

SAND FILTERING MACHINE



TA202A- Manufacturing Processes II

Course Instructor: Dr. Arvind Kumar

Tutor: Prof. Supratik Mukhopadhyay

Group Number: 47, Thursday

Group Members:

Anubhav Bairoliya - 210161

Raushan Kumar - 210830

Divyansh Mittal - 210358

Arko Prabho Basak - 210184

Mannu Dev Sah - 210588

Vedant - 211153

Suman Banerjee - 211069

Yuvraj Singh - 211209

Aditya Yadav - 210070

Harshit Sachdev - 210425

Guide's Name: Jeebanbandhu Mahanta

PARTS LIST

S.No	Part Name	Quantity	Material	P. No.	Material Size
1	Sand Filtering Box	1	Mild Steel	1	140x270x100
2	Rods	2	Mild Steel	2	320L D20
3	Collector	1	Toughened aluminum	3	130x260x50
4	Connecting Rod	1	Mild Steel	4	95x7
5	Rails	2	Mild Steel	5	270x20x20
6	Motor	1		6	
7	Spur Gear Type 1 (20 teeth)	1	Mild Steel	7	1.5 Module 20 Teeth
8	Spur Gear Type 2 (40 teeth)	1	Mild Steel	8	1.5 Module 40 Teeth
9	Machine Stand	1	Mild Steel	9	280x50
10	Disc	1	Mild Steel	10	D 100
11	Collector Support	1	wood	11	260x140
12	Wheels	4	Mild Steel	12	D40

**All units are in mm*

Overview

Sand is an essential raw material used for construction, metallurgical extraction, and manufacture of plaster, paint, fertilizers, glass, etc. Therefore, the quality of sand used in these processes becomes vital, as any compromise may lead to severe consequences.

One of the most essential processes to refine sand is to first rid it of any rocky impurity with a diameter greater than the standard grain size. Removing these rocky particles becomes necessary before the raw sand is subjected to chemical treatments. In India, the sand is often filtered manually using a sieve of a specific diameter before it is put in the concrete-producing machine. This site can be commonly seen at any construction site across the country.

Here, we propose a design for a machine that can filter sand more efficiently and quickly compared to manual labor. Using automation and engineering to make a working model of the sand filtering machine has been the driving force behind the project.

Functionality

Our project is a sand-filtering machine that uses a speed-regulated motorized reciprocating mechanism to filter sand.

Initially, we placed an elevated machine stand on a base plate. On top of the stand, we placed connecting rails to achieve constrained linear motion of the sand-filtering frame. This frame was constructed on grooved rollers, much like a railway train's wheel, so it could roll freely on the rails without tumbling. The mesh was welded between two rectangular frames, which were finally mounted on four rollers.

The reciprocating mechanism was made by connecting one end of a rigid rod to the periphery of a disc while the other end was connected to the filtering frame. When the disc rotates, the filtering frame executes to and fro motion on the rails.

A shaft was extended from the disc and connected to a gear assembly. The gear assembly consists of two gears arranged, one on top of the other. The smaller gear is connected to the disc and shaft arrangement, while the larger one is connected to the motor shaft.

The speed of the disc is hence increased by two times.

A collecting tray is placed beneath the entire assembly, which collects the filtered sand from where it is collected.

Weakness

1. Efficiency:

Our project has a heavy Filter Frame and hence making the process of sand filtering time- taking and more energy consuming. Though the sturdiness of frame was not compromised.

2. Waste Overflow:

Waste collected on the top of the filter can only be removed manually and no automatic method exists for now. The filtering process cannot be continued without disruption, as we have to stop the system for the garbage and filtered sand removal.

3. Weight Limitation:

The machine can only hold a certain amount of sand at a time. Overloading the machine can lead to failure of the machine

Future Modifications

- Designing an automatic mechanism to throw off the sand at regular intervals making the process more efficient.
- Make sand box possibly of less heavy material like lightweight alloy or sturdy wood.
- Using a high torque motor to improve efficiency and capacity of sand filtering.

Uses

The application lies in all the fields where filtration different sized solid particles is needed.

1. **Industrial- Construction Application:** Sand Filtering Machines
2. **Agricultural Application:** Flour Filtering Mills
3. Cleaning the beaches of India.

Problem Faced

- **Shaft:** The gear shaft used had a smaller diameter than the gear hole. This made the gear wobble on the shaft and made the whole gear arrangement stuck. We changed the shaft with another having an appropriate dimension to rectify the problem.
- **Reciprocating Mechanism:** Gear rod in our design was difficult to construct and required a lot of material. The mechanism hence used was simpler and more reliable.
- **Filter Frame:** Moving the filter frame was difficult as it would wobble on the rails. We restricted this motion by making grooves in the wheel and hence creating constraint for the frame.
- **Motor Stand:** The motor stand had to be scrapped as we didn't have space to put one. We rectified this by fixing the motor on the gear platform to implement hassle-free movement.
- **Sand Collector:** The sand collector beneath the net was adjusted by folding to make it fit in the project frame. Moreover, a support was added to create a slating collector.