

Design And Manufacturing Of Single Cylinder Hydraulic Power Press

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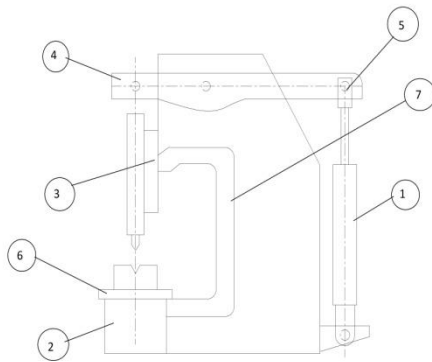
Abstract- The concept of manufacturing single cylinder hydraulic press is developed due to the main reason that our machine has the hydraulic cylinder which is not directly attached to the operation. We have seen many machine of single cylinder. Here the hydraulic cylinder is directly attached to the operation. Here the punch is directly placed to the hydraulic cylinder and the ram is not used for fixing the punch. But in our machine single cylinder hydraulic press machine the hydraulic jack is placed at the rear of the machine by using the one-third ratio ram the work is to be done. Here the punch is attached to the ram and ram is attached to the connecting rod. The punch is attached to the work piece operation. By seeing the double cylinder hydraulic press in the market which they used to do work of heavy duty parts and long work. But when we had seen in market they used it to do the job work and small work are to be done. Due to this a lot of energy is wasted. So we decided to make a machine were the small job are to be done easily and cheaply. Here first we have designed roughly the machine and by the design calculation the perfect designed is developed and fabricated all the parts and assembled it. Small parts are operated from other factory and estimation is carried out. Today in the market many types of single cylinder are present but our machine is a special type of machine.

I. INTRODUCTION

The development of engineering over the years has been the study of finding ever more efficient and convenient means of pushing and pulling, rotating, thrusting and controlling load, ranging from a few kilograms to thousands of tons (Sumaila 2002). Presses are widely used to achieve this. Presses, as defined by Lange (1975), are pressure exerting machine tools. They can be classified into three principal categories as: hydraulic presses which operate on the principles of hydrostatic pressure, screw presses which use power screws to transmit power and mechanical presses which utilize kinematic linkage of elements to transmit power (Nebel *et al.* 1989; Degarmo *et al.* 1997; Sharma 2005). In hydraulic press, the force generation, transmission and amplification are achieved using fluid under pressure. The liquid system exhibits the characteristics of a solid and provides a very positive and rigid medium of power transmission and amplification. In a simple

application, a smaller piston transfers fluid under high pressure to a cylinder having a larger piston area, thus amplifying the force. There is easy transmissibility of large amount of energy with practically unlimited force amplification. It has also a very low inertia effect. A typical hydraulic press consists of a pump which provides the motive power for the fluid, the fluid itself which is the medium of power transmission through hydraulic pipes and connectors, control devices and the hydraulic motor which converts the hydraulic energy into useful work at the point of load resistance (Sumaila 2002; Sharma 2005). The main advantages of hydraulic presses over other types of presses are that they provide a more positive response to changes in input pressure, the force and pressure can accurately be controlled, and the entire magnitude of the force is available during the entire working stroke of the ram travel. Therefore, it is intended here to design and manufacture a press, which is low cost and hydraulically operated using locally sourced materials. This will not only help to recover the monies lost in the form of foreign exchange, but will enhance the level of our local technology in the exploitation of hydraulic fluid power transmission. The principal parameters of the design included the maximum load (300 kN), the distance the load resistance has to move (piston stroke, 150 mm), the system pressure, the cylinder area (piston diameter = 100 mm) and the volume flow rate of the working fluid. The critical components that require design included the hydraulic cylinder, the frame, the hydraulic circuit (Fig. 1).

II. DESIGN METHODOLOGY



Key: 1-Hydraulic Jack (Cylinder), 2-Table, 3-Ram, 4-Link, 5-Connecting Pin, 6-Bed 7-Body

Fig.1 Schematic diagram of single cylinder hydraulic power press

Components:

A. Hydraulic cylinder:

Hydraulic cylinders (also called linear hydraulic motors) are mechanical actuators that are used to give a linear force through a linear stroke. Hydraulic cylinders are able to give pushing and pulling forces of millions of metric tons with only a simple hydraulic system.

Very simple hydraulic cylinders are used in presses; here, the cylinder consists of a volume in a piece of iron with a plunger pushed in it and sealed with a cover. By pumping hydraulic fluid in the volume, the plunger is pushed out with a force of plunger-area pressure.

B. Ram : Ram is made up of mild steel. Reason for using mild steel is that it has better ductility, machinability, high strength. It will perform up and down motion. Width : 57mm
Length : 250mm
Height : 200mm

C. Link(beam): It is made up of mild steel. It would be housed to join the other parts or components of machine.

D. Connecting Pin: It is round 'T' shape pin. It is made up EN31 hardened material. As it joins the other component thus hardened material is used.

E. Bed: It is a component on which the v-block would be placed. It is made up of mild steel.

F. Table: The table is made up of mild steel .the table is use for mounting the v block.
Thickness : 32mm
Length : 200mm

III. WORKING OF HYDRAULIC PRESS

Firstly, by starting the machine the hydraulic motor start working in the hydraulic unit. Now the hydraulic fluid in the hydraulic tank will be forced to move with the help of hydraulic pump by the working of the hydraulic motor. Now the hydraulic fluid will be move further in the hydraulic jack with the help of hydraulic pump .so this hydraulic fluid will move in jack with the help of nozzle with high velocity. Now hydraulic unit consist of one lever by operating of the lever the hydraulic jack will be moved in the upward direction by the pressure of the hydraulic fluid due to which the ram will move down and similarly the hydraulic jack move in downward direction by decreasing the pressure of the fluid by operating of the lever in the opposite direction.The hydraulic jack is connected with the horizontal column perpendicularly by the connecting pin.the connecting rod is connected with column with the help of connecting pin. Also the ram is connected with connecting rod. By this the ram can be given motion to perform the different operations such as cutting , bending, coining. For example in bending operation, the bending can be perform by fixing the v punch in the ram .Also the v block is mounted on the table. For performing the operation the axis of the ram should be perpendicular to the axis of the v block.

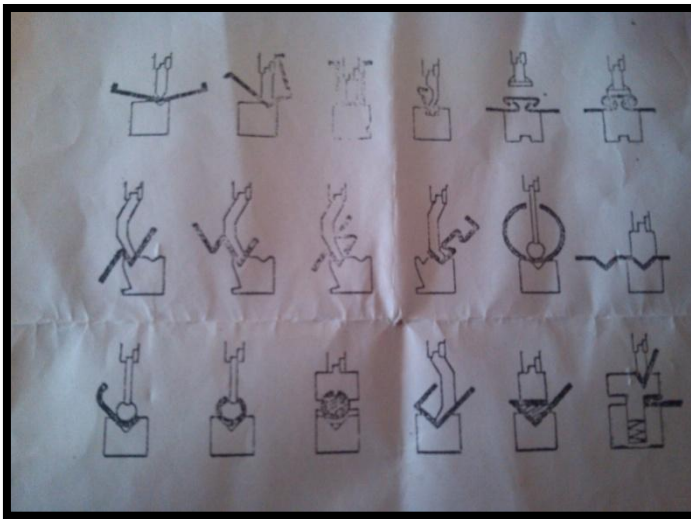


Fig 2:- Bending operation works on the hydraulic press

IV. TYPES OF FORMING OPERATION

- A. Bending: It is the process of stretching the sheet or strip of metal around a straight axis lying in the neutral plane and normal to its length wise direction.
- B. Drawing: It is the process of producing thin walled cup shaped articles from flat sheet metal blanks.
- C. Embossing: It is the operation of forming surface details of figures, letters or designs on sheet metal by displacement of the metal between two mating die halves . The operation is combination of drawing & stretching.
- D. Bulging: It is the operation of forcing a part of the wall of a drawn tubing or cup shaped part outward. Bulging is performed in split dies using rubber plugs, heavy grease, water or oil under pressure to force the metal to take the shape of the die. (this operation can't be performed in our machine.)
- E. Beading & Curling: They are used to form the edges of a sheet metal part into a roll or curl. This is done to improve the strength or appearance of the part and to give it a protective edge. Curling is used in manufacture of pots, pans and hinges .As the punch moves downwards into the die the metal is rolled into a curl in the radius cavity made in the punch.

V. CONCLUSION

During analysis of our fabricated machine we concluded the following some important things, firstly by using the different dies and different punches the following operation can be performed such as, if we are using the v shaped punch then the bending operation can be performed. Main purpose our machine is the bending operation and for performing that

operation the capacity of our machine is 20 ton. The work piece with 4mm thickness can be blended. The working depth we can get is maximum is 80mm.

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