

Mini Hydraulic Press Machine

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ABSTRACT

Here, we fabricate the model for press operation and it's known as hydraulic press machine. Hydraulic is a topic in applied science and engineering dealing with the mechanical properties of liquids. Fluid mechanic provides the mechanical theoretical foundation for hydraulics, which focuses on the engineering uses of fluid properties. In fluid power, hydraulics is used for generation, control and transmission of power by the used for pressurized liquids, here my system of pressing operation. The hydraulic press depends on pascal's principle the pressure throughout a closed system in constant at one end of the system is a piston with a small cross-sectional area driven by a lever to increase the force. Small-diameter tubing leads to the other end of the system.

Keywords: Actuator, Compression, Fluid, Force, Hydraulic, Piston, Pascal's Law, Pressure.

1. INTRODUCTION

Hydraulic press is a machine using a hydraulic fluid to generate a compressing force. It uses the hydraulic equivalent of a mechanical level.

The hydraulic press depends on pascal's principle the pressure throughout a closed system is constant. One part of the system is piston acting up as a pump with modest mechanical force acting on small cross-sectional area; the other parts of a piston with a larger area which generates a correspondingly large mechanical force. Only small diameter tubing is needed if the pump is separated from the press cylinder. Hydraulic presses are commonly used for forging, clinching, molding, blanking, punching, deep drawing, and metal forming operations, With the growth and importance of light-weighting in the aerospace and automotive industry, more applications are presented in Thermoplastics, composites, SMC Sheet Molded Composites, RTM Resin Transfer Molding, GMT Glass Mat Transfer and carbon Fiber Molding. All of these applications require precise control and repeat-ability.

In many workshops (especially small and medium scaled workshops), repair and replacement of press fitted machine elements are done in a crude manner. This process wastes time and consumes a lot of energy, as well as cause harm to the environment. Also the material to be replaced or the machine/plant on which the repairs is being carried out on may get damaged in the process. The ability of a technician to carry out his job safely, with less time and energy application depends on the availability of the right working tools. To perform jobs such as Pushing, pulling, thrusting and rotation, presses are required.

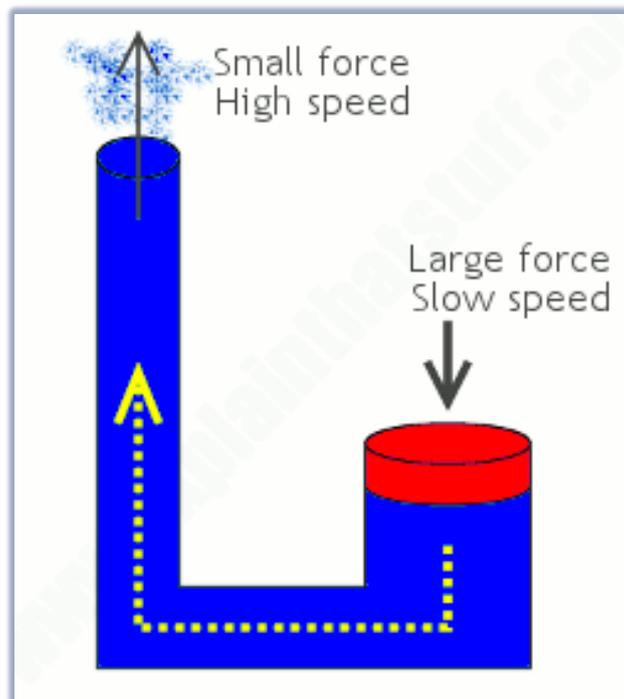
The major advantages of hydraulic presses over the other types of presses (power screw and mechanical presses) include; hydraulic press provides a more positive response to changes in input pressure, the force and pressure can accurately be controlled, and the en-tire magnitude of force is available during the entire working stroke of the ram travel (Butcher, 2004; Sullivan, 2000; Cockbain, 1998; Doring, 1998). Hydraulic presses are preferred when very large a nominal force is required, hence the best option for mounting and dismounting force fits (Lange 1975). The hydraulic press is therefore valuable equipment in the workshop and laboratory especially for press fitting

operations and for the deformation of materials such as in metal forming processes and material testing for strength (Dagwa and Ighadode, 2005; Harding, 1996).

The development of the manually operated hydraulic press and pull machine will bring relief to workshops (especially small and medium scaled) by reducing the time and stress associated with installation and removal of bearings, and other forms of force fits in machine assemblies, thereby ensuring easier and cheaper maintenance and repair of machines and plants. Since all parts of the machine were built with locally sourced materials, this project therefore reduces dependence on imported goods and promotes indigenous technology.

Hydraulic press used in industries are generally converted or built to crush or to press any “process” or the “product”. For example, this may include steel plates, aluminum rolls, metallic ores, etc. In this article, we will discuss the general principle of hydraulic presses followed by the details of the actual industrial hydraulic press.

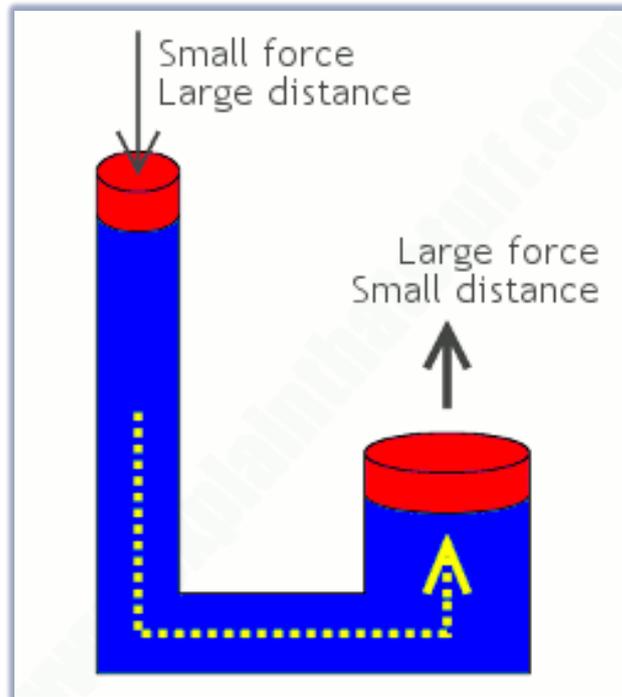
A piston is inserted into the slave cylinder and pressure is applied. The pressure applied causes the fluid to move through a pipe and into a larger cylinder. The larger cylinder is known as the master cylinder. The pressure exerted on the master cylinder and the piston in the master cylinder pushes the fluid back to the slave cylinder. The force applied on the fluid by the slave cylinder results in a large force, which is experienced by the master cylinder. An industrial hydraulic press comes along with what is known as the press plates. With the help of these press plates, the material to be worked on is either punched or crushed into sheets.



When you push on the trigger (appeared in red), you apply a generally huge power that moves the trigger a short separation. Since the water won't press into a littler space, it gets constrained through the body of the gun to the limited spout and squirts out with less power yet more speed.

Presently assume we could make a water gun work backward. On the off chance that we could shoot fluid into the spout at rapid, the water would stream the contrary way and we'd produce an enormous upward power on the

trigger. In the event that we scaled our water gun up commonly, we could produce a major enough power to lift things. This is actually how a water powered smash or jack works. On the off chance that you squirt liquid through a tight cylinder toward one side, you can make a plunger rise gradually, however with a ton of power, at the opposite end:



The science behind water power is called Pascal's standard. Basically, in light of the fact that the fluid in the pipe is incompressible, the weight must remain consistent right through it, notwithstanding when you're pushing it hard toward one side or the other. Presently weight is characterized as the power acting per unit of region. So in the event that we press down with a little power on a little zone, at the limited finish of the cylinder on the left, there must be a huge power acting upward on the bigger region cylinder on the privilege to keep the weight equivalent. That is the manner by which the power winds up amplified.

2. METHODOLOGY

2.1 DESIGN CONCEPTS AND CONSIDERATIONS

The hydraulic machine was designed to operate manually by push and pull force and was based on the concept and confederations:

1. The machine was designed with provisions for adjustments, such that hydraulic pistons can fit.
2. The hydraulic fluid is pumped manually, thus ensuring that the machine does not require electrical energy for its operation thereby incurring no operational cost.
3. The machine was made using locally sourced and available materials for easy operations, or repair. Also, standard components/parts were used to ensure the low cost of production and maintenance of the machine.

2.2 DESIGN ANALYSIS

Hydraulic cylinders are circular structures in which a piston slides when hydraulic fluid is admitted into it.

Hydraulic press is a mechanical device which is based on the “pascal’s Law” which states that equal intensity of pressure exerts on all direction in a closed system. It’s applicable here in such a way that if there is any pressure change at one point in a closed system then same intensity of pressure will change at other point in the same system.

2.3 MACHINE MANUFACTURING PROCEDURE/ DESCRIPTION

A hydraulic is a machine press using a hydraulic cylinder to generate a compressible force. It was the hydraulic equivalent of a mechanical lever. In this project I used four 40 ml hydraulic pistons as cylinders and 50 ml hydraulic piston as a lever by using a bit of applied force through the lever it can press in one point to the end.

Pressure is exerted by the fluid in a small cylinder, usually by a compressor. As well as the pressure exerted equally in all parts of an enclosed static fluid; Pascal’s law the force in a small cylinder must be exerted over a much larger distance. A small force exerted over a large distance is traded for a large force over a small distance. Though the pressure is the same, it is exerted over a much larger area, giving a multiplication of pressing a material.

2.4 USES OF A HYFRAULIC PRESS

Water driven press is utilized for practically all mechanical purposes. However, fundamentally it is utilized for changing metallic items into sheets of metal. In different enterprises, it is utilized for the diminishing of glass, putting forth powders in defense of the restorative business and for shaping the tablets for medicinal use. The other regular employments of the pressure driven presses are as per the following:

- For pounding vehicles.** Water driven press is the core of any vehicle pounding framework. In this procedure, a water driven engine applies a huge weight on the liquids into the chambers. The liquid weight makes the plates rise and with a huge power, the plate is driven on the vehicle in this way smashing it.

- Fat-Free cocoa powder.** While handling the cocoa beans, a fluid known as chocolate alcohol is determined. For making without fat cocoa powder, this fluid is crushed out in a water powered press. After this stage, this fluid is prepared further to make a powder. The powder in this manner inferred is cocoa powder, which is sans fat.

- For sword making.** During the time spent making swords, a water powered press is utilized to give a level shape to the crude steel.

3. RESULTS AND DISCUSSION

Hydraulic systems that do not have the necessary hydraulic fluids will not function, which becomes a problem when a leak occurs. You must repair the leak so the hydraulic fluids can continue to produce flow; otherwise, the hydraulic system will begin to slow down. Fortunately, areas that have leakage will also have hotter internal temperatures, according to insider secrets to hydraulics. This phenomenon can prove beneficial, since these temperatures can help us to locate the leak. Prevent leaks by using proper plumbing procedures and the correct materials.

A hydraulic system has four major advantages, which makes it quite efficient in transmitting power.

1. Ease and accuracy of control: by the use of simple levers and push buttons, the operator of a hydraulic system can easily start, stop, speed up and slow down.
2. Multiplication of force: A fluid power system (without using cumbersome gears, pulleys and levers) can multiply forces simply and efficiently from a fraction of a pound, to several hundred tons of output.
3. Constant force and torque: Only fluid power systems are capable of providing a constant torque or force regardless of speed changes.
4. Simple, safe and economical: In general, hydraulic systems use fewer moving parts in comparison with mechanical and electrical systems. Thus they become simpler and easier to maintain.

In spite of possessing all these highly desirable features, hydraulic systems also have certain drawbacks, some of which are;

- Handling of hydraulic oils which can be quite messy. It is also very difficult to completely eliminate leakage in hydraulic systems.
- Hydraulic lines can burst causing serious human injuries.
- Most hydraulic fluids have a tendency to catch fire in the event of leakage, especially in hot regions.

4. CONCLUSION

It is a multi-purpose machine as it can be used for performing different tasks. By changing the die different operation like bending, blanking etc. can be performed on a hydraulic press machine. The design has main focus on reducing operator fatigue and increase safety, improving the flexibility and makes operation more convenient, and to achieve dimensional and positional accuracy. Components of press are designed to avoid bending failure due to applied load. Mild steel is selected as material based on its properties such as high bending & tensile strength, its compatibility with operation like machining, welding, finishing, cutting, etc. and cost as economic factor.

Starting today, pressure driven presses are accessible in both the classifications, i.e., programmed and physically worked. If there should arise an occurrence of physically worked pressure driven presses, numerous well-being measures must be accepted, for example, utilizing interlocking and obstruction watches.

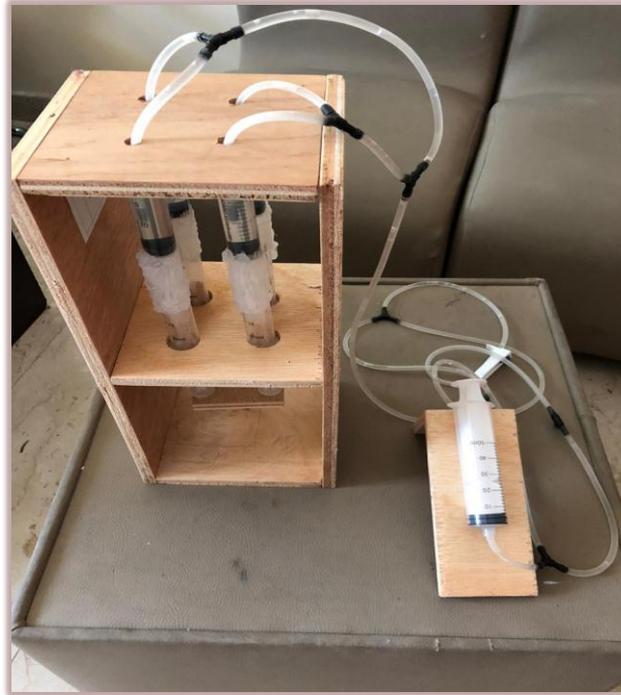
If you are unable to find the exact design and capabilities of a hydraulic machine to meet your needs, remember, that many presses are custom-built to meet the desired results of most any type of application.

Starting today, pressure driven presses are accessible in both the classifications, i.e., programmed and physically worked. If there should arise an occurrence of physically worked pressure driven presses, numerous well-being measures must be accepted, for example, utilizing interlocking and obstruction watches.

In contrast to their mechanical partners, pressure driven presses can pack any material to a full degree. Additionally, water driven presses take just 50% of the space that the mechanical ones take since they can pack an enormous weight in a chamber having a less width.

Make sure you read all reviews, from previous customers, to get a better understanding of the pros and cons of a particular machine. This type of information also helps you to make an informed decision.

The hydraulic press machine will look like this:



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