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Design and Analysis of Hydraulic Metal Bending Machine

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ABSTRACT: Tools and simple machines are a natural extension of our mastery of physics. By putting our knowledge to use, we are able to manipulate the world around us on a much larger scale. Tools and machines have allowed us to build great monuments, to settle otherwise inhospitable locations, and to launch ourselves into space. These simple machines which work on mechanical advantage were evolved in complex machines. Out of these many advantages hydraulics turned out to be a game changer. Hydraulics has proven to be one of the most efficient and economical system for amplification of forces. First used by the ancient Greeks as a means of elevating the stages of their amphit heaters, the principles of hydraulics were explained scientifically by the seventeenth century scholars Pascal and Boyle. The laws discovered by these two men regarding the effects of pressure and temperature on fluids and gases in confined areas form the basis of the principle of mechanical advantage; in other words, the "why and how" of hydraulics. Similarly, another mechanical advantage 'Lever' was explained and proven by Archimedes in 3rd century BC. Both of these models of amplification of forces along with others were later used in modern era of technology for the evolution of machines which made the modern world possible. Making a similar contribution by using two mechanical advantages in a machine, the aim of this project is to integrate the mechanical advantage of Leverage with Hydraulic System to facilitate the ease of operation to manufacture smaller parts and to reduce the dependence on heavy hydraulic machines for small punching operations. Thus the production effort can be reduced as the dependence on complex hydraulic machines will be alleviated. Hence an attempt has been made to provide the smooth and rapid functioning of punching work with the help of hydraulic system.

I. INTRODUCTION

A Hydraulic cylinder (also called a linear hydraulic motor) is a mechanical actuator that is used to give a unidirectional force through a unidirectional stroke. It has many applications, notably in engineering vehicles, industrial application, civil applications.

Hydraulic cylinders get their power from pressurized hydraulic fluid, which is typically oil, air. The hydraulic cylinder consists of a cylinder barrel, in which a piston connected to a piston rod moves back and forth. The barrel is closed on one end by the cylinder bottom (also called the cap) and the other end by the cylinder head (also called the gland) where the piston rod comes out of the cylinder. The piston has sliding rings and seals. The piston divides the inside of the cylinder into two chambers, the bottom chamber (cap end) and the piston rod side chamber (rod end / head end).

Flanges, trunnions, clevises, 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 / 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 brings in 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.

II. RELATED WORK

Oseni K Owolarafe, Michael O Faborode 25 May 2000 work on press machine & give conclusion that The comparative evaluation of the DSP system which is being developed and the conventional hydraulic press system



undertaken in this study revealed that the DSP system has many comparatively favorable attributes and is to be preferred to the hydraulic system.

Isaac Bamgboye and Morakinyo T.A An improved oil screw press has been designed and constructed having 98.6 % efficiency and a capacity of 0.86 tons/day. Abrasion rate of screwshafts has been reduced from 63.3% to 12.6% by using high carbon steel material instead of low-carbon steel. Peter Beerens in 2007 gives an idea about press machine and the result is extended due to improvement in the plate form in the design of the machine.

Sharma ISSN : 2278 – 0149 In their research they revealed that machine is capable to do work with some shear force. By putting (diametrically opposite) variable additional weights on the flywheel we can obtain that desired energy levels to suit the maximum load required for manufacturing different types of engineering parts. Of course it is understood that only limited variation in capacity is possible. If at all some bigger or odd components to be manufactured one can choose the next higher range of the flypress. It is very clear that for given press reasonable flexibility is possible as far as energy is total load is concerned.

III. METHODOLOGY

Bending is one of the most common sheet metal fabrication operations. Also known as press braking, flanging, die bending, folding and edging, this method is used to deform a material to an angular shape. This is done through the application of force on a work piece. The force must exceed the material's yield strength to achieve a plastic deformation. Only then can you get a lasting result in the form of a bend.

The working of the process is fully pneumatic and hydraulic operated where the air is working medium. In this unit compressor is used to supply the compressed air at certain pressure. This pressurized air is passed to the solenoid valve. The solenoid valve is controlled by control unit. This solenoid valve is used to control the direction of flow of air to the pneumatic cylinder. In this pneumatic cylinder the piston rod actuates due to the pressure. At the end of piston rod bending tool is attached. So that tool bends the rod into required v shape. Thus the work piece clamped on the frame is bending due to the reciprocating motion of the bend.

IV. EXPERIMENTAL RESULTS

A piece of hydraulic machinery uses a liquid (usually oil) under pressure to transmit energy. Let's consider a simple system such as the one that operates the clutch on my car. There are two cylinders with a piston in each and a small tube running between them.

When stepping on the clutch pedal, force the piston on one of the cylinders (known as the master cylinder) deeper into the cylinder pushing fluid under pressure into the other cylinder. The fluid exerts pressure on the other cylinder (the slave cylinder) and develops a force which pushes on the clutch

V. CONCLUSION

The project carried out by us will make an impressive mark in the field of small scale industries. It is very useful for the workshops to carry out the punching operations easily on our machine. This project has also reduced the cost involved in the concern. The project has been designed to perform the required task taking minimum time. We have estimated the capacity of the hydraulic punching machine. From the aluminium sheet to produce the punched product or for mass production of washers. This machine can be used for multipurpose punching at a single time of stroke of ram/plunger. As a modification and extension of the project, a motor along with a flywheel can be attached to automate the machine in order to increase the throughput time and reduce the cycle time of the machine according to desire. We have seen how the Hydraulic systems allow users to accurately yield large amounts of power with little input force. So we can say that a portable hydraulic system using leverages is quite economical as compare to the other alternative.



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