VIBRATION ANALYSIS OF BLOCK MAKING MACHINE

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Abstract: *There have been a succession of building collapses in this country for some time now. The cause for this is due to the poor quality of the construction materials used. The adoption of a block-making machine will aid in the production of more solid, high-quality blocks in a shorter period of time, hence reducing the problem of collapsed buildings in our country. Blocks can usually be moulded by hand, but the importance of using a machine cannot be overstated because it allows for a simpler, faster, and less expensive method of making blocks. Block making machines are available in a variety of designs, styles, shapes, and sizes. No other concept or device has had as much of an impact on production as compute. Computers are used in all engineering fields for calculation, analysis, design, and analysis. Product producers must consider making two products during the Manufacturing phase of the product's lifecycle: the physical products that they have always created and the virtual product, which is information about the physical product. This virtual product has the potential to supply producers with a new source of revenue. The goal of this project was to design, develop, and analyse a block forming machine frame in order to create a more efficient and versatile machine.*

1.INTRODUCTION

The goal of the proposed project is to create a product that benefits society through its use, reduced energy consumption, and the development of small-scale companies and agriculture.

2.LITERATURE REVIEW

Paving block moulding equipment has been designed and produced to match the production parameters, according to Ella Sundari et al. (2020). The maximum number of paving blocks that may be manufactured per day using a paving block moulding tool is 640.

Prasad et al. (2017) assist in the development of a product that uses less electricity and labour. The use of coir pith product can prevent plant development during the summer season, in arid terrain, and when there is a mineral deficit in the soil.

The concrete block producing machine was designed by Yemane Zemicheal and Qi Houjun (2020) to produce four blocks at once. It may also make five blocks at once by adjusting the mould and tamper assembly to the required size. In addition to the compacting vibrating mechanism, the weight of the machine is taken into account while designing it, as well as the staff required to move it and the convenience of operation. The enhanced machine can produce hollow blocks both inside and outside of halls; all that is required is a levelled concrete floor. It can be made locally and with readily available materials.

Yakubu and Umar (2015) devised a multipurpose brick/block producing machine based on standard design calculations, which they subsequently built using simple fabrication techniques. The equipment was then utilised to manufacture inexpensive and high-quality bricks and blocks in accordance with the African Regional Standard for compressed earth blocks and the Nigerian Building and Road Research Institute (NBRRI) standard. The mould must be converted to a moveable mould that can hold pallets in order to make hollow masonry units. The machine, particularly the feeding and evacuation components, might be automated (mechanism). This will improve its performance as well as the operator's safety.

Rufus ogbuka Chime at el. (2016),recommend that the movable parts of this machine like the lifting arm be oiled properly before usage for easy movement since they carry heavy load. That the machine must be properly Installed, balanced before usage to withstand the vibration involved. The pulley, lifting arm and the vibrator should be inspected before usage The machine must be properly cleaned after the normal daily work to be free from sand and cement which can attack the parts and destroy them or the sand also causing friction in the machine. The combination of human creativity with computer technology provides the design efficiency that has made CAD such as popular designtool. CAD has allowed the designer to bypass much of the normal drafting and analysis that was previously required, making the design process flow more smoothly. In fact, software design should be encouraged in our institution of higher learning base on the following facts, long product development, countless trial and error and accountability and limited profitability.

3. PAVER PLANT PROCESS

3.1 . Receiving and Storing Raw Materials

Different materials used in block manufacture, such as gravel and concrete, are brought in bulk by trucks or rail and stored separately in silos. Loading is done manually to ensure that the hoppers have enough material to finish the batch. Another conveyor belt unloads stone chips (aggregates) to be weighed, while another conveyor belt delivers concrete sand into a weight belt that weighs the coarse sand as it falls onto it and the weigh belt transporting this sand onward. The size of these chips is less than an eighth of an inch. The proportion of sand to stone chips varies depending on the paver type.

3.2 Batching and mixing

More often than not, the batching process is assessed in weight rather than volume. Batching is done before production and is based on the end product's qualities. It is the process of following a recipe and measuring and combining elements like as sand, screening, cement, admix, colour, and water. This is done in a big concrete mixer with a lot of sand and stone fragments. Six giant steel paddles mix and rotate, while cement is automatically injected through nozzles on the side of this massive mixing bowl. Water is added until the desired consistency is achieved. To achieve the desired colour, nozzles also discharge a pigment into the mix. Although the batter turns out dry and crumbly, the recipe contains just enough moisture to provide high-quality results.

3.3 Curing

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3.4 Cubing and Storing

The pavers are lifted off the board and stacked into a cube using a hydraulic clamp. A cuber is the name for this machine. To build a cube, the cuber stacks nine to ten layers on top of one another, and then wraps and straps the cubes together. Wrapping and strapping ensures that the materials are handled safely while being transported to the job site.

4. Material Selection

Mild steel is a low-carbon carbon steel that goes by the name "low carbon steel." Mild steel normally has a carbon concentration of 0.05 percent to 0.25 percent by weight, whereas higher carbon steels typically have a carbon content of 0.30 percent to 2.0 percent. Any more carbon, and the steel becomes cast iron.

- Unlike high carbon and other steels, it is more ductile, machineable, and weldable.
- During heating and quenching, it is nearly impossible to harden and strengthen the material.
- There isn't enough carbon and other alloying elements in the crystal structure to block dislocations, resulting in lower tensile strength.
- **Material Properties**

Young's modulus – 210 GPa

Density - 7880 Kg/m^3

Poisson's ratio - 0.3

5. Problem Identification

Some issues with block production machines have been observed, including structural damage caused by variables such as vibrations and deflections for continuous use and load. As a result, the life of a block forming machine frame is limited. To solve this technological challenge, the frame design of the block producing machine was revised in this project.

objective:

The primary goal of this project is to increase the durability of the block-making machine and to resolve various technical concerns. A new support for the frame structure of a block making machine has been presented to reduce vibration during the block building process. For the analytical testing and validation, mild steel is used. ANSYS software should be used to examine the structural integrity of this new block producing machine frame.

6.INTRODUCTION OF FEM

6.1 Introduction of FEM

The FEM is a mathematical model for predicting close experimental solutions in a variety of computing fields. FEM-based numerical analysis is generally referred to as finite element analysis (FEA).

6.2 FEA Works

As a machine tool for performance arts engineering analysis, FEA could be valuable in engineering. It entails the use of mesh construction techniques to break down a complex problem into little pieces, as well as the usage of a software package programme that follows the FEM rule.

6.3 Advantages of FEA Software

- It reduces the number of prototype tests, saving both money and time.
- It shows a graphical depiction of the analysis' results.
- The finite element modelling and analysis are done in the pre-processor and solution phases, which would take a long time and, in some situations, be impossible to execute manually.
- It aids in the optimization of a design.

7.DESIGN OF BLOCK MAKING MACHINE CAD

CAD software for mechanical design may provide raster visuals portraying the overall appearance of developed things, or it may employ vector-based graphics to depict the objects of traditional drafting. It entails more than simply shapes, though. CAD output must express information such as materials, methods, measurements, and tolerances according to application-specific norms, just like hand drafting of technical and engineering drawings.

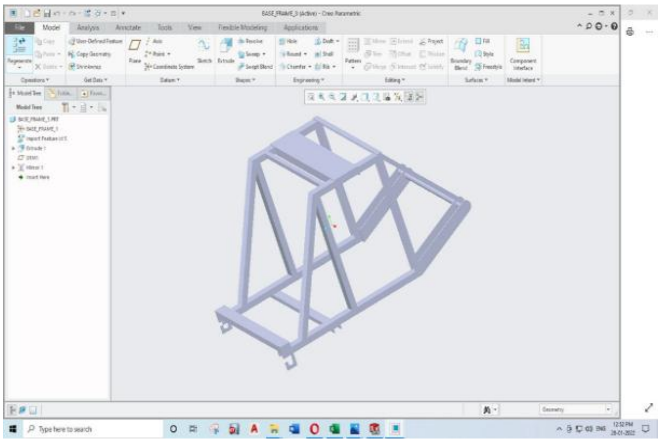

Fig : Model 3 of Block Making Machine

8.RESULT AND DISCUSSION

Modal Analysis of Block Making Machine Model 3

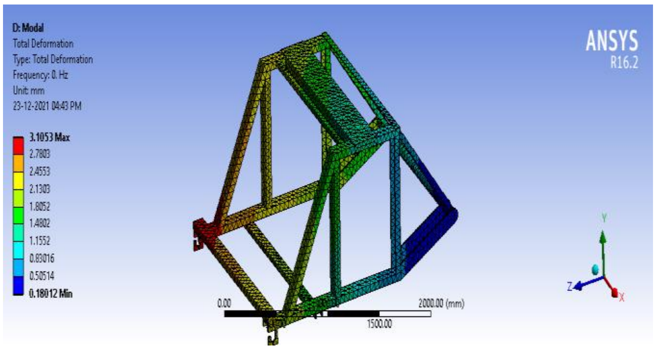

Fig : 1st model of deformation in model 3

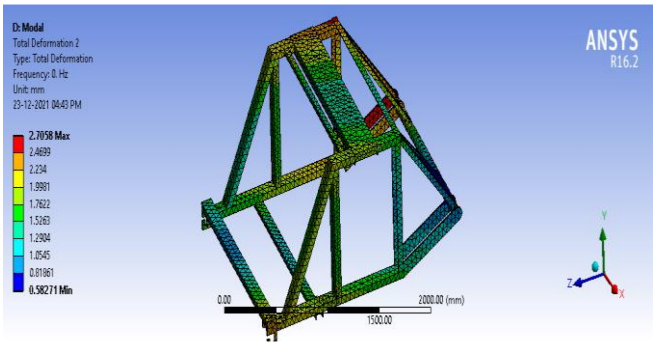

Fig : 2nd model of deformation in model 3

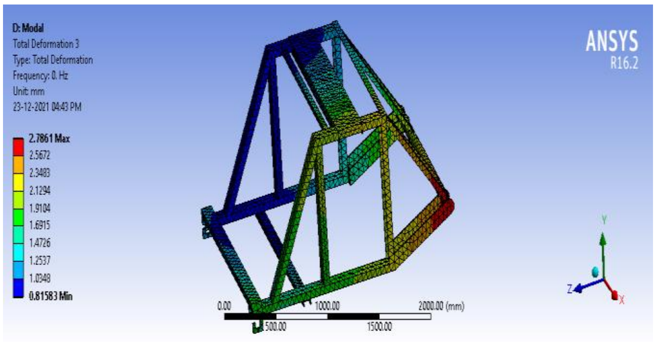

Fig : 3rd model of deformation in model 3

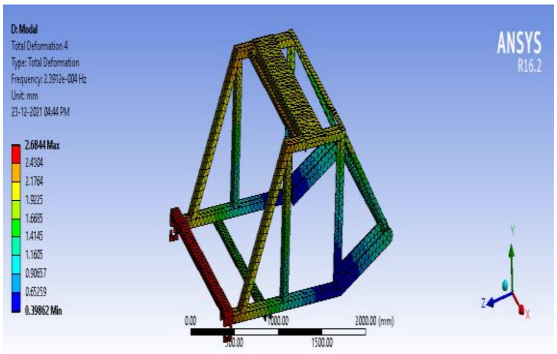

Fig : 4th model of deformation in model 3

Modes	Frequency	Max. Deformation
1	0	3.1053
2	0	2.7058
3	0	2.7861
4	2.39E-04	2.6844
5	1.23E-03	2.7948
6	2.68E-03	3.1662

Fig : Deformation of Model 3 at Specified Frequency (Free Vibration)

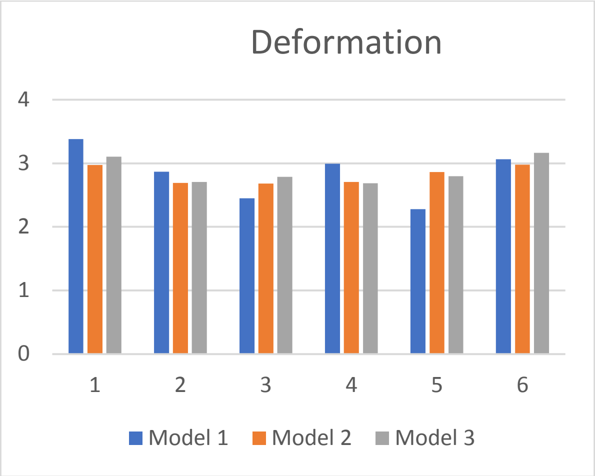

Fig : Graphical representation of deformation for 3 models of block making machine

9.CONCLUSION

Natural frequency analysis (modal analysis) was used in this project to improve the vibration resistance of the frame of the block producing machine. By doing a modal analysis, you will obtain insight into its behaviour and will be able to optimise not only the system under consideration, but also the structural behaviour. Model 3 has the smallest deformation at the highest frequency range, according to the results presented for three different models in the preceding chapter with suitable figures.

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REFERENCES

1. Ella Sundari, Soegeng Witjahjo, Eka Satria Martomi, Dodi Tafrant, "Design and Prototype of Paving Block Making Machine", Atlantis Highlights in Engineering, volume 7, Proceedings of the 4th Forum in Research, Science, and Technology (FIRST-T1-T2-2020)

2. Prasad M. Pawar, Pooja S. Gurav, Mrunali S. Raut, Pratik P. Shinde, "Design and Fabrication of Coco Pith Block Making Machine", International Journal of Engineering and Advanced Technology (IJEAT), Volume-6 Issue-4, April 2017.

3. Yemane Zemicheal and Qi Houjun, "Design, Analysis and Development of Improved Hollow Concrete Block Making Machine", International Journal of Engineering Research & Technology (IJERT), Vol. 9 Issue 03, March-2020.

4. Rufus ogbuka Chime, Samuel I.Ukwuaba, Rufus Chuka Chime, Abdulrahim Abdulbaqi Toyin, "Design modeling and simulation of block moulding machine: management approach", International Journal of Engineering Science and Innovative Technology (IJESIT), Volume 5, Issue 3, May 2016.

5. Yakubu and Umar, "Design, Construction and Testing of a Multipurpose Brick/Block Moulding Machine", American Journal of Engineering Research (AJER), Volume-04, Issue-02, 2015, pp-33-43.