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Design and Development of Safier-The Sieve Shaker

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Abstract - *Construction has dominated all the fields of life. In order to start any project, construction is required.In order to simplify this construction, use of technology, inventions and innovations is essential.Keeping this in mind, we have come forward with an idea.Since sand is an essential component in the field of construction.Selection of proper aggregate, that is sand grain size, texture, etc. is very important.For this, a sand analyser or shaker can be very helpful.*

KeyWords*: Construction, Technology, Aggregate, Sand, Grain size, Analyser, Sieve shaker*

INTRODUCTION

SAFIER-Simply speaking, Safier is a sieve shaker.It is a simple mechanical device which can be used to analyse an aggregate of sand particles, their grain size and composition of the aggregate and to separate different unwanted components.In the construction process, we require mould, which comprises of sand, cement, concrete, moisture and some adhesives.For a healthy, useful and superficial mould, proper combination and grain size is must.This can be achieved with the help of the Safier-the sieve shaker.

OBJECTIVES

The main objective of the design and development of SAFIER is to primarilyreduce man power, labour cost and time. In order to increase the reliability and efficiency of the process, Safier can be very useful.It will ultimately lead to an optimized low cost process.

CONSTRUCTION

1. HOPPER
2. COLUMN
3. SIEVES
4. COLLECTOR GUIDE
5. VIBRATING PLATE
6. BASE PLATE

Fig. Assembly of the Safier

The SAFIER is simple in construction. It consists of a base plate, sieve, a mechanical vibrator, a column, collector guide and an hopper. It consists of a heavy sheet of mild steel of thickness 7mm width dimension 44.5cm X 44.5cm. Eight column made of mild steel each of cross section 2.54cm X 2.54cm, are attached to the base plate. The length of four columns which provide base for the assembly are forty two cm in length and the remaining four which provides support to the vibrating body are 34cm in length.

WORKING AND OPERATION

The sample of sand to be sieved is poured into the top most sieve which has the largest screen openings, through the hopper.Each lower sieve in the column has smaller openings than the one above At the base is a collector guide to give a way to the finest sand particles.

The column is typically attached to the mechanical shaker.In operation, when the motor is switched on, it vibrates the plate to which it is attached. With this vibration, the column also vibrates, which in turn vibrates the sieve plates to and

fro. Sand particles are shaked in the sieves. The finest particles pass to the bottom most sieves and are collected through a collector guide. The bigger particles are retained in different sieve plates, depending upon the screening size of the sieves.The sand of required grain size is obtained and used as per requirement.

Four columns each of length 83cm are extended from the four corners of the vibrating plate. The joint assembly of the vibrating plate and column accommodates sieves of different screening sizes, which are enclosed and held intact with the help of these columns. The assembly is attached to a vibrating motor, which is run by an A.C supply. The assembly is completed by an hopper placed overhead at the topmost sieves.

APPLICATIONS

SAFIER has a wide range of applications.Construction of different infrastructural buildings, bridges, etc.Applicable in foundry industries for moulding and casting processes.For obtaining good shape and surface finish of decorative articles, like flower pots, statues, etc. Proper grain size is necessary, which can be achieved with the help of a SAFIER. Seperation of different components of an aggregate like gravel, crushed rocks, dust, etc. It can be frequently used in sugarcane industry for seperating small grains of sugar.It can be used for agricultural purposes like Raghi seperation.

ADVANTAGES

- ✓ Simple in operation and skilled operator is not required, i.e., user friendly
- ✓ Time efficient
- ✓ Reduces labour cost
- ✓ A single person can operate the machine and can perform huge amount of work in a short period of time
- ✓ Cost of machine is low & Low maintenance cost
- ✓ Highly useful in rural areas
- ✓ Pollution free and eco-friendly

OBSERVARTIONS AND RESULTS

Manual Method of Sieving:

- ❖ We carried out the performance test of the finished model and the observations and results are summarized as below:
- ❖ Weight of sand=42 Kg
- ❖ Sieve size=4.5mm and 2.5mm
- ❖ Labour required=02 persons
- ❖ Time taken to sieve the measured amount of sand=10 minutes,46 seconds
- ❖ Sand sieved in one minute=3.962 kg
- ❖ Sand sieved in one hour=237.73 kg

Results for Machine Operation:

- ❖ Sieve size = 4.5 mm and 2.5 mm
- ❖ Labour required = 01 person
- ❖ Time taken to sieve the measured amount of sand = 4 minutes,

  47 seconds
- ❖ Sand sieved in one minute = 8.78 kg
- ❖ Sand sieved in one hour = 572.196kg

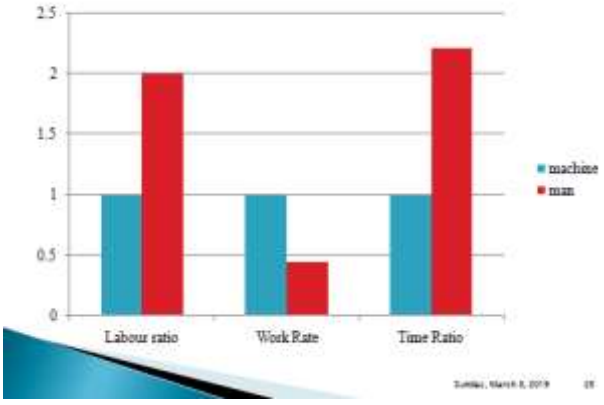
Time ratio = 10.6/4.78 = 2.21

- ❖ Ratio of rate of working = Work done manually in one hour / Work done by machine in one hour =237.33/527.19 = 0.45

TABLE OF COMPARISON

S.NO.	PARAMETER	MACHINE : MAN RATIO
01	LABOUR RATIO (persons)	1:2
02	WORK RATE RATIO (IN Kg}	1: 0.45
03	TIME RATIO (in terms of hours)	1: 2.21

PLOT OF MACHINE VS MANUAL OPERATION



CONCLUSIONS

The development of this machine can influence the construction industry in terms of economical efficiency and reliability.It can replace a very high tech high cost machine and produce comparable results.It can be an affordable apparatus for small scale constructors and can be very useful for many domestic construction works.What we infer from the above observations and calculations is as follows:

From the time ratio,it is clear that the time required for doing the same job manually is 2×2.21 times greater than that of machine operation.Labour required for manual operation is twice that of machine operation.

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BIOGRAPHY

The author is an engineer, innovator, blogger and a budding entrepreuner.He has a few innovations to his name, and is presently working on a couple of new projects, of which plastic waste management is a remarkable one.