International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 02 | Feb - 2022 ISSN: 2582-3930

DESIGN AND FABRICATION OF MULTI-STAGE AUTOMATIC SAND SEPARATOR

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ABSTRACT

Sand is used everywhere for large buildings and constructions. 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. The strength of this setup is simulated in ANSYS also and 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

Here we demonstrate the design and fabrication system. Sand is used in construction, manufacturing and many other industries. Sand has to be filtered before it can be used for construction. For this we have invented multistage sand separator and filter. Multistage sand separator and filter work to separate three types of sand. Small size sand is used for plaster, medium size sand column and large size sand is used to make floor in building.

It will take a lot of time so a lot of work is not done on time. We can use multistage sand separators and filters to save this time and to complete the construction in a given period of time. Using our prototype model, we can separate three sizes of sand at a time. Sand separator and filter machine concept is based on principle of the single slider crank mechanism. In this mechanism 4 links primary link is fixed, secondary link is crank, connecting rod is 3rd link and slider is 4th link. When crank rotate connecting rod will push the slider in forward and backward motion. These mechanisms convert rotary motion into reciprocating motion. This principle used for the power and motion transmission, for motor to each separator.

As we have a lot of construction is happening day by day. If you want to do any kind of construction, the most important thing is that you need a lot of sand. This is the sand we get in the river or in the sea. But even if sand is available, it cannot be used immediately in construction. For that she has to be separated like small size medium size. In many places laborers are used to separate the sand but it takes a lot of time. There are also machines in the market for separating sand but only one type of sand is separated from it. For this we are creating a model that will separate different types of sand in the same amount of time so that your time will be saved and manpower will be less.

1.1 METHODS OF SAND EXTRACTION

Various methods are used to extract sand.

- Active ducts: Sand and gravel are excavated in the stream. It involves the extraction of river basin material, especially sand and gravel, from the tops of the strips.
- Dry pit channel mining: The sand is extracted from the dry area by digging pits in the dry area or by temporary flow using mechanical or manual methods.
- Wet pit channel mining: In wet pit mining, sand is extracted by making underwater pits in the surface of the perennial stream as shown in the figure.
- In-stream sand and gravel traps: Sand and gravel traps have been used to reduce the movement of sand in the stream. It is already trapped under the water and when it floods, sand and creeks accumulate in it.
- Channel-wide in-stream mining: Channel-wide in-stream mining is the extraction of sand and gravel from the entire active channel during the dry season. This kind of mining is practiced in rivers having variable flow regimes. The bed is evened out and uniformly lowered.

Fig.1 sieving machine

The figure above shows that this method was used by the earlier people to get the sand in different shapes but the size of the net was getting the same size of sand and it was also time consuming and required a lot of labor to perform this process.

1.2 GRAIN SIZE OF SAND

There are different types of sand but it is defined by its grain size. Fine sand, very course sand ,course sand, medium sand, very fine sand.

- Fine sand:-Fine sand is commonly used in plaster and bricks work and its grain size is 0.25-10mm. Fine sand is suitable for preparing concrete required for construction and plaster purposes.

Fig.2 fine sand

- Medium sand:- Medium sand is used for road construction, asphalt mixing, construction filling, and construction of building materials such as concrete blocks, and pipes. Medium sand grain size is 0.5-025mm.

Fig.3 medium sand

- Course sand.:- Course sand is used to make floor in buildings It makes a solid & hard mass of concrete

with cement and sand. It provides bulk to the concrete . Course sand grain size is 1.0 0.5mm.

Fig.4 course sand

Grain Size Table:

Types of Sand	Size Of Sand
Fine sand	0.25-0.10 mm
Very course sand	2.0-1.0 mm
Course sand	1.0-0.5 mm
Medium sand	0.5-0.25 mm

2. LITERATURE REVIEW

Artificial sand concrete Experimental study of In the traditional form Concrete cement, Of sand The mixture was collected. This composite mix gives strength to concrete. But with increasing sand shortages And with increasing demand, the sand has started to dwindle. So we have to find some alternative. Cheapest and quickest to meet Convenient is to grind natural stone and make it grade size It is then used in place of concrete .And it's easy and convenient Concrete using this experiment m20 m30 and m40 sand of this type Has been artificially created for 100% replacement [1]Grain size analysis is an analytical technique. Which was sponsored in earth science and its Uses are studied in laboratories .It is used in various places like archeology and geo-archeology It is used to analyze sedimentary rock soil different particles The main purpose of which is to do Such is the vine of transport The purpose is to determine the relative environment and energy type of the system This analysis sludge particle size Its distribution is inferred from this .(2)The use of concrete is increasing day by day and it is becoming one of the basic constructions . The reason for this is cement , It is a mixture of finely mixed sand and water River sand and M sand are used together in the construction industry But the use of river sand is a growing industry But now the government has banned the excavation of river sand from river basins .Due to this shortage of sand, now the sand produced in the construction industry is used for construction .Sea sand has also been used for this purpose.[3]Gears are used to increase speed and energy .But it is the stress he encounters that causes the gears to fail. The teeth of the gear are broken by tension but to reduce the stress on it According to Lewis's theory, ISO equations are used [4]Multiplayer ceramic, frequent break down in the electronics industry, had a breakdown and a capacitor board level interconnect was designed to rectify the breakdown.[5]This shows the effect to dynamic bending there are many factors, such as an increase in current deterioration is predicted to TFT analyzing the tone distribution.[6]It is used to obscure the driver's field of vision during rainy season It consists of three important components: wiper Our connection mechanism and electric motor are the three things used in wiper motor. [7] The DC wiper motor is used in motor vehicles and is an important component .But it is also electromagnetic interference .For this E M l conducted emission to stand use for wiper motor One common mode of current use for this is the invention of the motor .Common mode square was designed to suppress common mode.[8]The search for a permanent magnet DC motor for automatic applications is carried out in this finite component.13.5 v ,2 pole motors were analyzed for use There salt is a reduction in the cogging torque of the wiper motor used [9]

3. Prototype of Sand Filter

The solid modeling and engineering drawing by using solid works software the fabrication process progress use drawing as a reference. The process consists of fabrication to all parts that have been designed by the dimension using various types of manufacturing processes. The manufacturing process includes weldment, sweep, pattern, welding, drilling, bending, cutting and etc. During the fabrication process, if there have error occurs, such as a fabrication error, so the process needs to modify the process need to go back to the previous step and the process flow again until no error occurs the process can have been continued smoothly until the final product is finished. Then, the draft report needs to be submitted to the supervisor for double-checking if there had an error.

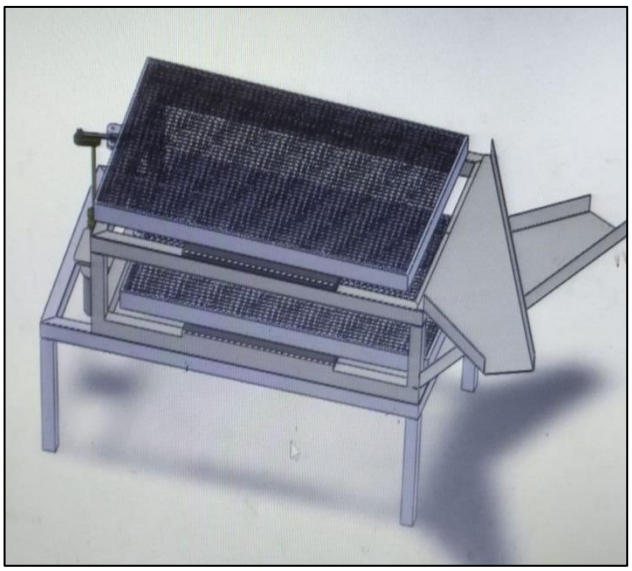

Fig.5 solid model of sand filte

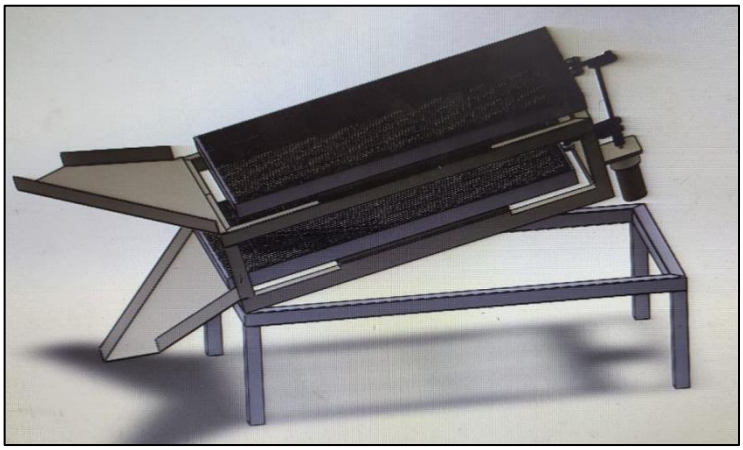

Fig.6 solid model of sand filter

4. Design and calculation

Condition 1:-

Given:

length=1.22m

Width=0.91m →

Formula: 22.27 22.27

Area=length×width

Stress= force/area

Solution= area = length×width

=1.25×0.91

=1.11**m2**

We assume the weight of sand 50kg the weight of sand on slider due to applying dynamic condition the impact of weight consider as double, 100kg.

From above,

Stress = per kg of sand weight/cross-section area

σ= 100/1.11

σ= 90.09kg/**m2**

σ = [883.48N/**m2**]

The weight of sand is uniform distributed on filter sheet therefore we consider as uniform distributed load,

The force acting is downward

= weight of sand×cross-section area

=100×1.1102

=111.02

For findinga forceof reaction at every support ,

ΣF=0

f1+f2+f3+f4-111.02=0

4f = 111.02

f=111.02/4

f=27.75N

∴ the thickness of rectangular cross-section is ,

Condition 2:-

Given: length= 1.22m

Width=0.91m

Formula: Area = length ×width

Stress = force/area

Solution= area = length × width

=1.25 × 0.91

=1.11**m2**

We assume the weight of sand 50kg the weight of sand on slider due to applying dynamic condition the impact of weight consider as double, 100kg.

From above,

Stress = per kg of sand weight/cross-section area

σ= 200/1.11

σ = 180.18kg/**m2**

σ = [1766.96N/**m2**]

The weight of sand is uniform distributed on filter sheet therefor we consider as uniform distributed load,

The force acting is downward

= weight of sand ×cross-section area

=200 ×1.1102

=222.04

For finding a force of reaction at every support ,

ΣF=0

f1+f2+f3+f4-222.04=0

4f = 222.04

f= 222.04/4

f= 55.51N

∴ the thickness of rectangular cross-section is ,

Condition 3:-

Given:- length= 1.22m

Width=0.91m

Area = length ×width

Stress = force/area

Solution= area = length × width

=1.25 × 0.91

=1.11**m2**

We assume the weight of sand 50kg the weight of sand on slider due to applying dynamic condition the impact of weight consider as double, 100kg.

From above,

Stress = per kg of sand weight/cross-section area

σ= 300/1.11

σ = 270.27kg/**m2**

σ = [2650.44N/**m2**]

The weight of sand is uniform distributed on filter sheet therefore we consider as uniform distributed load,

The force acting is downward

= weight of sand ×cross-section area

=300 ×1.1102

=333.06

For finding a force of reaction at every support ,

ΣF=0

f1+f2+f3+f4-333.06=04f = 333.0

f=333.06/4

f= 83.26N

∴ the thickness of rectangular cross-section is ,

Calculation of graph for (stress against area) :

From condition (1),

∴ 90.09 / 1.11 × 180.18/x

X×90.09 = 180.18×1.11

X = (180.18×1.11)/90.09

X=2.22 m^2

∴ 90.09/1.11×270.27/x

X×90.09/1.11 × 270.27/x

X= (270.27×1.11)/90.09

X=3.33m^2

5. RESULT AND DISCUSSION

Graph :- 1 The above graph is drawn force versus stress in this graph the force is given on Y- axis and stress is given on X -axis . In this graph force is increase then also stress increases.

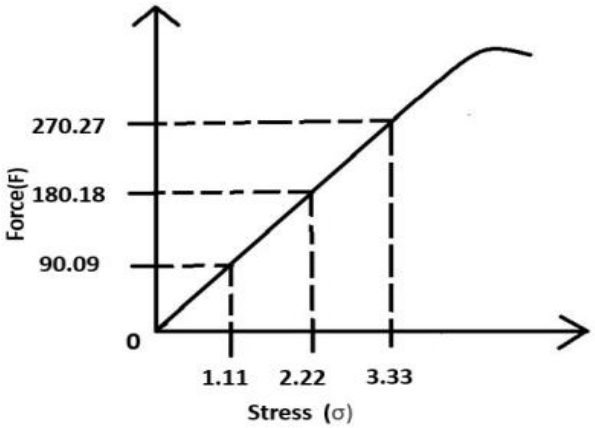

Fig.7 Force v/s stress

Graph :- 2 The above graph is drawn on the efficiency of conventional machine and experimental machine.the Y-axis represents quantity of sand and X-axis represents the sand size .the blue chart is shows conventional machine and brown chart shows experimental machine. in these graph When we take 10 kg of sand to filter then experimental machine is filter more fine sand than conventional machine is shown on the graph.

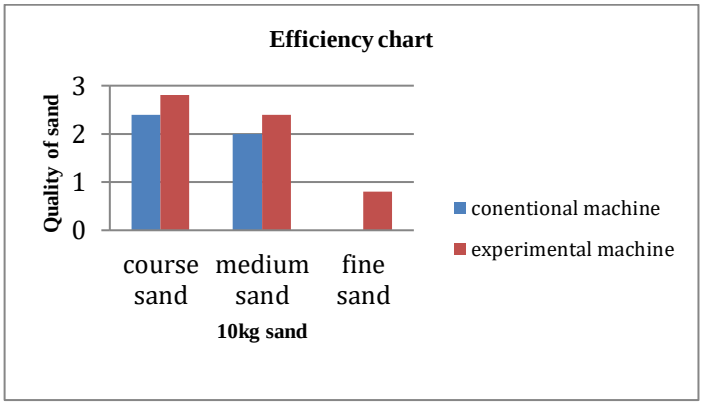

Fig.8 Efficiency Chart

Graph :- 3 the above graph is drawn filtered sand versus feed sand .the Y-axis is shows filtered sand and X-aixs is shows feed sand.blue line on graph represents auto sand and brown line on graph represents conventional sand .in those graph when sand is feed then sand is filter the fine sand is more filter automatically than conventionally is shown on graph.

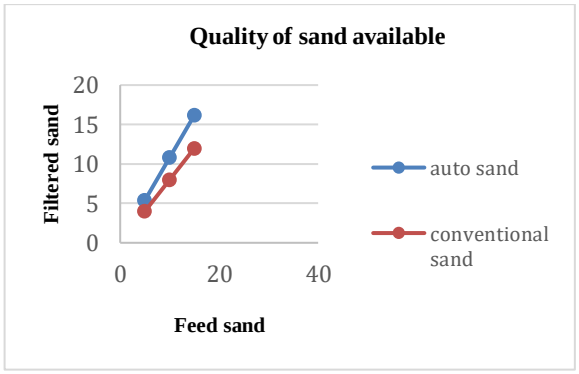

Fig.9 Quality of sand available

6. CONCLUSION

By using the experimental set up we separate the sand more efficiently than the conventional machine. three different types of sand are separated as per our need. We have made three different compartments in the machine for separating sand at different types with a single input.

The following conclusive statement are as below,

- The first compartment separates sand up to 2 mm, the second compartment up to 2 mm to 4 mm and the third compartment separates sand up to 4 to 8 mm.
- The rate of sand separation doing is 40% higher than the conventional device.

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