

All Reciprocating Automation in Hydraulic Press

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Abstract - A hydraulic press is a machine using a hydraulic cylinder to generate a compressive force. To make an example of all reciprocating motion of hydraulic press in one press. Electric control panel, Solenoid valve, Pressure Switch and Limit switch make possible of this projects and all of this device is already used in industrial hydraulic press. By using electric control panel it is possible to operate hydraulic press with smart phone by using Arduino and Blynk app. The reciprocating motion of hydraulic ram is depends upon application of hydraulic press. Therefore each application required its own control on reciprocating motion of hydraulic ram.

Key Words: Hydraulic Press, Hydraulic Cylinder, Arduino Project, Blynk app, Automatic press, Automation in Press.

1. INTRODUCTION

Hydraulic press is a machine which pull or push object placed between press and hydraulic ram. In hydraulic press hydraulic ram moves back and forth by supply of pressurized hydraulic oil. The reciprocating motion of hydraulic ram is depends upon application of hydraulic press. Therefore each application required its own control on reciprocating motion of hydraulic ram. In hydraulic press hydraulic ram full extend and full retract is avoiding because it build extreme stress on hydraulic press and hydraulic cylinder. Stress is produced because there is no movement and hydraulic pressure reach its maximum valve. Therefore to avoid full extended and retract condition a limit switch or a pressure switch is used. Limit switch is placed such a way that before full extend or retract hydraulic ram it touch limit switch first. After touching limit switch, limit switch give signal to control panel or directly stop current supply of Solenoid operated direction control valve. Pressure switch is used to avoiding high pressure at full extended and retract position. It sensing hydraulic pressure, at a certain level of pressure it give signal to control panel or directly stop current supply of Solenoid operated direction control valve. Therefore limit switch and pressure switch play important role in reciprocating motion control of hydraulic ram in hydraulic press. The purpose of making this project is to show all 25 different reciprocating motion in hydraulic press. The project is a simple c type hydraulic press of capacity of 12 ton. All reciprocating motion in only on press is achieved by advance electric control panel. One advance

feature of this project is it also operated by smart phone connected by Bluetooth with help of Arduino and blynk app.



Fig. Hydraulic press operate with smart phone

2. LITERATURE REVIEW

Per-Willy Lazuli and Bjorn Victor Lund (2010) [1] presented in a study the results of modeling and simulation of a physical hydrostatic transmission with three different modeling tools; Simulink, Sim Hydraulics and Simulation X. The aim has been to get the simulations from the different models to be as similar as possible to the two measured pressures and the rotational speed of the load. The Simulation X model gave the best results compared with the measurements. The largest challenge has been to simulate the model in Simulink and to find the frictional losses in the hydraulic motor by performing different tests. The solver in Simulink could not solve the equations and it was difficult to find the tests for finding two of the friction parameters.

Mohamad M. Saleh (1992) [2] in this paper Author has given a complete thesis on design study of a heavy duty hydraulic machine using finite element techniques. The machine is designed by ENERPAC without any measurement or variable hydraulic system. The investigation dealt the theoretical and experimental model of the machine to establish the accurately optimal design analysis and further development of the present machine at minimum time and lower cost. The applicability of the existing PC based FE package as a computer aided design tool is also investigated. A comparison has been made between the experimental and theoretically predicted results. Both the results are found to be in good agreement with each other.

Sinha and Murarka (1988) [3] in this paper Authors has conducted a study on hydraulic presses. It represented a 3-D complex structure. It is found that an exact analytical method of stress and deformation analysis is cumbersome and time-consuming. In order to reduce core memory requirement and the cost of computation, a simplified plane stress (PS) FEM model for a hydraulic press structure (welded frame) has been identified for its analysis. On the basis of this investigation, certain significant guidelines have been obtained for the design of press frames. Such a model has resulted in savings in computational time, core memory requirement and cost of analysis.

3. PROBLEM IDENTIFICATION AND OBJECTIVES

3.1 Problem Identification

- In manual hydraulic press high skilled operator is required because in manual hydraulic press there is no limit switch or pressure switch is used to stop hydraulic ram before full extend or retract condition.
- In manual hydraulic press direction control valve is fixed at certain place therefore operator not able to see job from different positions while operating.
- In manual hydraulic press operator is always in danger due to direction control valve is fixed near to job or hydraulic press and compressing a brittle material for testing or fun is always dangerous.
- In manual hydraulic press continuous operating is difficult because it's hard to push and hold lever of direction control valve
- In manual hydraulic press safety procedure is more than automatic hydraulic press.
- In manual hydraulic press operator is required to push lever of direction control valve during whole cycle of operation and each cycle of operation.
- In manual hydraulic press production is low in stamping, punching, cutting etc.

3.2 Objectives

- Operator can easily see job from different direction while operating because of remote control
- Remote control also reduce risk of accident and increase operator safety which is most important.

- It is also operate by smart phone via Bluetooth hence distance is increase between operator and hydraulic press when compressing or dangerous material/job. Hence safety farther increase.
- It is also operate by foot pedal therefore it is very useful for continuous working.
- It is also operate by timer in smart phone, therefore we can set time for start motor or stop motor same as up and down.
- Easy to use.
- High production is achieved.
- Safety is increase.

4. CONSTRUCTION

4.1 Hydraulic Press Frame

The most common are the gap-frame, also known as C-frame, and the straight side press. A straight side press has vertical columns on either side of the machine and eliminates angular deflection. A C-frame allows easy access to the die area on three sides and require less floor space. A type of gap-frame, the OBI pivots the frame for easier scrap or part discharge. The OBS timed air blasts, devices or conveyor for scrap or part discharge.

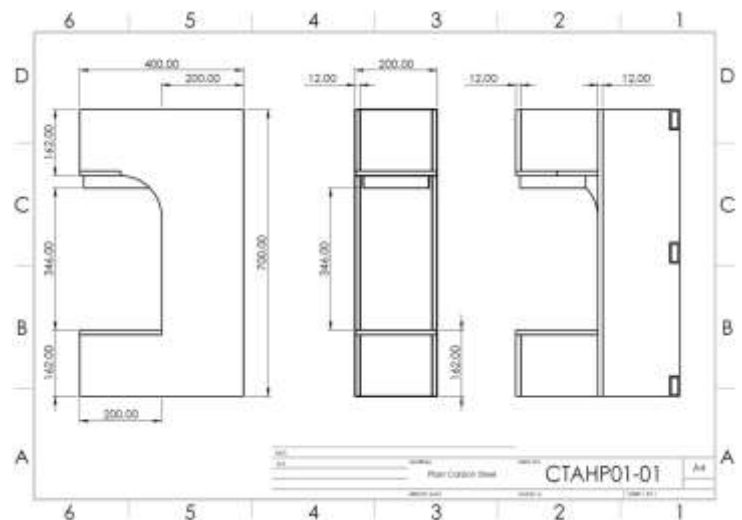


Fig. Drawing of Hydraulic Press Frame

4.2 Hydraulic Cylinder

Flanges, trunnions, clevises, and lugs are common cylinder mounting options. The piston rod also has mounting attachments to connect the cylinder to the object or machine component that it is pushing or pulling.

A hydraulic cylinder is the actuator or "motor" side of this system. The "generator" side of the hydraulic system is the hydraulic pump which delivers a fixed or regulated flow of oil to the hydraulic cylinder, to move the piston. The piston

pushes the oil in the other chamber back to the reservoir. If we assume that the oil enters from cap end, during extension stroke, and the oil pressure in the rod end / head end is approximately zero, the force F on the piston rod equals the pressure P in the cylinder times the piston area A .

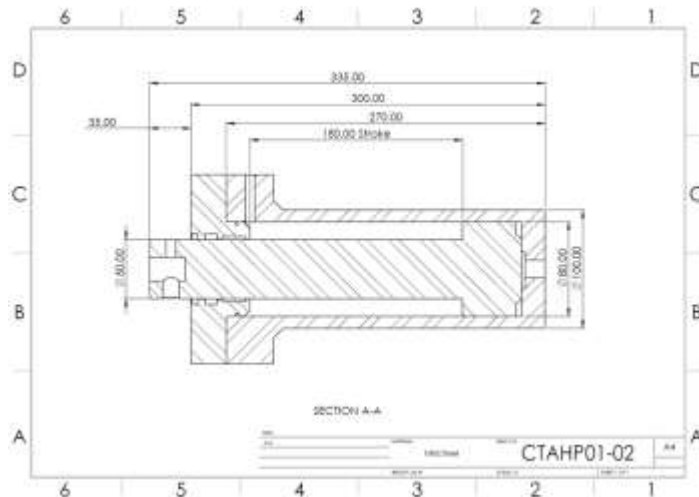


Fig. Drawing of Hydraulic Cylinder

4.3 Electric control panel with Arduino.

It controls overall operation and performance of hydraulic press, by controlling power pack unit. It consists of motor starter, push-button, indicator lamp, current and voltage indicator, contactor, timer etc. Control panel gets it feedback from hydraulic press by means of limit switch, pressure switch, proximity-switch, thermocouple etc.



Fig. Display of Smart Phone While Operating Hydraulic Press

5. CONCLUSIONS

It is also important to note that hydraulic presses are available in both manual and automatic. When using manual hydraulic presses, it is crucial to observe various safety measures for your own safety and the safety of your workers for example barrier guards and interlocking. All in all, safety applies to both manual and automatic hydraulic presses. Apply all the safety measures indicated. Hydraulic presses are very useful for industrial purposes. Also, its working mechanism is very simple. Therefore it important to make its all reciprocating motion in one press for an example. The fluid which in most instances is oil is usually displaced when one of the pistons is forced inward. The small piston displaces small quantities in a given distance of movement compared to the large piston which is equivalent to the ratio of the piston's head surface area. Hence, the small piston must be moved a great distance in order to get the large piston to move impressively.

The total distance covered by the master piston is determined by the distance covered by the slave piston divided by the ratio of the areas of the pistons' heads. This is how energy in form of output is conserved and the Law of Conservation of Energy is fulfilled. Work is force exerted over a certain distance. When force is increased on the master piston, the distance where the force is exerted must be reduced.

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