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DESIGN AND MODIFICATION OF HYDRAULIC PRESS FOR SLEEVE REMOVAL FROM ENGINE CYLINDER BLOCK

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Abstract

A sleeve removal machine is designed for removal of pressed sleeve from engine cylinder block after any rejection occurred in engine either finishing operation of sleeve or engine failure during engine testing, This operation should be need very safe because of the sensitive tolerance at the Sleeve and Cylinder block. Construction of the cylinder, ram were the most important parts because this parts functions are very important for this press machine.

KEYWORDS: Hydraulic pump, Pressure Relief valve, Check valve, Flow control valve, Hydraulic hoses, Sleeve.

1. INTRODUCTION

Rejection occurred in cylinder block because of sleeve got rejected in further super finishing operation after pressing sleeve like Boring operation, Honing operation. Some other chances of sleeve rejection is Piston insertion inside sleeve during assembly of engine, engine got seized because of thermostat valve not open, oil pump jammed, oil not topped up in engine. This machine is design for removal of pressed sleeve from engine cylinder block.

Figure 1a: Damaged piston

Figure: 1 Breakage sleeve

Figure 1b: Damaged sleeve

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2. LITERATURE REVIEW

Mr. K.Shravan Kumar1, B.Prashanth (2017)[1] was developed multi-purpose machine it can be used for performing performed on a hydraulic press machine. Main focus of this design for reducing operator fatigue and increase safety, improving the flexibility and makes operation more convenient, and to achieve dimensional and positional accuracy. Components of the press are designed to avoid bending failure because different tasks. By changing the die different operation like bending, blanking etc. can be of applied load. Mild steel is selected as material based on its properties such as high bending & tensile strength, it compatibility with operation like machining, welding, finishing, cutting etc. and cost as economic factor.

Gaurav Pradip Sonawane, Gaurav Shashikant Udgirkar, Shailesh Vijay Shirsath1, Manish Sudhir Deshpande (2014)[2] The press was developed after studying the pneumatic system as well as hydraulic system i.e. hydro – pneumatic system, were it was found that hydro – pneumatic system is more effective the pneumatic system and cost efficient than hydraulic system. This system has been shows noticeable improvements in various sectors like operation time and cost of operation. It is observed that operation time is reduced from 3 hours to approximately 30 min per assembly and the cost of operation due to this development is reduced approximately by 90 %.

Malachy Sumaila and Akii Okonigbon Akaehomen Ibhadode (2011)[3] The performance test result of Design and Manufacture of a 30-ton Hydraulic Press was developed by them is under tests the product is checked to see if functional requirements are satisfied, identify manufacturing problems, ascertain economic viability, etc. Testing is therefore employed to prove the effectiveness of the product. For the hydraulic press, test for any leakages is the most significant test. The test started with the initial priming of the pump at low pressure, after which the fluid was pumped by pump this was carried out under no-load condition. The machine was left to stand still in this position for two hours. The machine was then subjected to a load of 10 KN provided by two compression springs of constant 9 N/mm both springs arranged in parallel between the platens. The springs were compressed axially to a length of 100 mm. This arrangement was left to stand for two hrs for observed leakages. Leakage in the system was not indicated as the lower platen did not fall from its initial position. A 30-ton hydraulic press was designed, manufactured. The machine was tested to ensure conformability to design objectives and serviceability. The machine was found to be satisfactory at a test load of 10 KN.

Table 1: Basic properties of hydraulic and pneumatic systems.

Criteria	Hydraulics	Pneumatics
Energy Carrier	Oil/operational	Air
Energy transfer element	Pipe and Hose line	Pipe and Hose line
Conversion from/into Mechanical energy	Pumps, cylinders, hydraulic Motors	Compressors, Cylinders
Most important Characteristics	Pressure p (30…400 bar)	Pressure p (approx. 6 bar)
Precision of motion. All systems are Improved by positioning action	Very good because oil can Hardly be compressed	Not good because air is compressible
Typical Application	Processing parts, linear actuation, presses, rotation	Artisanry, mounting devices, Fitting-out

3. COMPARISION OF HYDRAULIC & PNEUMATIC SYSTEM

Hydraulic systems operate with oil but pneumatic systems operate with air. It is the basic differences of this system. When choosing the most suitable system for a particular design solution, the specifications on the overall operating conditions are to be strongly considered. Correct solution can be reached, based on the examples of applications for the different system types. The right choice of system (or a combination of systems) requires precise information regarding the technical data of the components, their advantages and disadvantages.

4. WORKING PRINCIPLE

A hydraulic press is a machine that uses pressurized liquid to create force. These machines are composed of a simple cylinder and piston mechanism. The press consists of a large cylinder, with a large piston, and a small cylinder and a small piston. The large cylinder and the small cylinder are connected to one another by means of a pipe. The two cylinders, and the pipe connecting them, are filled with a liquid. At this point, the function of the hydraulic press depends on Pascal's Principle.

Pascal's Principle states that when pressure is added to a liquid at rest, there is an identical increase in pressure at all points. Applying this principle to the hydraulic press means that any force that is added to the piston in the smaller cylinder will be transferred to the piston in the larger cylinder, in a proportionally increased level of force. This allows a hydraulic press to produce a great deal of force from the application of a small amount of force to the small piston. The increase of the force produced by the larger piston is proportionally larger than the force exerted on the small piston.

Hydraulic press is using hydraulic cylinder in which generation, transmission and work done are achieved by using fluid under pressure, cylinder are indispensable units in the hydraulic circuit for converting hydraulic energy into mechanical energy. The cylinder is the link between the hydraulic circuit and the working machine.

5. MANUFACTURING PROCESS

Length of Machine taken L= 910 mm & width is B= 450 mm as per dimension of heavy duty cylinder block i.e. 6 cylinder block. Cylinder mounting plate thickness taken 20 mm for safety purpose, beam height taken 850 mm for removing sleeve with respect to fixture frame & Component horizontal height.

Cylinder mounting plate 910X450X20 mm is welded with four beams, this structure only support to cylinder mounting.

The basic Manufacturing process is shown in below figure.

Figure 2: Hydraulic press

6. CONCLUSION

This is a multi-purpose machine as it can be used for performing different task, this press is used to fitment & removal of sleeves of course this hydraulic press more efficient for this purpose, new hydraulic press was constructed including modeling, selection of hydraulic component.

The design has main focus on reducing operator fatigue and increase safety, improving the flexibility and makes operation more convenient

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