Design and Fabrication of Hydraulic Balancer and Vibration Analysis of Balancer in Hollow Block Making Machine

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***Abstract*— In general the hollow block machine is worked in manual, semi-automatic, automatic for any form. It is movable and fixed to the ground. Aim of this project is to avoid unequal or unbalance position of lower die to the hydraulic machine. The reason of unbalance position of die is circulation of oil fluid cannot be flow equally to the hydraulic machine. So, the position die is not setting to pallet and product is not accepted to the market. The design of balancer is used to overcome the above problem thoroughly. The balancer is used the concept of rack and pinion mechanism. [2]The rack and pinion system, motor rotation can be easily converted to linear motion. Rotation of the pinion-shaft motor is received by the gear (reduction unit), and then transmitted through the pinion gear to the rack and finally converted to linear motion. In addition to analyze stress and displacement of balancer.**

Keywords: Balancer, Vibration analysis of balancer, Balancer of concrete block

I. INTRODUCTION

Cement concrete hollow blocks have an important place in modern building industry. They are cost effective and better alternative to burnt clay bricks by virtue of their good durability, fire resistance, partial resistance to sound, thermal insulation, small dead load and high speed of construction. Concrete hollow blocks being usually larger in size than the normal clay building bricks and less mortar is required, faster of construction is achieved. Also building construction with cement concrete hollow blocks provides facility for concealing electrical conduit, water and sewer pipes wherever so desired and requires less plastering. Concrete is a mixture of ordinary Portland cement, mineral aggregate (sand and stone chips) and water **[1]**. The water used in preparing the concrete serves two purposes:

1. It combines with the cement to form a hardened paste
2. It lubricates the aggregates to form a plastic and workable mass.

The water that combines with the cement varies from about 22 to 28% of the total amount of mixing water in concrete. Mineral aggregates (sand and stone chips) are normally divided into two fractions based on their particle size. Aggregate particles passing through the No.4 or 4.7 mm Indian Standard sieve are known as fine aggregate. The particles retained on this sieve are designated as coarse aggregate. Natural sand is often used as fine aggregate in cement concrete mixture. The maximum size of the coarse aggregate that may be used in cement concrete hollow blocks is 12.5 mm.

II. BALANCER OF HYDRAULIC MACHINE:

The several components assemble to produce the design of balancer. The components are rack and pinion (gear) part, shaft, bearing block, bolt and nut, rack cover plate. The balancer can fixed to the lower die and weld of the hydraulic machine. If the machine is operating condition, the upper die can be lift in downward movement to punches lower die. The lower die is exactly setting to the pallet and receives the compaction from upper die. The vibration is surely formed to the hydraulic balancer. Because, the machine having 10 ton of weight to compact or punch to the lower die. So, we have to analyze the static and dynamic value of the balancer.

III. METHODOLOGY: DESIGN AND FABRICATION PROCESS

In this project are made to optimize the design of balancer using modeling of CATIA V5 software and analysis part can done for using ANSYS software. A simple CAD model is shown in *fig 3.1*. In order to the model of balancer necessary part is given below.

1. Modeling of rack part
2. Modeling of pinion or gear
3. Modeling of shaft
4. Modeling of bolt and nut
5. Modeling of bearing block
6. Modeling of rack cover plate. Then the six models are assembled to get the design of balancer.

The wrought iron material can be used to fabricate the hydraulic balancer. [5]Wrought iron is the old material of the blacksmith. It resists corrosion far better than modern steel. Wrought iron has been used in building from the earliest days of civilization, wrought iron door furniture being commonplace in Roman times. The structural use or iron dates from the Middle Ages, when bars of wrought iron would be used occasionally to tie masonry arches and domes.

Table3.1: The chemical composition of wrought iron.

Material	Iron	Carbon	Manganese	Sulfur	Phosphorus	Silicon
Wrought iron	99–99.8	0.05–0.25	0.01–0.1	0.02–0.1	0.05–0.2	0.02–0.2

Table3.2: The properties of wrought iron:

Property	Value
Ultimate tensile strength [psi (MPa)]	34,000–54,000 (234–372)
Ultimate compression strength [psi (MPa)]	34,000–54,000 (234–372)
Ultimate shear strength [psi (MPa)]	28,000–45,000 (193–310)
Yield point [psi (MPa)]	23,000–32,000 (159–221)
Modulus of elasticity (in tension) [psi (MPa)]	28,000,000 (193,100)
Melting point [°F (°C)]	2,800 (1,540)
Specific gravity	7.6–7.9

The above table1 is used to fabricate of hydraulic balancer. Two types of fabrication process as possible. Casting process and Manufacturing process. The fabrication of casting process is to select the wrought iron material is to be heated with heating chamber at the melting level of wrought iron. The melting range of wrought iron is 1540°C. If the molten metal to be placed in the balancer molding and they are produced by a balancer with burr of the material. The fabrication of manufacturing process is carried out drilling, cutting, turning, chamfering operation and to produce the design of balancer. The design may be produce at manually and computer.

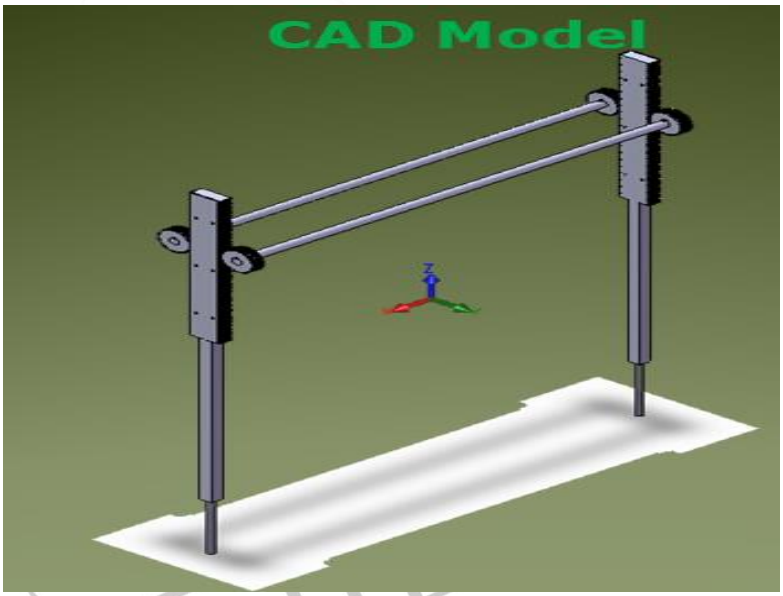

Fig: 3.1 Simple CAD model of hydraulic balancer

IV. ANALYSIS OF BALANCER:

ANSYS 14 software can be used to analyze the model of balancer **[3]**. The vibration analysis is classified at two categories **[4]**:

1. Static analysis
2. Dynamic analysis. We have analyse only static or model analysis of stress and displacement of the component.

V. V. RESLUT AND DISCUSSIONS:

RESULT:

The *fig 5.1* and *fig 5.2* as shows the static analysis result of Von-Misses stress and Resultant displacement.

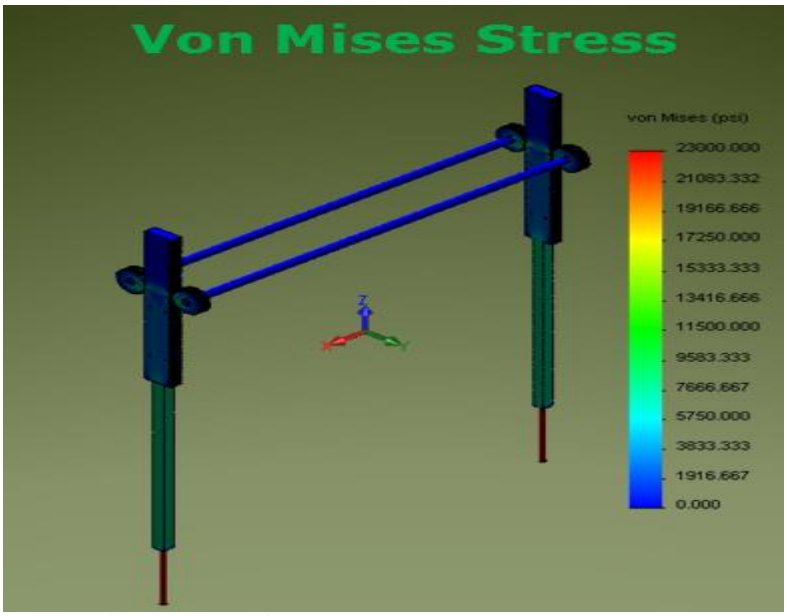

Fig: 5.1 Maximum and minimum of Von-Mises stress of the hydraulic balancer

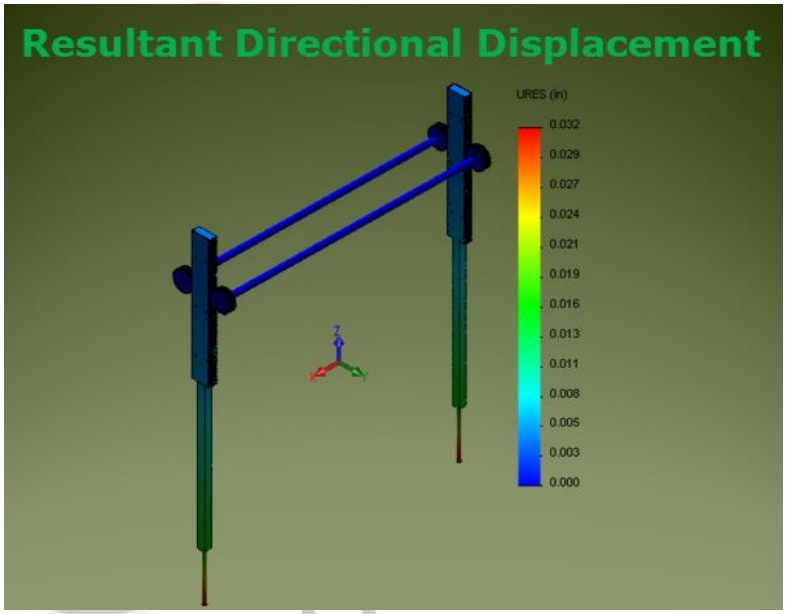

Fig: 5.2 Maximum and minimum displacement of the hydraulic balancer

VI. DICUSSION

In this project work has provided us an excellent opportunity and experience to use our limited knowledge. We gained a lot of practical knowledge regarding for modeling, assembling, analyzing, fabricating and machining while doing in this project. In this project is to avoid unequal or unbalance position of lower die to the hydraulic machine. The reason of unbalance position of die is circulation of oil fluid cannot be flow equally to the hydraulic machine. So, the position die is not setting to pallet and product is not accepted to the market. The design of balancer is used to overcome the above problem thoroughly and analyse the result of stress and displacement of the hydraulic balancer.

VII. ACKNOWLEDGMENTS

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VIII. REFERENCES

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