

Design and Fabrication of Mini Hydraulic Press

Mr. N Lakshmi Puthra¹, Mrs. Bhavani², Mr. Manoj T. M.³, Mr. Venkatesh S⁴, Gowri Shankar T P⁵

U G Students, Department of Mechanical Engineering^{1,2,3,4}

Assistant Professor, Department of Mechanical Engineering⁵

R L Jalappa Institute of Technology, Doddaballapur, India

gowrishankartp@rljit.in

Abstract: *The work is focused on design and optimization of top plate of the press machine. The hydraulic jack is placed in between top plate and adjustable frame. They are analyzed to improve their performance and quality for press working operation. Hydraulic press being used for forming and pressing operations with wide range of capacities. Hydraulic press machine works under continuous impact load. Because of these 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 5-ton capacity hydraulic press considering constraints like design, weight and cost. Using the optimum resources possible in designing the hydraulic press components can affect reduction in the cost by optimizing the weight of material utilized for building the structure. In the present scenario, time constrain is a crucial part for completion of any production process*

Keywords: Hydraulic press.

I. INTRODUCTION

Hydraulic press is a mechanical device is to produce compressive force by means of fluid. It works on the principle of pascal's law. pascal's law state that "Intensity of pressure in a static fluid is transmitted equally in all direction". It uses the hydraulic equivalent of mechanical lever, and was also known as BRAMAH press after the inventor, JOSEPH BRAMAH, of England. He invented and was issued a patent on this press in 1795. Frame, hydraulic jack and press table are the main components of the hydraulic press. Hence a hydraulic press is a machine that makes use of the pressure exerted on the fluids crush, straighten are mold. In hydraulic press the force generation, transmission and amplification are achieved using fluid under pressure. the liquid system exhibits the characteristics of solid and provides a very positive and rigid medium of power transmission and amplification.

Hydraulic press is used for almost all industrial purposes, but basically it is used for transforming metallic objects into sheets of metal. Hydraulic press can commonly be found for forging, molding, blanking, punching, deep drawing and many other metal forming operations. The jacks work in accordance with the hydraulic principle. The feature compactness, small, light and portability. There are widely used in automobiles and tractors. The jacks are suitable for vertical compressing or lifting the jobs. The ranges of ambient temperature at which the jacks can be used from 50°C to -20°C. Hydraulic press is used his knowledge of fluid mechanics and motion to develop this device. This invention significantly increased the compression power available, expanding the product groups and options available to other inventors.

By applying hydraulics to a press, an entire class of machines was invented. There is a wide range of different hydraulic press machines, ranging from small table top units for hobbyists to huge machines used to create metal parts. Additional power is created through the movement of the fluid, which is confined to the system. In this paper, we present an optimal design of the hydraulic system for a class of industrial press machines. Such machines are expected to one of the existing solution principles is to control the movement of the press head to produce a proper pressure profile. For instance, two methods based on this principle are available. However, from our experience in designing and operating some press machine in practice with these two methods, it is found that they may not be satisfactory. For instance, a particular brick press machine has a noise level during the pressure switching period produce a large pressure on a work-piece and they are driven by a hydraulic system.

The mechanical press has been the first choice of many press users for years but now a day by increasing demand of product. As modern hydraulic presses offer good performance and reliability, the use of Hydraulic Press is increased. As Hydraulic press machine use several load capacities to convert sheet metal into desired product. These presses come in manual mode of operation as per user requirement. The development of the manually operated hydraulic press and pull machine will bring relief to workshops 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.

II. METHODOLOGY

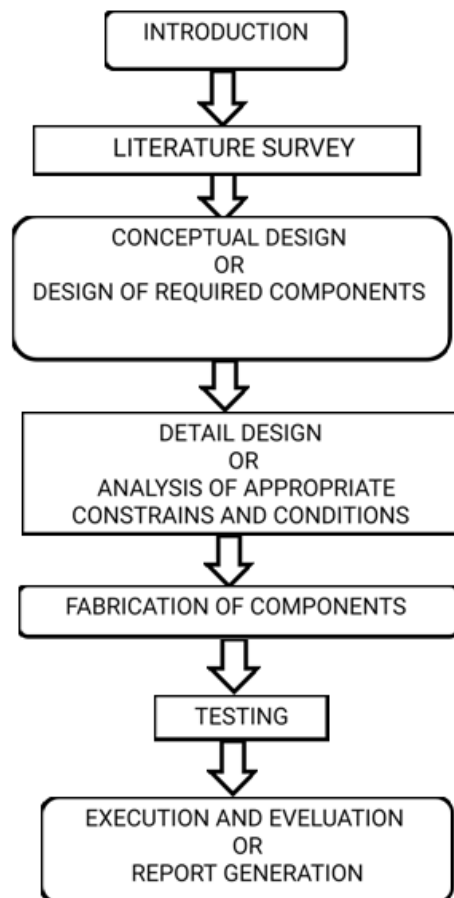


Fig.1 Flow chart of work

III. COMPONENTS





1.Hydraulic jack 2. Frame 3. Spring 4.Supporting column 5. Supporting frame

Fig.2 Components of hydraulic press

IV. WORKING PRINCIPAL



Fig.3 Model of Hydraulic press

Pump and hydraulic accumulator are used to supply the high-pressure liquid. The Hydraulic accumulator works as a junction point between the pump and the rams. When the press is in the stationary position, a hydraulic accumulator stores the high-pressure liquid. When strong thrust is necessary for operation, a hydraulic press is used. The main components of hydraulic press like, Bed, adjustable frame, fixed table, sliding block, spring, hydraulic jack, pressure relief valve, pressing tool. Here we are placing the hydraulic jack in-between sliding block and top frame. And also tension spring is attached. The function of spring is an extension or decreases by means of applying a load.

The work table is placed on the bed and bed carry the whole wait of machine. And it is mad up of mild steel. Two supporting column is attached. This supporting is supporting the sliding block because of moment of hydraulic jack with a applying a load. Generally, multiple small rams are used rather than using one large ram because it is easy to control the thrust forces as compared to large sizes. The number of rams depends upon the working load. The hydraulic pressure of fluid drives the ram.

Hydraulic press is a mechanical device its's works on the principle of 'pascal's law'. Pascal's law "state that pressure or intensity of pressure in a static fluid is equal in all direction". Pump and hydraulic accumulator are used to supply the high-pressure liquid. The Hydraulic accumulator works as a junction point between the pump and the rams. When the press is in the stationary position, a hydraulic accumulator stores the high-pressure liquid. When strong thrust is necessary for operation, a hydraulic press is used. Hydraulic press is a system where a liquid, usually crude oil, is

pumped down hole under high pressure to operate a reciprocating pump or a jet pump. This is a very flexible pumping system and can be used to produce low- to high-volume wells. This system is capable of producing a higher volume of fluid than the mechanical lift pump.

Hydraulic lift uses a pump and pumps oil very high pressure. The required power oil or produced water is reclaimed and reused to continue operating the wells. The pump produces oil on both the upstroke and the down stroke. The pump stroke speed is not easily adjustable due to varying load. The main components of hydraulic press like, Bed, adjustable frame, fixed table, sliding block, spring, hydraulic jack, pressure relief valve, pressing tool. The piston in this cylinder is pushed so that it compresses the fluid in it that flows through a pipe into the larger cylinder. The larger cylinder is known as the master cylinder.

The pressure is exerted on the larger cylinder and the piston in the master cylinder pushes the fluid back to the original cylinder. The force applied on the fluids by the smaller cylinder results in a larger force when pushed in the master cylinder. The hydraulic press is mostly used for industrial purposes where a large pressure is required for compressing metals into thin sheets. An industrial hydraulic press uses the material to be worked upon along with the help of the press plates to crush or punch the material into a thin sheet.

4.1 ADVANTAGES:

- Low cost and Easy to operate.
- Less time consuming.
- Low power required.
- High tonnage capacity.

4.2 DISADVANTAGES:

- Operational speed is low.
- They consume high energy.

4.3 APPLICATION:

- Metal forming operations and punching.
- Auto motive parts.
- Sheet molding composites and Resin transfer molding.

V. CONCLUSION

This work has provided a n excellent opportunity and experience, to use limited knowledge. It has gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. The work is a good solution to bridge the gates between institution and industries. The work is completed the work with the limited time successfully. The “HYDRAULIC PRESS” is working with satisfactory. 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.

REFERENCES

- [1]. Bhandari, V.B. (2009), “Design of Machine element”, Tata McGraw-Hill Education.
- [2]. Khurmi, R.S. and Gupta, J.K. (2005), “A Textbook of Machine Design”, Eurasia Publication House (P.V.T.) Ltd. 14th Edition.

- [3]. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Edn. 8, Laxmi Publications P.Ltd., 22 Golden House, Daryaganj, New Delhi.
- [4]. A Text Book of Fluid Mechanics and Hydraulic Machines – By, R. K Rajput and S. Chand & Co, Ram Nagar, New Delhi.
- [5]. Brian S. Elliott (2006), "Air-Over-Hydraulic Jacks", Compressed Air Operations Manual, McGraw-Hill Professional,
- [6]. S. Zhigiang, "Variations of Hydraulic Jack", Auto Universal press, Shangai publication.
- [7]. Andrew A. Parr, Hydraulics and Pneumatics, Elsevier Science & Technology Books, ISBN: 0750644192, March 1999.
- [8]. George E. Totten, Handbook of Hydraulic Fluid Technology, Marcel Dekker, inc., ISBN: 0-8247-6022-0.
- [9]. S. R. Majumdar, Oil Hydraulic Systems Principle and Maintenance, Tata McGraw-Hill, ISBN-10: 0-07-463748-7
- [10]. W. Bolton, Programmable Logic Controller, Elsevier's Science & Technology, ISBN: 978-1-85617-751-1
- [11]. T. Patel, S.Sheth, P.Patel, "Design of Semi-automatic Hydraulic Blanking Machine using PLC", 3rd National Conference on Innovative & Emerging Technologie