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# Design, Development and Stress Analysis for Twin Punching 100 ton Forging press

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**ABSTRACT: -** The proposed work is concern to modify the existing single punch forging press setup into twin punch forging press setup by carrying out structural analysis and analysis of stress distribution in base plate and lower die. The comparative study of stress distribution on base plate and design modification. Experimental system is to be developed to achieve the stated objective which includes mainly at examining the stresses on all main parts of the forging press.

**KEYWORDS: -** 100 Ton forging press, UTM, ANSYS, CATIA software.

## I. INTRODUCTION

A hydraulic press is a machine using a hydraulic cylinder to generate a compressive force. Column, upper platen, bottom platen, movable platen and cylinder are the main components of the hydraulic press. Ranging from a few kilograms to thousands of tons. Presses are pressure exerting machine tools. They can be classified into three principal categories as hydraulic presses, screw presses and mechanical presses. The hydraulic motor which converts the hydraulic energy into useful work at the point of load resistance. The performance of a hydraulic press depends largely upon the behaviour of its structure during operation. The concept of hydraulic press is based on pascal's theory, which states that in an enclosed system, the pressure throughout the system always remains constant. Hence a hydraulic press is a machine that makes use of the pressure exerted on the fluids to crush, straighten or mold. The hydraulic presses can compress any material to a full extent.

## II. RELEVANCE

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. This subject deals with the FEA implementation for modal analysis and stress distribution of 100 Ton 4 column hydraulic forging press machine. Metal forging is one of the manufacturing processes which are almost chip less. These operations are mainly carried out by the help of press. These operations include deformation of metal work pieces to the desired size by applying pressure or force. Press machine always works under impact load condition. Because of continuous impact load, the hydraulic press machine always experience continuous stress. Some parts of the machine experience compressive stresses and some experience tensile stresses. Press machine continuously deals with stress and because of that there are frequent structural failure problems in the machine. Different components of the machine are subjected to different types of loading conditions and are analysis using FEA tool. ANSYS is one of the FEM tools, which is incorporated in the present work.

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## III.LITERATURE REVIEW

Malipatil, et.al.[1] studied the optimum resources possible in designing the hydraulic presses frame can effect reduction in the cost of the hydraulic presses. An attempt had been made in this direction to reduce the volume of material. So industrial application project consisting of mass minimization of H-frame type hydraulic press. This press was compensated the forces acting on the working plates and has to fulfill certain critical constraints. ANSYS was used for this analysis. The main aim was to reduce the cost of the hydraulic press without compromising on the quality of the output. With regarding to design specification, stress distribution, deflection, and cost, werefocused on optimized design. The methodology followed in this work was comparison of stresses induced in machine for different thickness used for construction of frame and column of the H frame type hydraulic press

Bapat et.al. [2]implemented FEA was for analysis and optimization of hydraulic forming press machine. These operations were mainly carried out bythe help of press. These operations included deformation of metal work pieces to the desired size by applyingpressure or force. Press machine always works under impact load condition. Because of continuous impact load, thehydraulic press machine always experiences continuous stresses. Some parts of the machine experience compressive stressesand some experience tensile stresses. Press machine continuously deals with stress and because of that there was a frequent structural failure problem in the machine. The buckling analysis was done for the tie rod in compression. The geometry of upper head was modified to save material.

Raz et.al. [3] carried out the dynamic behavior of the hydraulic press for free forging. They said hydraulic press is defined by a static forging press. The force may have in special cases of forging properties of dynamic and shock load. Commonly used hydraulic press was used speed forging with speed up to 180 strokes per minute. And the goal was achieve to compare different types of frame designs for hydraulic forging Presses. Results were determined for each supporting structure for these special operations. Comparing is made using FEM modal analysis. The performed model analysis show needs for lowering of first critical natural frequency.

Parmar et.al. [4] carried out modification of foremost element of hydraulic press machine. The goal of structure optimization was to decrease total mass of hydraulic press while assuring adequate stiffness. Structural optimization tools and computer simulations have gained the paramount importance in industrial applications as a result of innovative designs, reduced weight and cost effective products. Comparing result of old bottom platen and weight was reduced. Deflection increased but it was in permissible limit. Von-mises stresses increased and it also did not cross permissible limit and the bottom plate was safe under working condition.

Parthiban, et.al. [5] studied the hydraulic press using hydraulic cylinder to generate a compressive force. Frame, upper platen, lower platen and cylinder are the main components of the hydraulic press. The press frame and cylinder were designed by the design procedure. Press frame and cylinder were analyzed to improve its performance and quality for press working operation. Structural analysis has become an integral part of the product design. The frame and cylinder were modeled by using modeling software CATIA. Structural analysis has been applied on C frame hydraulic press structure and cylinder by using ANSYS software. According to the structural values the dimensions of the frame and cylinder are modified to perform the functions satisfactory.

Zahalka [6] analyzed model of hydraulic press frames for open die forging. Dynamic behavior of the forging machines were necessary to explore due to the increasing of speeds on large forging hydraulic presses for open die forging. The paper described the modal analysis of two selected presses, which represent the most common designs of hydraulic presses for forging. The problem was evident from the obtained results of performed modal analysis on the presses CKV 50 and CKV 170. The excitation frequency approaches to the real natural frequency of press frame. Designers design press frames with high usage of material. Further simulations of oscillation was done, which was excited by time-dependent work force. Results of analysis were compared with measurement in the real operation.

## IV.PROPOSED WORK

### A.SCOPE

Many of the earlier investigators have studied the problems concerned with the

1. Structural analysis of the only lower tones press like 5, 10, 30 tones.
2. Most of the researches made on single punching press.
3. Very few researches carried out on the twin punching.

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4. Analyzed the press model by using only ANSYS software package.
5. Very few experiments carried out for finding the stresses in forging press by using the strain gauge set up.
6. Fewer researches carried out on punch design and die design.
7. Fewer study on failure analysis of the punch.

**B.PROBLEMDEFINITION:**

Design and analyze a twin punching set up for the100 ton forging press. The company needs, comparative study of stress analysis for single punching press set up and twin punching press set up. Due to variation in forces, there is deformation and change in equivalent stresses which produce more maintenance cost of machine and produce defect in product. It is required to eliminate this defect and reduce the maintenance cost of machine. Design upgrading is also their need to meet global competition.

**C.OBJECTIVE:**

Therefore the specific objectives of this dissertation works are:

1. To analyze stress distribution on base plate and lower die of forging press in single punching setup.
2. To modify the design of single punch forging press setup into twin punch forging press setup.
3. To analyze stress distribution on base plate and lower die of forging press in twin punching setup.
4. To carry out structural analysis of base plate and lower die in single punch and twin punch forging press setup

**D.EXPERIMENTAL SET UP:-**

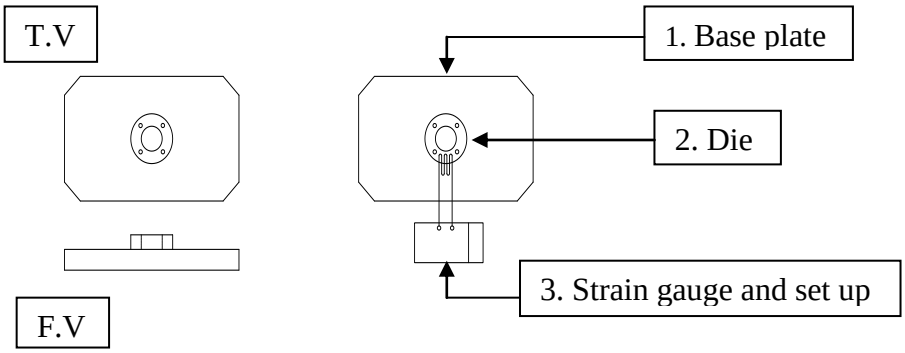


Fig 1: Single punching press set up

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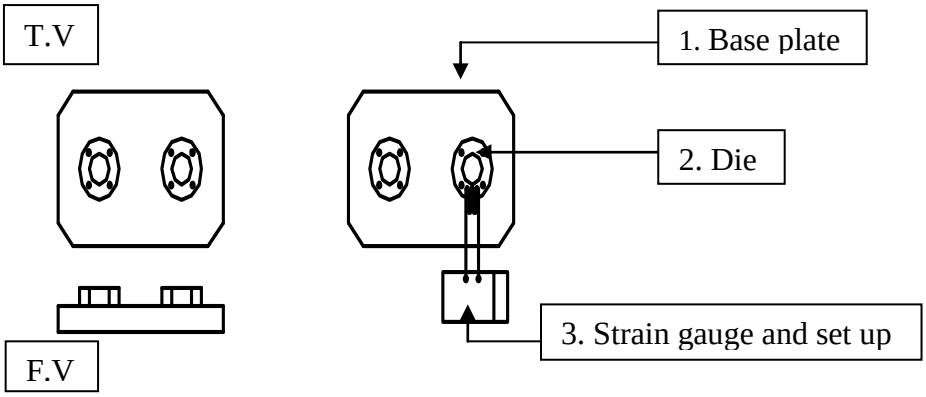


Fig 2: Twin punching press set up

**E.EXPERIMENTAL WORK:**

- The force acting on the die is varies according to the diameter of billet so this force will be measured by using strain gauge.
- This force is used for stress calculation by using ANSYS.
- The die is most important part in press set up & the compressive force acts on the die , due to this compressive force, stress will be in die & that will be measured by using UTM.
- The same procedure will be followed for different material specimen and stress will be calculate.
- The comparative study for different material will be carried out.

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