Automatic Sand Separator Machine

Abhishek Madhavrao Bokhare[1], Omkar Narayan Babhale[2], Sarthak Gopal Bhise[3], Vaibhav Gopal Kadam[4], Prof. N.B.Kale[5], Prof.R.B.Chavan[6]

[1234] *Student of Mechanical Engineering Department Shri Shivaji Polytechnic Institute, Parbhani*

[5, 6] *Lecturer of Mechanical Engineering Department Shri Shivaji Polytechnic Institute Parbhani*

Abstract: **Sand is essential for any type of construction. Different types of sand are required for different constructions. For example, column, plaster, stairs. And this process takes a lot of labor and effort, so if you want to build on a large scale, the traditional methods of separating sand are not suitable for us.as per the survey, single filter machine is available in the market. In our experimental setup three different quality of sand filtered in a single process. By using our experimental setup we reduce lebour cost and time. And increase working efficiency or working purpose upto 35%. For this operation we used three types of filter frame and three different compartments. The slider crank mechanism is used in this model**

Keywords: **Stress, Reaction force, Sand.**

1. INTRODUCTION

Sand is the most important component in every construction project. Because it normally comes in a mixture form, before used in constructions it required to be removed from unwanted material like stones and other undesired large particles before used in constructions. Similarly, the size of sand changes depending on the stage of building, for example, fine sand is used for plastering and slightly coarse sand is used for wall and slab construction. That's why, sands need to be appropriately screened as requirements of sand in different stages of construction. As a result, sand sieving machines can be best option for separate sand in required size because they are simple to use and convenient.

We all know that separating sand with a manually operated sieving machine is an old and traditional method.

Apart from that, there are many types of sieving machines are used by workers society which are like sand screening cum washing machines, rotatory type sand.

2.HISTORY

The purpose of this research is to come up with a novel design for a sand filter machine. Because of an issue, we are making a sand filter machine for small building construction and domestic usage. In addition, we want to achieve our aim through technical advancements based on current concepts. Explosive thoughts based on statements of difficulties gleaned from investigations on fine sand quality and workload applied. Many factors, including research, have influenced our decision to make this product our core endeavour. We develop and improve a product that can filter high-quality sand without combining it with foreign materials, hence lowering sand filtering burden. It would also have two purposes in one notion.

Fig 1: Conventional Method of Screening

3.LITERATURE SURVEY

Sand substance is one of the most important things in industrial world. Nowadays the industry need the sand sub stand that are already been process known as sand product. As we know the sand sub stand are mixtures with variety other component such as dirt and metal. Usually, people use their hands to sieve sand and absolutely it will take much time to do it. But now, we get some ideas to modify this sieve sand machine by using the power of vibration motor system. With the invention of this sieve sand machine, it can be overcome and makes the construction contractor's work more convenient. It can also be used in the manufacturing of mould industries especially for the sand casting process. By using this sieve sand machine, we can save more time, energy and cost. Indirectly, it will improve the manufacturing qualities. This machine is fixed with wheels, so it is easy to move and to keep. Besides, it is easy to use even by the unskilled workers. Furthermore, it is easy to operate and the spare parts can be obtained easily on the local market Therefore, this machine is suitable to use in the "Industri Kecil dan Sederhana (IKS)" and training institutes such as Polytechnic and MARA Training Institutes (IKM) for training purposes So to make the process more efficient new technology is needed to help increase the productivity so the human power can be reduce and also can cut the cost of the process.

3.2 History Of Sand Filter Machine: From years sand has been the most important thing in human community. Most sediment, including sand, are made up of the fragments that result when rock is broken down by wind and rain (weathering). Generally, they start as larger fragments (gravel), which are broken down as rivers carry them down stream; the finer the particle, the further it has travelled. In other words, large bits of gravel are plentiful on the banks close to the head of a river. As you travel downstream, gravel becomes finer into cobble, pebble, granule, and eventually turning into sand, and finally flowing into the ocean, where these sediments deposit. That is why, by carefully analysing the mineral content and chemical composition of sand on riverbanks, beaches and ocean floors, we are able to determine which formation, indeed what kind of rock, it originated from. Most sediment, including sand, is made up of the fragments that result when rock is broken down by wind and rain (weathering). Generally, they start as larger fragments (gravel), which are broken down as rivers carry them down stream; the finer the particle, the further it has travelled. In other words, large bits of gravel are plentiful on the banks close to the head of a river. As you travel downstream, gravel becomes finer into cobble, pebble, granule, and eventually turning into sand, and finally flowing into the ocean, where these sediments deposit.

That is why, by carefully analysing the mineral content and chemical composition of sand on riverbanks, beaches and ocean floors, we are able to determine which formation, indeed what kind of rock, it originated from. Most sediments, once formed in the ocean, sub duct to the Earth's interior (mantle) from trench with a sub ducting tectonic plate. However, some pieces tear loose from the whole, and accreted to the hanging wall continental plate, once again becoming part a continent. Geological structures formed in this way are called accretionary bodies (prisms). Accretionary bodies are characteristic to the subduction zone like Japan, which make up a large part of the Japanese islands Formations and rocks form and break down, form and break down, again and again. During that process minerals also break down and alter, even transform into other minerals, again and again. However, some stubborn minerals simply ride these cycles out, refusing mechanical breakdown or chemical alteration at all. These minerals bear the marks of the processes of geological history. By carefully analysing them, geologists are able to infer the geological history of the earth itself. Most sediments, once formed in the ocean, sub duct to the Earth's interior (mantle) from trench with a sub ducting tectonic plate. However, some pieces tear loose from the whole, and accreted to the hanging wall continental plate, once again becoming part a continent. Geological structures formed in this way are called accretionary bodies (prisms). Accretionary bodies are characteristic to the subduction zone like Japan, which make up a large part of the Japanese islands. Formations and rocks form and break down, form and break down, again and again. During that process minerals also break down and alter, even transform into other minerals, again and again. However, some stubborn minerals simply ride these cycles out, refusing mechanical breakdown or chemical alteration at all. These minerals bear the marks of the processes of geological history. By carefully analysing them, geologists are able to infer the geological history of the earth itself.

Fig 2:Traditional sand filter

The figure 2 above show the process has been use by people before us the ancestor way to sieve the sand. And collect the sand they wanted. This process sieve the sand into it size depending on the size of the net been used. This smooth sand or the product usually uses as main material in construction to build building or house. Smooth sand is required to achieve better quality product example in making sand casting or making any product based on sand.

3.3 SAND: Sand is a quartz-based material. The sand is practiced sized between 4.75mm and 0.15mm are common sand used to produce concrete and plaster. According to research, sand are available from mines or rivers. The sand mining is sand which was excavated from the mine. This sand is widely used and usually divided into two types, namely fine and rough sand. Fine sand which contains little soil is usually used for mixing along with fine sand from rivers and cement. The mix produces a mixture of plastic and easy to attach although its strength is somewhat less. Coarse sand is suitable for use to combine concrete and make blocks and cement bricks. According to research, river's sand its quality is good and does not contain excessive impurities. Concrete mixing using sand the river is harder to work. Therefore the additives are named facilitators are sometimes used to improve workability. If the mixer is not used, the mix need more cement to get that work pleasures same. Sand obtained from seafront is not suitable for use. The beach sand contains salt that will cause a pelvic event on the building's surface.

Fig 3: SAND

4.COMPONENTS

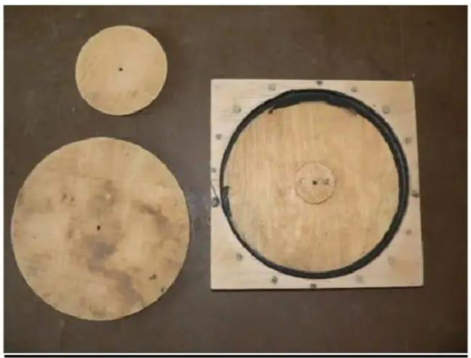
MOTOR: An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this is the conversion of mechanical energy into electrical energy and is done by an electric generator, which has much in common with a motor.

Most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force. In certain applications, such as in regenerative braking with traction motors in the transportation industry, electric motors can also be used in reverse as generators to convert mechanical energy into electric power.

For our project purpose we are using 60 watt single phase A.C. motor with 1000 rpm, which operation 50Hz A.C. frequency.

WOODEN ROTOR: The single phase A.C. motor is connected with a 20cm diameter wooden wheel, i.c., rotor around its shaft which is then connected with the connecting rods.

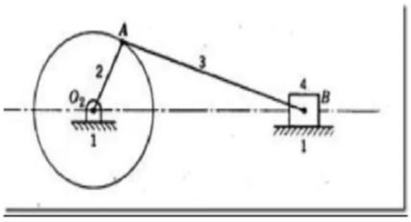
This helps in producing rectilinear motion needed for the Sieve movement.



CONNECTING RODS:
A connecting rod is a shaft which connects a piston to a crank or crankshaft in a reciprocating engine. Together with the crank, it forms a simple mechanism that converts reciprocating motion into rotating motion.

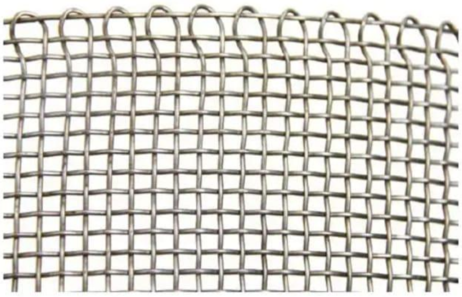
A connecting rod may also convert rotating motion into reciprocating motion, its original use. Earlier mechanisms, such as the chain, could only impart pulling motion. Being rigid, a connecting rod may transmit cither push or pull, allowing the rod to rotate the crank through both halves of a revolution. In a few two-stroke engines the connecting rod is only required to push.

For our project purpose we are using to connecting rods with 20cm and 15 cm and the breadth of those is 3 cm.



GI SAND FILTERATION NET: A sieve, or sifter, is a device for separating wanted elements from unwanted material or for characterizing the particle size distribution of a sample, typically using a woven screen such as a mesh or net or metal. The word "sift" derives from "sieve". In cooking, a sifter is used to separate and break up clumps in dry ingredients such as flour, as well as to aerate and combine them. A strainer is a form of sieve used to separate solids from liquid.

Sieving is a simple technique for separating particles of different sizes. A sieve such as used for sifting flour has very small holes. Coarse particles are separated or broken up by grinding against one-another and screen openings. Depending upon the types of particles to be separated, sieves with different types of holes are used. Sieves are also used to separate stones from sand. Sieving plays an important role in food industries where sieves (often vibrating) are used to prevent the contamination of the product by foreign bodies. The design of the industrial sieve is here of primary importance.



SIEVE FRAME: Wooden Frames are generally square or rectangular, though circular and oval frames are not uncommon. Frames in more unusual shapes such as football shapes, stars, hearts can be hand carved by a professional wood carver or carpenter (or possibly molded out of wood pulp). There are also picture frames designed to go around corners. A popular design is the scoop, an indent in the frame adding depth.

Wheel: A wheel is a circular component that is intended to rotate on an axle bearing. The wheel is one of the key components of the wheel and axle which is one of the six simple machines. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines.

PLANE STEEL SHEET: Plane steel sheet- It is flat rectangular thin sheet of steel with smooth surface.

STRUCTURE: Structure- It is a rigid structure of cast iron s which is used to mount all the components on or inside it. It gives support and strength to the system.

5.COST OF COMPONENTS

Sr. No	Material	Cost of Material
1.	Iron Square Pape	1450/-
2.	Moter	950/-
3.	Circular Pipe	60/-
4.	Plane Steel Sheet	550/-
5.	Mesh	180/-
6.	Roller	150/-
7.	Wheel	110/-
8.	Colour/Paint	170/-
9.	Iron Flat Bar	450/-
10.	Wooden Rotor	140/-
11.	Nut Bolt	130/-
12.	External Hex Screw	160/-
13.	Regultor Wire Pin	120/-
	Total Cost	4620/-

✓ LIST OF COMPONENTS

IRON SQUARE PIPE

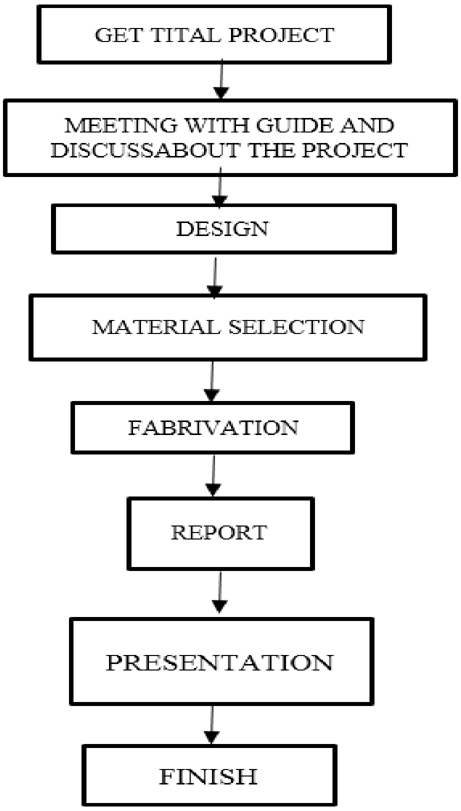
WHEEL | ROLLER

EXTERNAL HEX SCREW

6.METHODOLOGY

This chapter will cover the detail explanation of methodology that is being used to make this project complete and working well. Many finding from this field mainly generated from research of other to improve this project. Methodology is the process of preparing a project that you want to create. Design method or methodology is one of the methods used in developing or designing a project. The methodology used is to help create a creative and innovative project to achieve production objectives in the final project. The design of this machine takes into account all aspects and must also meet the needs of the user to make sand separation in a construction. The design you have created is not that complicated. In addition, the design of the "Modern Sand Filter" project tool is also easy to understand because it has its own basic parts. The size and balance of this project have also been taken into account to facilitate the learning session.

Flow Chart: The diagram shows the flowchart of the process for the success of this project. In addition, there are also several steps to be taken as well should be followed in implementing this project. The step is as shown in figure. From the charts of this flow, the activity record for the success of this project can be done smoothly and consistently.



8.WORKING MECHANISM

When sand filter is activated, motor starts to rotate in such a way that rotational motion of the motor is converted to reciprocating motion which is transferred to filter of our sand separator. When unfiltered sand are drop on the filter, due to continuous reciprocating movement of filter, it starts to filter the sand. These filtered sand of fine grains are fallen into the diagonal sheet and due to gravity, fine grain sands are collected in a collector.

9.APPLICATION

- Construction field- Road construction, building construction etc.
- Industries- Powder metallurgy plant etc.
- Agriculture Field- Flour mill, Corn shelling, Peanut shelling etc.

10.ADVANTAGES

- Take less time to separate sands.
- No manual operation required.
- No skilled worker required.
- Simple in construction.
- Negligible maintenance required

11.DISADVANTAGES

- Lower capacity to separate at a time.
- Not suitable for mass sand separations
- Required special care to minimized the vibrations

12.CONCLUSION

Thus a low cost and simple design automatically operated sand filter and separated machine is fabricated. This machine reduces human effort and hence we don't need multiple persons to filter the sand. This simple design of conventional design which can enhance day today household needs and daily day to day purposes and it can be also used in for industrial applications. By using this method we can do any operation as per our requirement with the use of electricity

13.REFERENCES

[1] Load cell (September 2022) from https://en wikipedia.org/wiki/Load cell
[2] International Journal for Research in Applied Science and Engineering Technology (JRASET) (March 2021). Design and Fabrication of Automated Sand Filter and Waste Separator Machine.
[3] Alina Carmen Cojocaru, M. Ram Murty (28 Feb 2006), An Introduction to Sieve Methods and Their Applications, London Mathematical Society Student Texts, CAMBRIDGE UNIVERSITY PRESS, 0521848164
[4] Geankoplis, CJ. (2009) Principle of Transport Processes and Separation Processes. First edition. Pearson Education South Asia PTE LTD