A REVIEW ON HORIZONTAL HYDRAULIC PRESS

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ABSTRACT

It required to design, analysis and process optimization manufacturing to reduce quality costs in industrial applications. In this project we design the special purpose machine for inner sleeve used in the silencers. This SPM works on the principle of the hydraulic sequencing circuit. We provide the two cylinder arrangements one is horizontal position which used for performing different operations and pressure used for this cylinder is 20 TONS. The second Cylinder is operate vertically for clamping purpose under the pressure of 5 TONS. One end of the workpiece is flurred and the other end is squeezed using horizontal hydraulic press. After using this machine the time required for the manufacturing the part reduces and production rate increases.

Keyword : - *Techniques, design ,manufacturing, cost reduction, quality, industrial companies***.**

1. INTRODUCTION

Hydraulic press is a equipment to produce compressive force. It depends upon pascal's principle that is the pressure throughout an enclosed system is constant. In a hydraulic press the forces generated, transmitted are achieved using fluid under pressure. The liquid system provides the properties of a solid. In simple press a small piston transmits the fluid to a larger piston due to fluid under pressure.

1.1 MECHANICAL PRESS

Mechanical presses belong to a class of machine tools that encompass a wide range of different machine types. Primarily, the mechanical press transforms the rotational force of a motor into a translational force vector that performs the pressing action. Therefore, the energy in a mechanical press comes from the motor. These types of presses are generally faster than hydraulic or screw presses, (actually the screw press may also be classified as a mechanical press). Unlike some presses, in a mechanical press, the application of force varies in both speed and magnitude throughout the distance of the stroke. When performing a manufacturing operation using a mechanical press, the correct range of the stroke is essential. Presses are chosen based on the characteristics of the manufacturing process. Mechanical press machine tools are commonly used in metal forging manufacture, and sheet metal working. The desired application of force will dictate the type of machine required. Extrusion will often necessitate a more consistent force over a longer distance. However, a mechanical press may often be a good choice for impact extrusion, since a fast, quickly repeatable application of force over a limited distance is what is needed for that type of manufacturing process. The most powerful mechanical presses in modern manufacturing industry will have a press capacity of about 12,000 tons, (24,000,000 lbs).

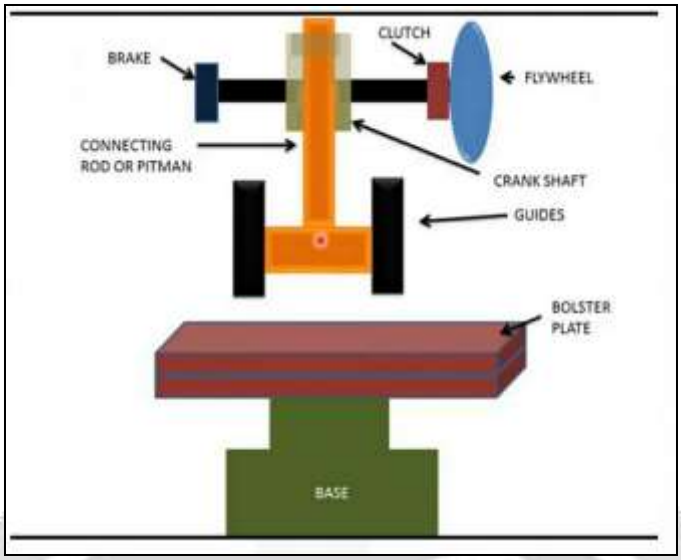


Fig.1. Mechanical Press

1.2 PNEUMATIC PRESS

Pneumatic presses are used when the manpower is not strong enough to generate the force required, or the number of parts to be machined is too large. Pneumatic presses are manufactured with various force transmission mechanisms. Their movement is based on compressed and dried air. Usually the air pressure applied is in between 3 bar to 6 bar (44 psi to 87 psi). Pneumatic presses reach their nominal force at 6 bar (87 psi). A controller is needed t operate a pneumatic. Normally 2-hand controller are used at manual work stations. In case the pneumatic press is integrated into an automated process a plc takes over the control.

Pneumatic presses are manufactured in three different force transmissions: The toggle mechanism, direct acting, and hydro-pneumatic transmission. The optimum transmission ratio of the toggle lever produces large forces at the end of the stroke and ensures low air consumption. The relatively high ram speed and the defined length of the stroke are the advantage of the toggle mechanism. Pneumatic toggle presses are therefore especially used for riveting, punching, and edge cutting. Direct acting pneumatic presses are the most widely used pneumatic presses. Their advantage is that they produce a constant force over the whole length of stroke. The air pressure used is directly related to the generated force of the press. A particular advantage of the direct-acting pneumatic press is the precise adjustment of the stroke length. This allows for flexible use in various applications: such as assembling, bending, press-fit, and crimping.

Fig.1. Pneumatic Press

1.3 HYDRAULIC PRESS

Hydraulic presses are a powerful class of machine tools, they derive the energy they deliver through hydraulic pressure. Fluid pressure, in a particular chamber, can be increased or decreased by the use of pumps, and valves.

Sometimes devices and systems may be used to increase the capacity of the pumps in more powerful presses. These presses can operate over a long distance and at a constant speed. Hydraulic presses are generally slower relative to other press machine types. This involves longer contact with the work, therefore the cooling of the work can be an issue when hot forming a part with hydraulic force. Hydraulic presses are capable of being the most powerful class of presses. Some may be as large as buildings, and can deliver awesome pressure. The largest hydraulic presses are capable of applying 75,000 tons, (150,000,000 lbs), of force. The hydraulic press shown is being used to manufacture a metal forging. Extrusion is also a very common use for such a press, although extrusion is often performed horizontally.

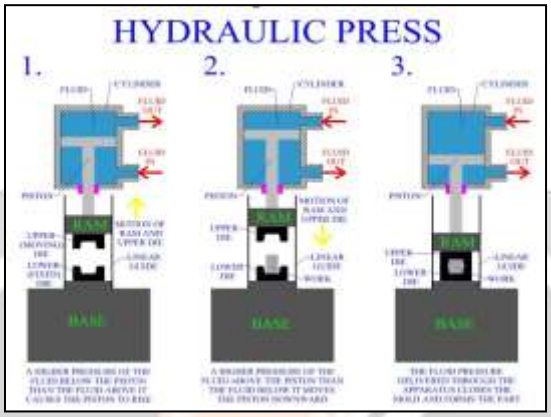


Fig. 2. Hydraulic Press

2. LITERATURE REVIEW

B. Parthiban1, et. Al [2014] studied that A hydraulic is a machine using hydraulic cylinder to generate a compressive force. The top and bottom segment has to resist the force generate while pressing operation and it is significance to calculate the mechanical properties like total deformation and stress developed on the machine. The machine is designed and fabricated for this special purpose only the load capacity of 10 Ton. Structural analysis to become a part to identified the product design. The frame and cylinder are model by using CATIAV5. In this 10 Ton hydraulic pressing machine we observed that the deformation is high and the optimization of cylinder and tie rod are analyzing by using ANSYS software. The objective of this paper is to reduce weight and cost of the pressing machine in the quality of output in the component of machine. The above result of comparison between existing and modification method of the cylinder and Tie rod is used to get weight reduce. In the modified structure in maximum shear stress and defection of the cylinder and Tie rod respectively in which does not cross safe limits. In cylinder we observe the modified dimension compare to 25% of existing dimension. In Tie rod the modified dimension compare to 7.2% of existing dimension. The modified dimension of components structure is safe under working condition. Deepak Annasaheb More et al. [2015] studied that The concept of the hydraulic press is based on Pascal's theory, which states that when pressure is applied on fluids in an enclosed system, the pressure throughout the system always remains constant. In hydraulic press, the force generation, transmission and amplification are achieved using fluid under pressure. This paper describes design, development and manufacturing of multi-purpose H-frame hydraulic press. The size and shape of machine structure should be such that it not only provides safe operation but also working stress and deformation do not exceed specific limit. In this work, the theoretical and analytical study has been carried out on the welded structure of a hydraulic press machine of a 200kN nominal operational load. The theoretically predicted results and those obtained by analytical software have been compared with the design goal of the press structure. The analysis of model was thorough at a minimum cost of material and analysis time. Because of using standard sections for manufacturing of press frame, weight reduction takes place.
Akshay Vaishnav et al. [2016], studied that hydraulic presses are being used for forming and pressing operations with wide range of capacities. Hydraulic press machine works under continuous impact load. Because of this continuous load, tensile and compressive stresses are experienced in various parts of machine. These stresses cause permanent deformation in some parts of machine. This work is based on optimization of a 250-ton four pillar type hydraulic press considering constraints like design, weight and cost. The work is focused on design and optimization of top plate of the press machine. Top plate holds the hydraulic cylinder and is one of the most critical parts of the

machine. The design is based on sizing optimization method and the results are validated by Finite Element method with proper boundary conditions. The CAD modelling has been carried out by PTC CREO and for FEA, ANSYS software is used.

3. DESIGN AND ANALYSIS

3.1 Design of Cylinder

Inner and Outer Diameter:

Firstly we have select the material for cylinder is Mild Steel.

Material selection for cylinder tube is steel i.e., ST52

Table No. 3.1

Designation	Yield Strength	Ultimate strength
ST52	310 Mpa	650 Mpa

[From: DDB, K. Achchagam]

Given:

Load = F = 20×9.81×1000

F = 196200N

Assumption:

Maximum Working pressure of cylinder = 210 bar =210×105 N/mm2

a)Force:

Force =Area× pressure

$196200=(\pi/4\times D^2)\times 210\times 10^5$

D=0.0436602m

Cylinder of model A4 is selected.

Bore diameter (D) =100 mm

Core diameter (d) = 50mm

b) Stress:

$(\sigma)_t = p\times(ro^2+ri^2)\div(ro^2-ri^2)$

$= 21\times(50^2+25^2)/(50^2-25^2)$

$= 62\ N/MM^2$

C) Stroke Length:

Discharge/ Vane pump flow rate

Q = 40 lpm = 40×10-3 m2/s

Q = A × V

V = 5092.95 m/min

V = 0.848 m/sec

0.8488×15= Stroke

Stroke=1.2732 m

For safety purpose we have selected standard stroke length.

Stroke =1400mm

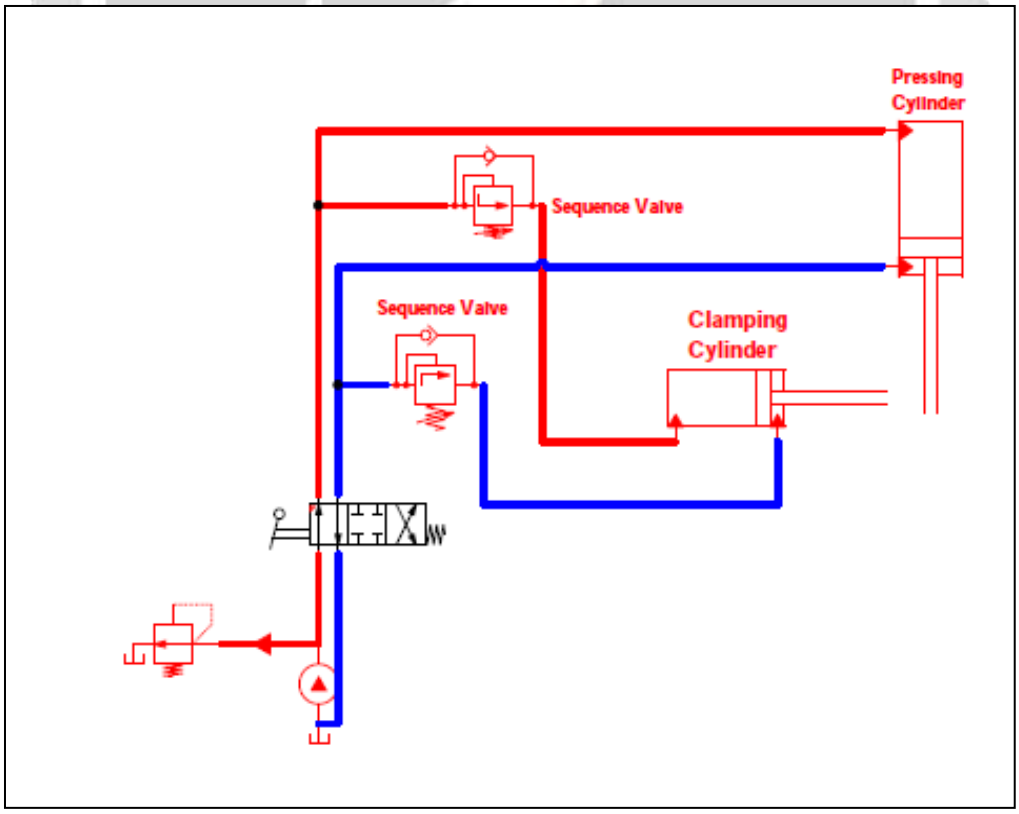
D=0.0947 m

D=94 mm

Cylinder of model A4 is selected.

Bore diameter (D) =100 mm

Core diameter (d) = 50mm



4. CONCLUSION

Hence, we have studied about various types of press like hydraulic press, pneumatic press, mechanical press. We learned about the difference between pneumatic and hydraulic press and their different working applications. Also, learned about detail design of sequencing circuit. We designed sequencing circuit using automation studio software for horizontal hydraulic press.

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