

# Design and Modification of Shock Absorber Bracket in Engine Frame Assembly

Mohnesh Mandhare<sup>1</sup>, Shubham Kulkarni<sup>2</sup>, Krishnakant Pawar<sup>3</sup>, Tushar Chaudhari<sup>4</sup>, Pooja Trimbake<sup>5</sup>  
<sup>1</sup>Assistant Professor, Dept. of Mechanical Engg., G. H. Raisoni College of Engineering, Ahmednagar, India  
<sup>2,3,4,5</sup>UG Student, Dept. of Mechanical Engg., G. H. Raisoni College of Engineering, Ahmednagar, India

**Abstract:** The aim of this paper is to integrate the mechanical system of hydraulic press with hydraulic system to facilitate to producing complicated sheet metal part at minimum number of operations at low price. In the present scenario time constrain is crucial part for completion of any production process. Thus with aid of atomization, the production time can be reduced as well as higher degree of accuracy can be achieved as the human effort will be alleviated. Using different type of die for sheet metal operation like blanking, bending, piercing, punching, etc. It helps to increase the repeatability and productivity. In automobile industries, there are many part are manufactured by using sheet metal forming process. Hence we need to find out different stresses and failure criteria by using the FEM.

**Keywords:** Ape PIAGGIO, hydraulic press, shock absorber bracket.

## 1. Introduction

The project is related to, "Design and Modification of Shock Absorber Bracket in Engine Frame Assembly" for PIAGGIO and ATUL ape. A shock absorber is a mechanical or hydraulic device designed to absorb and damp shock impulses. In a vehicle, shock absorbers reduce the effect of travelling over rough ground, leading to improved ride quality and vehicle handling.

Shock-absorber Bracket is a part on which shock absorber springs are mounted. Suspension maximizes the friction between the road surface and the tires to give steering stability with good handling which ensure smooth of the passengers. It does this by converting the kinetic energy of the shock into another form of energy which is then dissipated. This article explores about the working of Auto suspensions and design of suspensions in the future. Shock absorber bracket is bracket on which shock absorber springs are mounted. This shock absorber bracket is connected to engine frame assembly.

## 2. Literature Review

S. S. Chikshe [1] during the blanking method, the blanking punch penetrates into the flat solid & forces the fabric into the blanking die. The portion of the flat solid that setting out through the blanking die gap is that the element with the demanded profile. Piercing operation created of merely whole punching. It differs from blanking specified the punching is that the scrap and therefore the strip is that the work piece.

Pritam B. bhawar [2] Progressive die performs a series of operations in a very single die at 2 or additional workstations.

There's given end half at every stroke of press machine. Style and development of progressive die is one in all the necessary innovate flat solid producing. The little error at any work station will induce serious producing losses through die failure, half pure mathematics distortion and production risk. This analysis deals with planning a progressive die, simulating the blanking and piercing method. By exploitation this die we will turn out correct part.

B. F. Satpute [3] Press tool was one in all the necessary technique of changing staple into finished product. Sort of merchandise was factory-made by press operating processes. Compound die could be a press tool of collective operations performed on the flat solid. The varied operations are administrated in a very single stroke. The planning of compound die is basically looking on material of flat solid, thickness of flat solid and quality of style and operations. This press tool has significance like high rate of production and minimum per cost of product.

Prabhakar Purushothaman [4] Press tools area unit unremarkably employed in hydraulic, pneumatic, and mechanical presses to provide parts at high volumes. Typically press tools area unit categorized by the kinds of operation performed mistreatment the tool, like blanking, piercing, bending, forming, forging, trimming etc. The press tool will be fixed as a blanking tool, piercing tool, bending tool.

Nandish Harti [5] The thought during this paper deals with style of blanking punch and die for cam head washer element victimization Finite component analysis. The planning of blanking punch and die could be a terribly preciseness, advanced and information primarily based method. Sheet blanking could be a terribly vital and powerful tool for producing method range of components for cars, aerospace, and marine merchandise.

## 3. Theory

### A. Die and punch

A die and punch assembly is a metal working process. That is convert raw material (sheet metal) into components. And also

die is a tool to manufacturing of parts and component from sheet metal. The Compound die, combination die and progressive types of dies are produced in mass production quickly.

The die placed on a press. When the press moves upward direction and die is opened. As the press is moved down and die is closed. The sheet metal move through die which is open and fed into the die a precise amount with each press. The die is a closed together, the die performed work on the metal and finish parts are ejected from the die. The die sheet metal operation such a ways like as punching, bending and coining.

Die key is made of tool steel to withstand high shock load, sharp cutting of edge and resist the abrasive forces involved.

**B. Components of Die**

Main components of die as

- Die holder
- Die block
- Punch plate
- Stripper plate
- Back up plate
- Punch
- Guide pin
- Stroke

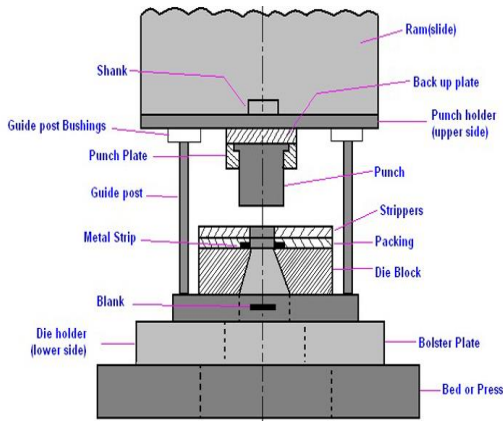


Fig. 1. Components of die

**C. Material selection**

Name: SAPH440

Full Form: Steel Automotive Pickled Hot-rolled and 440 MPa minimum tensile strength.

Table 1  
Other properties

Property	Value
Density	7833.000 kg/m <sup>3</sup>
Thermal Conductivity	0.032 kW/m-C
Specific Heat	481.000 J/kg-C
Modulus of Elasticity	199947950000.000 Pa
Poisson's Ratio	0.290
Yield Stress	305000000.000 Pa
Ultimate Stress	440000000.000 Pa
Elongation %	33.000

**4. Construction and working**

In shock absorber bracket, bracket is assembled by three parts like LH part, RH part and z-bracket. But due to assembling the parts by welding, there are cost of product and cycle time for manufacturing the tool is increased. Hence we modify this bracket in single sheet metal. Due to this modification, cycle time for production and cost of tool was reduced. Also life of product will be more. For manufacturing this modified shock absorber bracket. we designed the die and punch.



Fig. 2. Shock absorber bracket

**5. Design**

**A. Blanking cutting load/force calculation**

The blanking force or cutting force is the force required to punch a blank

This determines the capacity of the press to be used for the tool.

$$F = P \times t \times \tau_{us}$$

Where,

F= blanking force or cutting load (N)

P = perimeter (mm)

t = Thickness of sheet (mm)

$\tau_{us}$  = ultimate shear strength of sheet (N/mm<sup>2</sup>)

$$F = P \times t \times \tau_{us}$$

$$F = 1275 \times 2 \times (40/1000)$$

$$= 102 \text{ Tons.}$$

$$= 102 + 10\% \text{ of force}$$

$$= 122.2 \text{ Tons}$$

Blanking force/ cutting load = 122.2 tons

Thus we select the 160 Tons press tool.

**B. Bending or forming force calculation**

$$P = \frac{C}{3} \times B \times t \times T_s, \text{ Kgf/mm}^2$$

Where,

P=bending force in tonn.

C=constant (1 to 2)

B=bending length in mm.

t= thickness of the plate in mm.

Ts=tensile strength of the material in Kgf/mm<sup>2</sup>

$$P = 2/3 \times 261.1 \times 2 \times 45.62$$

$$P = 15881.8426 \text{ Kgf}$$

$$P = 15881.8426 \times 9.81$$

$$P = 155800.8766 \text{ N}$$

$$P = 155.80 \text{ Ton.}$$

Thus we select the 160 tons press tool.

## 6. Result and Discussion

### A. Stress Results

Table 2  
Stress result

Result component: Von Misses				
Extent	Value	X	Y	Z
Minimum	0 Pa	-0.008 m	0.090 m	0.085 m
Maximum	6.08e+009 Pa	0.062 m	0.086 m	0.067 m

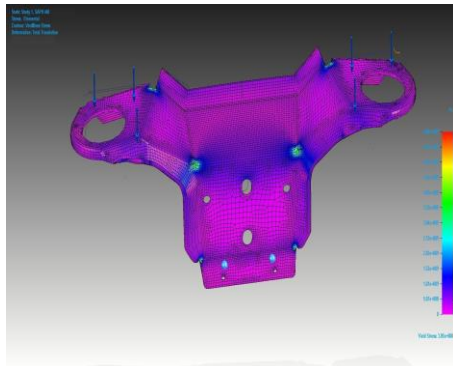


Fig. 3. Stress results

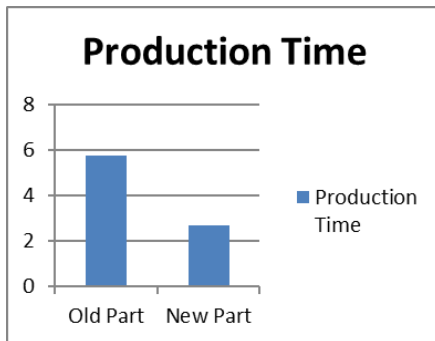


Fig. 3. Production time comparison between old part and new part

## 7. Conclusion

In this project we produced a more efficient design and modify shock absorber bracket for reducing the cycle time and various cost of production. This tool was reduced the electricity consumption and also improved life of tool, because of eliminating the many operations on press and welding, tool becomes cost effective, the rate of production is increased.

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