily remove unwanted particles from the grains, nuts and other pulses automatically.

B. Automatically Driven Sand Sieving Machine

P.R. Gajbhiye ,RupeshKhode PratikSukhadeve ,VickyChaple

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 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 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

C. Development of NCAM Reciprocating Cassava Mash Shifter

Abiodun L.O., Oladipo N.O and Bamidele B.L.

The NCAM cassava mash sifter was developed to tackle the problems of high labour, expense associated with manual sifting, time wastage, the tedious mature of the operation, injury to the hand or palm as one rubs against the raffia sieve continuously, back ache, caused by prolonged sitting in one position during manual sifting, low productivity, and the hygienically unsafe nature of manual sifting as products are exposed to germs.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 4, May 2026 Impact Factor: 8.2

D. Stacked Siever for Natural Sand Processing

W.D. Handoko, N. Widiastuti, G.S. Budi, K. Karelius, S. Pratapa

This stacked sand sieve was intended to replace conventional sieves that had several disadvantages, including unstable speed, inefficient time in processing large amounts of sand, and relatively higher costs incurred. This stacked sieve exhibited the following characters: 1) composed of two sieves, 2) can be assembled easily to change the size of the sieve, 3) had 3 variations of the sieve slope, and 4) used a gasoline motor to pro- duce a sift speed of 25.2 cm/s and 36.4 cm/s. The sieve slopes were manually adjusted by positioning the sieves according to the available slots on the device.

E. Energy-based Indicators of Soil Structure by Automatic Dry Sieving

Dmitry Fomin, Maria Timofeeva, Olga Ovchinnikova, Ilya Valdes-Korovkin, Andrey Holub, Anna Yudina

Numerous methodological approaches and fractionation procedures contribute to the continuation of discussions about soil aggregate formation. This study aims to justify the dry sieving procedure and suggest an optimal sieving regime for automatic shakers for soil samples.

For this approach to calculating total sieving energy, using oscillation frequency, vibration amplitude, and time was proposed. Retisol, Phaeozem, and Chernozem topsoil samples from agricultural and native ecosystems were analyzed using a sieving test, in which 50-kg soil samples were divided into 500–700 g subsamples and sieved with a constant oscillation frequency (50 Hz), but with varying vibrational amplitudes (0–2.5 mm), for sieving times that ranged from 1 to 5 min. We found that the optimal sieving regime is characterized by total sieving energy of 1850 J kg− 1, reached during 2 min of sieving with a 50 Hz frequency and a 2.5 mm amplitude. Based on results of the dry sieving test, we have proposed the indicators of mechanical stability of soil structure: index of soil structure stability (SS) which characterize the degree of change in the soil aggregates size during sieving with minimal and optimal sieving energy, and modified the soil friability index (F4), that characterizes the rate of change in the soil aggregates size under mechanical load by dry sieving.

The proposed formula of total sieving energy calculation allows comparing results between soil studies. Our meta-analysis showed that most (26 of 34) studies used insufficient sieving energy, where the aggregate size distribution did not reach the equilibrium state. A detailed protocol for soil dry sieving analysis is provided.

F. Quality attributes of parboiled rice prepared with a parboiling process using a rotating sieve system

Naruebodee Srisang, Thatchapol Chungcharoen

The aim of this study is to apply a rotating sieve system to the parboiling process for parboiled rice production. The parboiling time and rotation speed were the main production factors affecting the quality attributes of the parboiled rice, including the degree of starch gelatinization (DG), fissure percentage, head rice yield (HRY), white belly, and color. The results showed that the parboiling process with a rotating sieve can decrease the parboiling time required to provide an even quality of parboiled rice. The parboiling time for an even quality of parboiled rice was 5 min at rotation speeds of 10 and 15 rpm, while the parboiling time at a rotation speed of 5 rpm was 10 min. Additionally, the values of DG and HRY were increased with increasing parboiling time. In contrast, the fissure and whiteness percentages of the parboiled rice decreased. However, the quality of the parboiled rice was not dependent on the rotation speed.

G. Shredding and sieving thermoplastic composite scrap: Method development and analyses of the fibre length distributions

Guillaume A. Vincent, Thomas A. de Bruijn, Sebastiaan Wijskamp, Mohammed Iqbal Abdul Rasheed, Martin van Drongelen, Remko Akkerman

Recycling of thermoplastic composites has attracted considerable attention in the recent years. Several recycling solutions include shredding scrap to centimetre-sized flakes to retain long fibres, followed by a remanufacturing step that prevents fibre breakage. Determining the exact fibre length distribution (FLD) for these routes is crucial, as it is of importance for the processibility of the material as well as the mechanical performance of the recycled parts. In this paper, novel analysis methods are introduced to calculate FLDs based on photographs of flakes. The reliability of the method and of the sampling was found to be high. The relation between flake size and FLD was studied, showing that

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 4, May 2026 Impact Factor: 8.2

offcut layup barely influences the FLD in comparison to flake size. The effects of shredding settings and sieving were studied, showing a strong correlation between machine parameters and FLD, whereas the offcut size was found to have no effect on FLD.

H. Intelligent optimal sieving method for FACTS device control in multi-machine systems

Qiang Lu, Wencong Wang, Chen Shen, Shengwei Mei, Masuo Goto, Akihiko Yokoyama

A multi-target oriented optimal control strategy for FACTS devices installed in multi-machine power systems is presented in this paper, which is named the intelligent optimal sieving control (IOSC) method. This new method divides the FACTS device output region into several parts and selects one typical value from each part, which is called output candidate. Then, an intelligent optimal sieve is constructed, which predicts the impacts of each output candidate on a power system and sieves out an optimal output from all of the candidates. The artificial neural network technologies and fuzzy methods are applied to build the intelligent sieve. Finally, the real control signal of FACTS devices is calculated according to the selected optimal output through inverse system method. Simulation has been done on a three-machine power system, and the results show that the proposed IOSC controller can effectively attenuate system oscillations and enhance the power system transient stability.

III. CALCULATION

Machine Efficiency

Let's assume averagely we use machines 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.

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

IV. WORKING PROCESS

The figure shows the sand filter and separator. In this the whole work is based on the 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 has 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 transfers 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.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 4, May 2026 Impact Factor: 8.2

ADVANTAGES OF AUTOMATIC SAND FILTER MACHINE

- This machine is easy to use and portable.
- Operates on both battery and power source so that can be used in remote places.
- Increases productivity
- Worker's intervention is removed.
- Only one man can handle this machine

DISADVANTAGE OF AUTOMATIC SAND FILTER MACHINE

- Initial cost is more compared to manual method.
- Applicable for very small-scale application.

V. APPLICATIONS

- Substance industry: resin, pigment, industrial medicine, cosmetic, coatings.
- Foodstuff industry: sugar powder, starch, salt, rice.
- Environnent : assistant détergent, active Carbon.
- Coatings: Powder coatings, pigment paints, etc.
- Metals: Metal powders, zinc powder, copper powder, coal powder, alloys, etc.
- Agricultural: -sorting of fruits grain.

VI. CONCLUSION

After Deep study of design and fabrication of motorized sand filtering machine we have concluded that
By applying slider and crank mechanism we can easy filter sieve.
To introduce this thesis in domestic market we have to use more powered motor and gear box and rigid structure.
Although initial investment is more for this machine productivity is more than manual work, so it is feasible and economical for commercial application. In this project also study, the mild steel failure problems encountered by loads were successfully. Thus, a low cost and simple design motor operated sand filter machine is fabricated. This machine reduces the human effort and hence we don't need multiple persons to filter the sieve.

FUTURE SCOPE

This machine works on slider crank mechanism hence for commercial purpose we can manufacture it to handle large construction sites. And any other work like gold and silver jewellery processing work. etc. for that we have to use more powered motor with gearbox. Etc. 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.

REFERENCES

[1] Alan Biju, Alwin Thomas, Akash J Kalarickal, Jeswin Jose, Rittin. Abraham Kurien, Assistant Professor, Department of Mechanical Engineering, Saintgits College of Engineering, Kottayam, Kerala, India "Design and Fabrication of Domestic sand Sieving Machine" (2020 IJRAR May 2020, Volume 7, Issue 2)
[2] RupeshKhode PratikSukhadeve ,VickyChaple, P.R.Gajbhiye ,Assistant professor, Department Of Mechanical Engineering, K. D. K. College Of Engineering, Nagpur-440009, Maharashtra, India. "Design and Fabrication of Automatically Driven Sand Sieving Machine" (2019 JEITR, Volume 6, Issue 5)
[3] Abiodun L.O., Oladipo N.O and Bamidele B.L. National Centre for Agricultural Mechanization, Ilorin, Kwara State, Nigeria. "Development of NCAM Reciprocating Cassava Mash Sifter." (Vol. 5 No. 1. 2016. Pp. 10-13)

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 4, May 2026
Impact Factor: 8.2

[4] W.D. Handoko , N. Widiastuti , G.S. Budi, K. Karelius, S. Pratapa, Departement of Physics, Faculty of Sciences and Data Analytics, Institut Teknologi Sepuluh Nopember, Surabaya 60111, Indonesia, Departement of Chemistry, Faculty of Sciences and Data Analytics, Institut Teknologi Sepuluh Nopember, Surabaya 60111, Indonesia, Departement of Physics Education, Faculty of Teacher Training and Education, University of Palangka Raya, Palangka Raya 74874, Indonesia, Departement of Chemistry, Faculty of Mathematics and Natural Sciences, University of Palangka Raya, Palangka Raya 74874, Indonesia " Design and characterization of a stacked siever for natural sand processing" (2021 Elviser proceedings 44 3237-3240)

[5] Dmitry Fomin, Maria Timofeeva, Olga Ovchinnikova, Ilya Valdes-Korovkin, Andrey Holub, Anna Yudina, Soil Science Institute, Pyzhyovskiy Lane 7 Building 2, 119017, Moscow, Russia, Institute of Mechanics, Lomonosov Moscow State University, Michurinsky Prosp. 1, 119192, Moscow, Russia "Energy-based indicators of soil structure by automatic dry sieving" (2021 Soil & Tillage Research 214) 105183)

[6] Naruebodee Srisang, Thatchapol Chungcharoen, Department of Engineering, King Mongkut\'s Institute of Technology Ladkrabang, Prince of Chumphon Campus, Chumphon, 17/1 Moo. 6 Chumkho, Pathio, Chumphon, 86160, Thailand. "Quality attributes of parboiled rice prepared with a parboiling process using a rotating sieve system" (2019 Journal of Cereal Science 286-294)

[7] Guillaume A. Vincent, Thomas A. de Bruijn, Sebastiaan Wijskamp, Mohammed Iqbal Abdul Rasheed, Martin van Drongelen , Remko Akkerman, Group of Production Technology, University of Twente, 7522 NB Enschede, the Netherlands. ThermoPlastic composites Research Center, Palatijn 15, 7521 PN Enschede, the Netherlands. ThermoPlastic composites Application Center, Saxion University of Applied Sciences, M.H. Tromplaan 28, 7513 AB Enschede, the Netherlands "Shredding and sieving thermoplastic composite scrap: Method development and analyses of the fibre length distributions" (2019 Composites Part B 176 107197)

[8] Qiang Lu, Wencong Wang, Chen Shen, Shengwei Mei, Masuo Goto , Akihiko Yokoyama, Department of Electrical Engineering, Tsinghua University, Beijing 100084, China. Power Systems Division, Hitachi Ltd, Tokyo, Japan. Department of Electrical Engineering, School of Engineering, Tokyo University, Tokyo, Japan "Intelligent optimal sieving method for FACTS device control in multi-machine systems" (2002 Electric Power System Research 62 209-214)