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DESIGN OF MOVEMENT SYSTEM SHAKER SCREEN SEATHER MACHINE Crankshaft ROTATION

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Abstract
The sand sieving machine, shaker screen, crankshaft rotational motion system, is a machine that facilitates building work in separating the mixture of sand and gravel. In the design and analysis related to the selection of the frame model in order to determine the strength of the material in holding each component of the sand sieving machine, this research uses solidwork software, based on the results of the solidwork software simulation, the stress value in the sieving tank is 3,303 N/mm2, the displacement value is 2,325 mm, the safety factor by means of a simulation of 4,059. The capacity of the shaker screen sand sieving machine has a volume of 0.824 with a length of 160 cm, a width of 70 cm and a capacity of accommodate wet and dry sand media weighing 30 kg.

Keywords: *Sand sifter, Construction, design, software solidwork*

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Introduction

Sand is an important material in making houses and other buildings, in the form of stones and fine grains measuring between 0.065 mm to 2 mm from volcanic eruptions, rivers, and in the soil. The grains of sand that are usually still mixed with stones or gravel must be separated. The sieving process is the process of separating a mixture of sand and stone/gravel using a sieve made of sieve wire to produce a ready-to-use sand material. Problems that are generally encountered by construction workers when the sand sieving process is carried out manually require 2 people alternately with horizontal or back and forth movements, of course it is less effective and efficient because it requires large energy and relatively long time because the work is manual. The purpose of this research is to explain about the sand sieve shaker screen system for rotational motion of the crankshaft as well as perform analysis related to stress distribution, displacement, and safety factor using Solidwork software.

Research Method

The research method used in the design and analysis of the frame strength of this sand sieving machine uses the FEA (finite element analysis) method by dividing several parts of the structure to be tested into finite elements (finite), each element connected to each other and the process dividing an object into parts is called meshing.

The research procedure begins with collecting the data needed in the design and analysis of the frame construction. Data is obtained through various means such as: Internet, Journals, and related research. Then draw the frame model of the sand sieving machine in 2D and 3D according to the type of material used with the frame generator option, verify the material or check the material properties table, determine constraints with reference to the position of the pedestal in the design that has been made, which can be in the form of fixed constraints, pin constraints, and friction constraints determine the position and magnitude of the load on the frame.

Materials and tools used

- Frame Structure Design
- Shaker Screen Sand Sieve Container
- Electric motor
- Puli
- V-belt
- Bearing
- Crank Connection
- Connecting Rod
- Swing Arm

Solidwork system software design

Results and Discussion

Frame Structure Design

The frame design of this sand sifter machine has a length of 1151 mm, a width of 845 mm, a height of 785 mm with a tilt angle of approx..

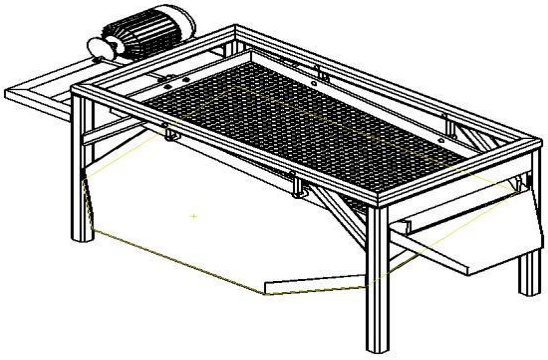

Figure 1 3D Design

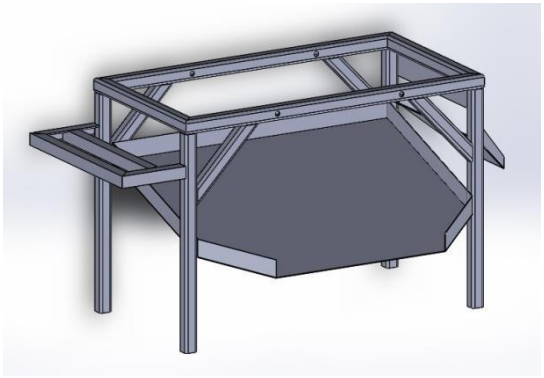

Figure 2 Main Frame Structure

Assignments Material

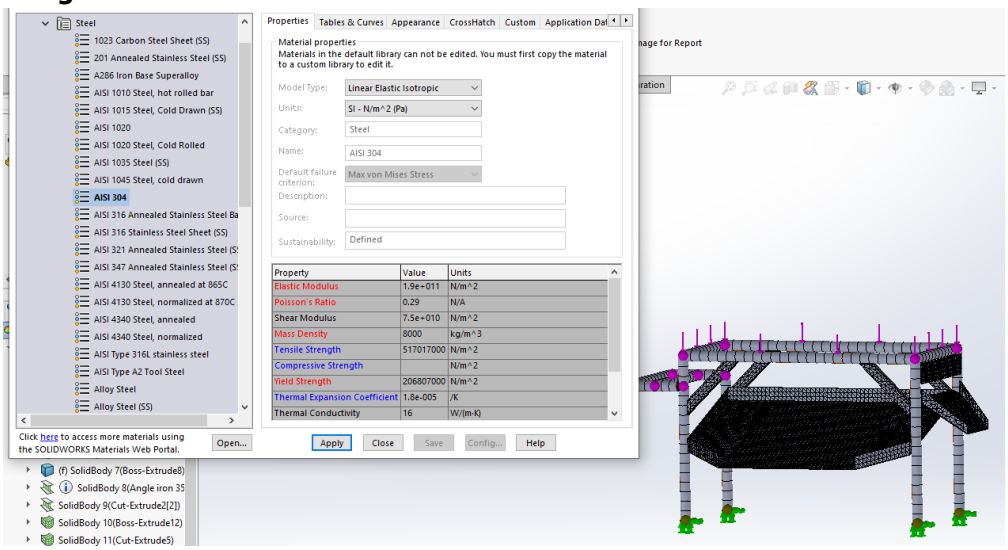

Figure 3 Assignements Material

In the 2016 solidwork software, the material has been determined during the modeling process for each part that is made. This type of material can be re-verified during the testing process. Verify the material is found in the Material Properties.

Determining Constraints and Loading

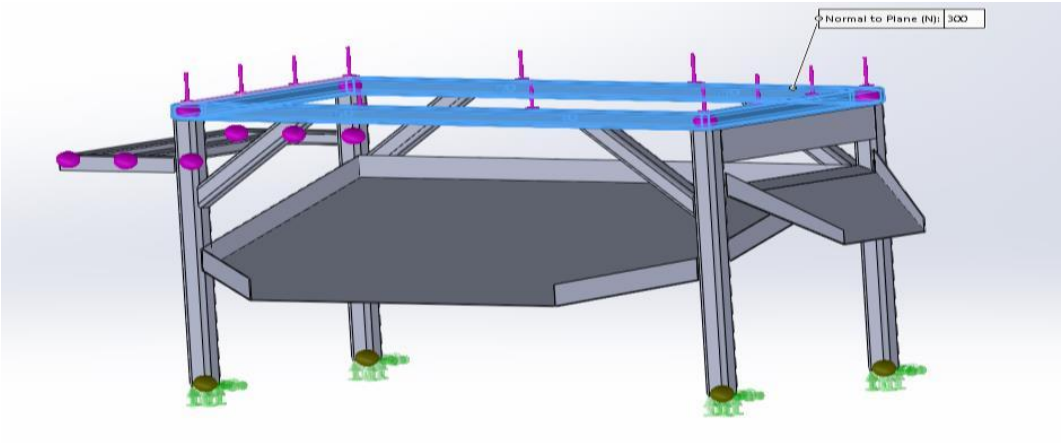

Figure 4 Constrain

The next stage is to determine the location of the constraint that is placed with reference to the position of the pedestal in the modeled design. Constraints can be fixed constraints, pin constraints, and friction constraints. The loading of the maximum tamping capacity is made starting from 30kg. Analysis of the load on the frame of the sand sieving machine not only accepts the load from the sand but also accepts the load from the sifter tank, pulley, crankshaft, bearings and the tensile force of the v-belts.

Meshing dan Running Program

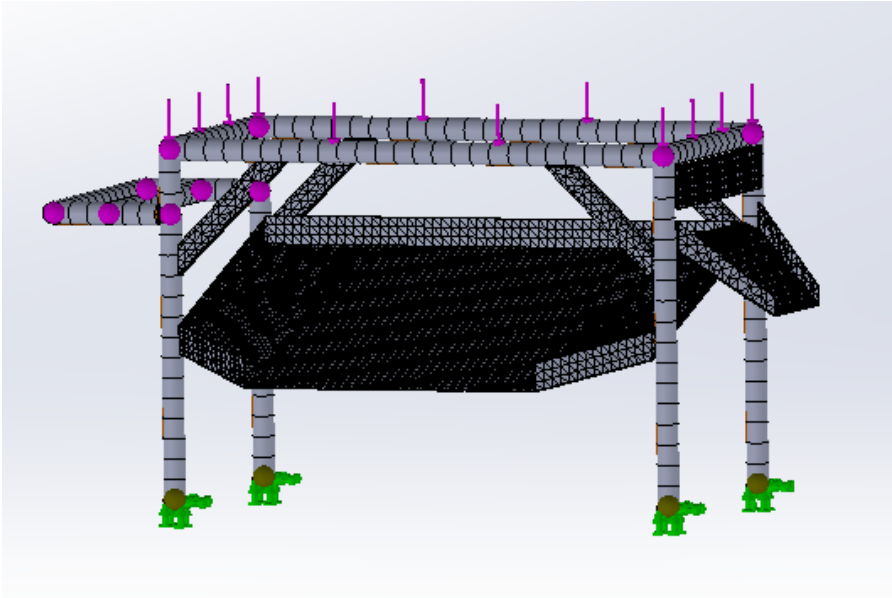

Figure 5 Meshing

The main step of analysis using the finite element method is the meshing process where the continuous system of objects to be analyzed is discretized so that the main structure becomes elements that have a smaller size and a certain amount. The simulation running process is carried

out after the pre-analysis and meshing process is carried out. The running process will run by reading the process using the finite element analysis (FEA) method.

End Simulation

After the running process, the results of the simulation are obtained. There are several results in the form of stress, displacement, and safety factor

Stress

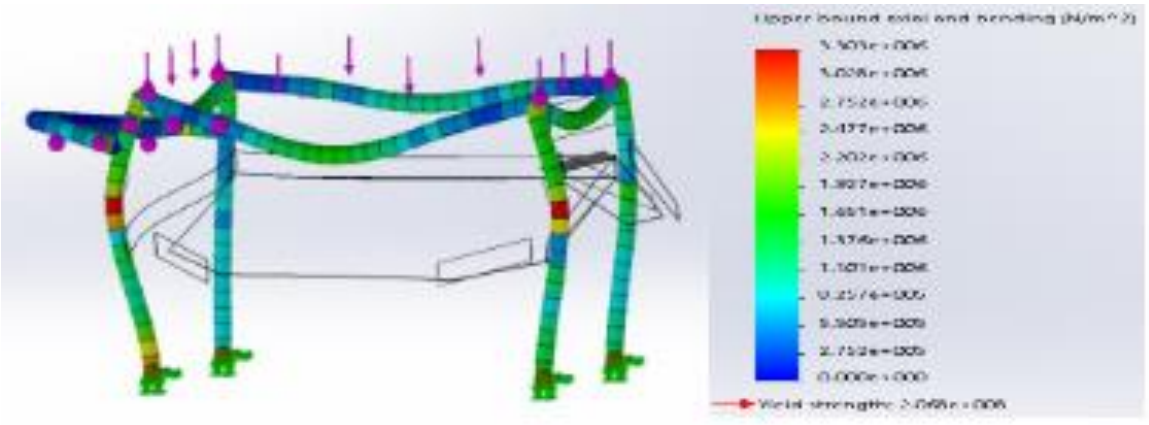

Figure 6 Stress Analysis

Stress is one of the results of the calculation of the stress-strain relationship in the object model, strain is obtained from the deformation experienced by the frame model. Equivalent stress refers to the Stress . method

Displacement

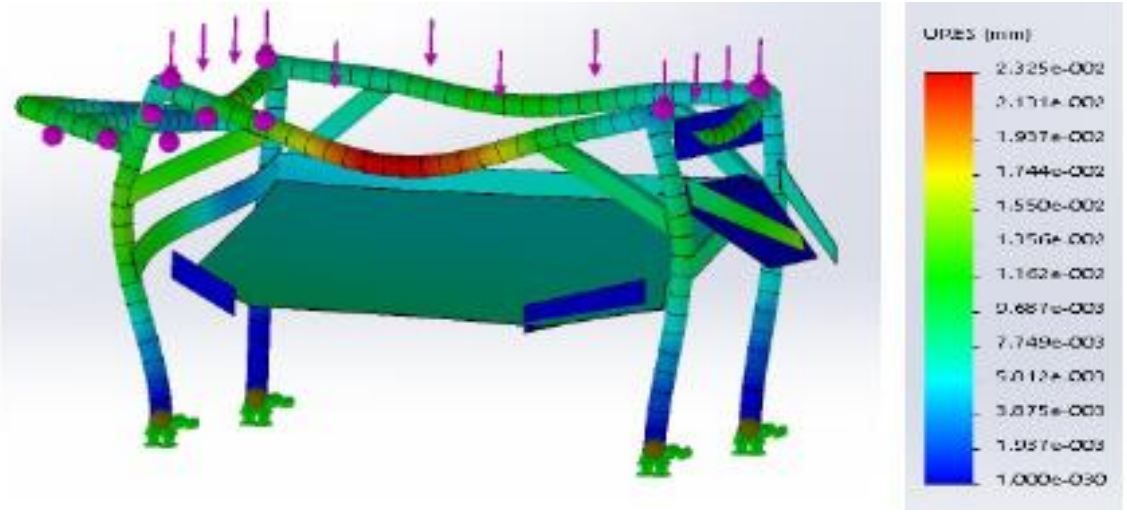

Figure 7 Displacement

The result of the structural analysis using the element method is deformation or displacement.

Safety Faktor

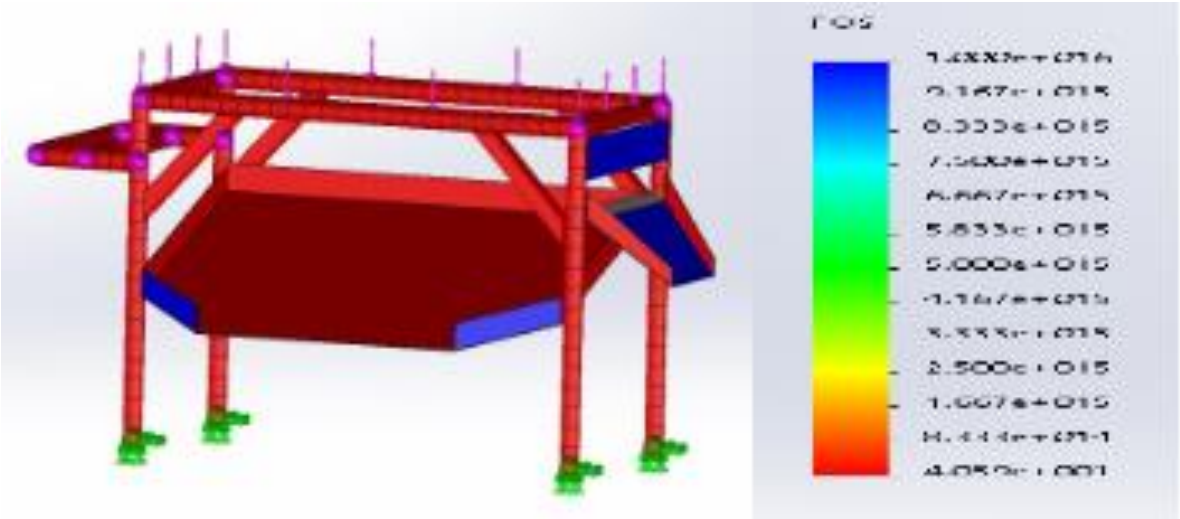

Figure 8 Fos

Safety factor is the safety value in a design. The safety factor is calculated with reference to the quotient of the allowable stress (yield strength) divided by the amount of stress that occurs.

Conclusion

1. The power supply uses a v-belt type A-45 with a circumference of 1150 mm. To get the translational movement back and forth on the sand sieve screen is done by installing the crankshaft.
2. Data on the results of dry and wet sand sieving tests. On the type of wet sand with a capacity of 30 kg, the results obtained are 27 kg with a time of 14 minutes. For the type of dry sand with a capacity of 30 kg, the results obtained are 29 kg with a sieving time of 7 minutes.
3. This sand sifter can be disassembled and installed according to the sand fineness required by the user.
4. Work productivity of sand sifting machine operators has increased compared to using the manual method. Based on the survey results that have been carried out, 30 kg of sand can be sifted in 14 minutes, whereas if using a machine designed and made 50 kg of sand can be sifted in 7 minutes.

Reference

Heru Sulistiawan, Perancangan Mesin Pengayak Pasir Cetak Vibrating Screen Pada IKM Cor Di Juwana Kabupaten Pati, Prosiding SNATIF Ke-1 Tahun 2014.

Irfandi, Analisa Uji Kinerja Mesin Pengayak Pasir Menggunakan Piringan Ayak Dengan Metode Gerak Eksentrik Kapasitas 1M³/Jam, Jurnal Ilmiah "MEKANIK" Teknik Mesin ITM, Vol 3 No 1 Tahun 2017.

Angga Sateria, Rancang Bangun Mesin Pengayak Pasir Untuk Meningkatkan Produktivitas Pengayakan Pasir Pada Pekerja Bangunan, Jurnal Teknologi Manufaktur, Vol 11 No 1 Tahun 2019.

Nofriady Handra, Mesin Pengayak Pasir Dengan Tiga Saringan, Jurnal Teknik Mesin. Institut Teknologi Padang Vol. 6 (1) Tahun 2016.

Daud Frengki, Perancangan dan Pembuatan Mesin Pengayak Dengan Sistem Mekanisme Empat Batang, Tugas Akhir Universitas Riau Tahun 2015.

Sularso, 1994. Dasar perencanaan dan pemilihan elemen mesin, Cetakan ke 10.