Analysis of Hydraulic Sheet Cutting Machine And Its Fixture By Using FEA

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Abstract- *The sheet metal cutting process is a main part of the all industries. Normally the sheet metal cutting machine is manually hand operated one for medium and small scale industries. In our project is "Analysis Of Hydraulic Sheet Cutting Machine And Its Fixture By Using FEA". Automation in the modern world is inevitable. Any automatic machine aimed at the economical use of man, machine, and material worth the most. The sheet metal cutting machine is used to cut the small size of sheet metal. The machine is portable in size, so easy transportable. The sheet metal cutting machine works with the help of hydraulic cylinder. The piston is connected to the moving cutting tool. It is used to cut the small size of sheet metal. The machine is portable in size, so easy transportable.*

Keywords- Hydraulics, hydraulic jack, control valves, Die, springs.

I. INTRODUCTION

The sheet metal cutting process is a main part of the all industries. Normally the sheet metal cutting machine is manually hand operated one for medium and small scale industries. The metal shit cutting by hand hacksaw is hardworking and time consuming. The labour charges also increases. Hence the process is uneconomical. In our project we are making hydraulically powerised machine which is used for cutting, bending , pressing operations. As a development part it will be of a small capacity and simple but function properly. The sheet metal of maximum 0 to 3 mm width can cut easily and 20 to 30mm length of sheet . So every time the bar has to feed up to stopper manually is the effort and extra work to operator. The machine is capable of serving as a hydraulic press, sheet metal brake, shear for thin sheet metal, and tubing bender is ideal for use in a home Workshop, where space may be limited. The basic working principle of hydraulic press is depends on the Pascal's law i.e." it uses the pressure exerted on fluid used to crush something".

Hydraulic systems are used to transfer energy by converting mechanical energy to fluid energy, and then back to mechanical energy. The principle reason for converting to fluid energy is the convenience of transferring energy to a new location. Hydraulic drives have many advantages over other technologies. The ratio of weight, volume and inertia to available power is significantly lower than in electromechanical drives, especially for linear motion. Hydraulic systems are especially suitable for those operations characterized by abrupt loading, frequent stops and starts, reversing and speed variations that cause sharp peak, cyclic and fluctuating power demands. Many device of mechanical are based on hydraulic power. Hydraulic device uses principles of fluid static and fluid kinematics are used for either storing the hydraulic energy or then transmitting when needed or maintaining the hydraulic energy several times and transmitting the same. In all such machines, power is transmitted with the help of a fluid, which may be water or oil. Our mechanism is used in industrial fitting and maintaining department, in automobile garage or in industrial workshop. Our project is used for reducing manufacturing cost and saving time and also to reduce maintaining cost or a manufacturing cost. Here we manufacture a lightweight & easy to handle machine so that you can carry anywhere into the shop.

The main objective of this project is to analyze the study of hydraulic press operations like cutting, bending, pressing, punching. Also perform job holding process effectively with less human efforts by using machine with hydraulic power. This machine used in small scale and medium scale industries.

II. LITRATURE REVIEW

This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased. Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics form an attractive medium for low cost automation. K. Sainath, Mohdsalahuddin MohdjibranBaig, MdAzam Ali Farooky,Mohammes Siddique Ahmed, MohdRiyaz Uddin, Faraz Ur Rehman Azhar,Md Shaffi [1] explains that hydraulic

jack depends on force generated by pressure. A jack is device which uses to lift heavy loads by force. A jack can be categorized by the type of force which they employ : mechanical or hydraulic jack. Mechanical jack such as car jack , house jack and hydraulic jack such as bottle jack or floor jack. Chinthakindi Vinod, P. Chandra Kumar, CH. Sharath Reddy [2] explains that in present world automation is the need of time in order to reduce the human effort. Hydraulic machine have different type of uses like pipe bending, sheet bending operations and many more. pipes and sheets are used in various fabrication works and architectural work . To bend these pipes and sheets in various is very hard by manually. Using a particular machine to develop the sheets and pipes will be useful. Designing of machine is done in software CATIA and analysis of work piece are done to find strain, stress, deformation with the help of ANSYS software. Bhushan v. Golechha, Prashant S. Kulkarni [3] explains the power press machine working. It is a cheap less manufacturing process. The of this process to reduce the cost and weight of pneumatic press without reducing the quality of output. For the analysis of project ANSYS software used. Power press is useful for large quantities of articles quickly, accurately and economically. there are three types of power press : mechanical, hydraulic and pneumatic . Some features of this press are common. Mustafa Telwala, Anand Parikh, Vaja Hitesh, Hardikbhai Dabhi, Rajdipsingh G.Vaghela, Hardik N. Chauhan (2015) [4] explains that power press working machine is a cheap less manufacturing process. Press has a bed, frame which exerts force upon work material through special tool. For the analysis of force and load solid works software has been used. The main aim of the frame is to withstand the force developed by ram. C-type frame is mostly used frame. Malachy Sumaila and Akii Okonigbon Akaehomen Ibhadode (2011) [5] explains that 30 ton hydraulic press was constructed, designed and tested using available sourced materials. The main advantage of hydraulic presses over that they provide more positive response to changes in input pressure force. The hydraulic press is an valuable equipment in the workshop and laboratories. All workshop in Nigeria al such machines are imported into the country. Mohamad M. Saleh B. Engg. , M. Engg. (2012) [6] explains that systematic study and performance of 150 ton hydraulic press machine. The study gives the experimental and theoretical model of machine to establish design analysis at minimum time and lower cost. This hydraulic press machine used in large capacity of industries. Ti is useful in many of operations at low cost and low maintenance.

III. WORKING

In this study we are going to analyze the hydraulic press operations like cutting, bending, pressing. Every press has got certain basic units. Base is the lower part of the press frame. A sheet metal plate is placed on the top of the bed. A die is fitted on the top of the metal plate. The frame has got guide ways for the sliding movement of the ram. The punch is fitted at the bottom of the ram. The die and punch are correctly aligned. The work piece is in the form of sheet metal. It is fed over the die. When the ram comes down, the punch presses the sheet metal. The required operation is carried out. As said earlier the force from the press is used to do a particular operation. This is done by two main parts die and punch. Mechanization is broadly defined as the replacement of manual effort by mechanical power. Hydraulic is an attractive medium for low cost mechanization particularly for sequential (or) repetitive operations. Many factories and plants already have compressed oil system, which is capable of providing the power (or) energy requirements and the control system (although equally hydraulic control systems may be economic and can be advantageously applied to other forms of power). The main advantage of an all hydraulic system are usually economic and simplicity the latter reducing maintenance to a low level. It can also have outstanding advantages in terms of safety.

SELECTION OF HYDRAULICS

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Hydraulic is an attractive medium for low cost mechanization particularly for sequential (or) repetitive operations. Many factories and plants already have compressed oil system, which is capable of providing the power (or) energy requirements and the control system (although equally hydraulic control systems may be economic and can be advantageously applied to other forms of power). The main advantage of an all hydraulic system are usually economic and simplicity the latter reducing maintenance to a low level. It can also have outstanding advantages in terms of safety.

PRODUCTION OF COMPRESSED OIL

Hydraulic systems operate on a supply of compressed oil, which must be made available. In sufficient quantity and at a pressure to suit the capacity of the system. When hydraulic system is being adopted for the first time, however it wills indeed the necessary to deal with the question of compressed oil supply. The key part of any facility for supply of compressed oil is by means using reciprocating compressor. A compressor is a machine that takes in oil, gas at a certain pressure and delivered the oil at a high pressure. Compressor capacity is the actual quantity of oil compressed and delivered and the volume expressed is that of the oil at intake conditions namely at atmosphere pressure and normal ambient

temperature. Clean condition of the suction oil is one of the factors, which decides the life of a compressor.

CATIA SKETCHES:-

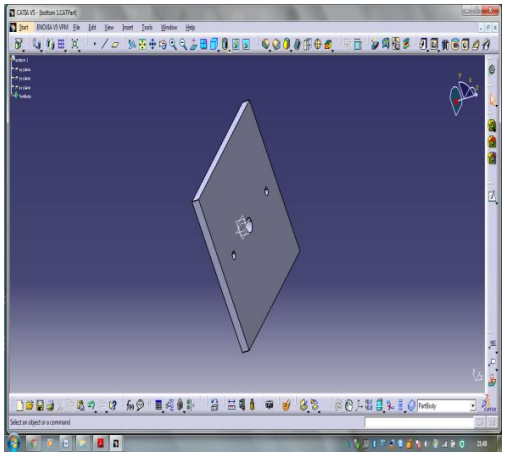

Fig. 1 CATIA sketch of Bottom Plate

The above fig.1 shows the bottom plate of project. This plate is the most essential part of project this used to fit the die of project.

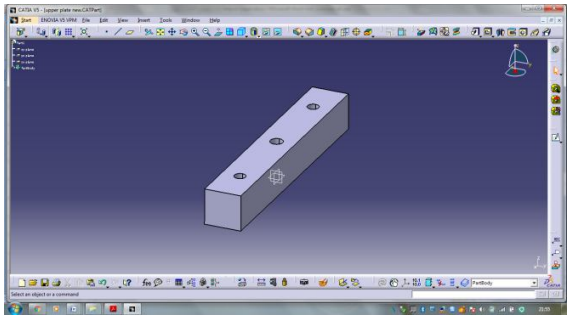

Fig. 2 CATIA sketch of Upper plate

The above fig. 2 shows the upper plate of project. Upper plate used to fit punch to operate the machine.

VII. CONCLUSION

In this paper there are several types of cutting machines are available in market. But for small scale industries this machines are not ideal. To overcome this problem research has been conducted to find a solution on how to design hydraulic cutting machine satisfy the need of low cost small size, medium skill requirement and which is fit for future needs.

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