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## PNEUMATIC SHEET METAL CUTTING MACHINE

Varpe Akshay V.<sup>\*1</sup>, Naikodi Pratik K.<sup>2</sup>, Mule Rushikesh H.<sup>3</sup> & Badhe Hrishikesh N.<sup>4</sup>

<sup>\*1,2,3&4</sup>Students at Department Of Mechanical, Jaihind Polytechnic, Kuran, INDIA.

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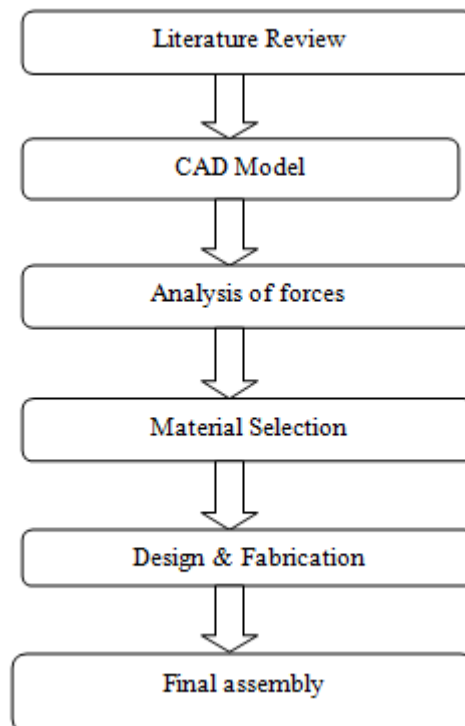
### ABSTRACT

The main part of all industries having metal sheet cutting process Normally the sheet metal cutting machine is operated by manually hand operated but our project pneumatic auto sheet metal cutting machine which is use to cut sheet metal without any human efforts. The working medium of our project is compressed air. The compressed air from compressor is used to movement of piston of double acting cylinder in forward and backward positions. In sheet cutting machine sheet metal placed in between two shearing blade in which one blade is fixed and another one is movable for cutting purpose. In this machine the large force is mainly required for carried out a process of sheet metal cutting. For reduce human efforts we are designing a “Pneumatic automatic sheet cutting machine.”

### INTRODUCTION

The sheet cutting machine is most important sheet metal industry. Some industry hand sheet cutter are used for that machine to operate the human efforts are required. The machine should simple to operate and easy to maintain hence we tried to developed pneumatic automatic sheet cutting machine. Idea for new business product is mean of reducing manufacturing cost or solve industrial labour problem. Sheet metals are used in Car bodies, medical tables, roofs for buildings etc. Use of sheet metal are now days in furniture, cupboards.

### METHODOLOGY



### LITERATURE REVIEW

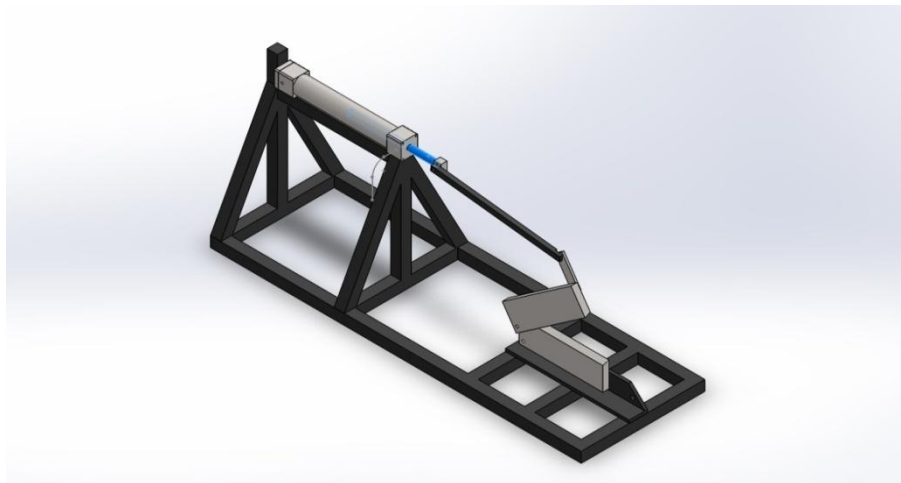
In shearing or cutting operation as or blade descends upon the metal, the pressure exerted by the blade first cause the plastic deformation of the metal. Since the clearance between the two blades is very small, the plastic



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deformation takes place in a localized area and the metal adjacent to the cutting edges of the blade edges becomes highly stressed, which causes the fracture to start on both sides of the sheet as the deformation progresses and the sheet is sheared. In dentistry applications, pneumatic drills are lighter, faster and simpler than an electric drill of the same power rating, because the prime mover, the compressor, is separate from the drill and pumped air is capable of rotating the drill bit at extremely high rpm. Pneumatic transfer systems are employed in many industries to move powders and pellets.

### CAD MODEL



*Fig1:-pneumatic sheet cutting machine model*

### MATHEMATICAL CALCULATION

$$1. \text{ Cutting force} = L \times t \times T_{max}$$

Where ,

$$L = \text{length of cut} = 200\text{mm}$$

$$t = \text{thickness} = 2\text{mm}$$

$$T_{max} = \text{maximum stress} = 30\text{N}$$

$$\begin{aligned} \text{Force required} &= 200 \times 2 \times 30 \\ &= 1200\text{N} \end{aligned}$$

$$2. \quad P = F/A$$

Where ,

$$P = \text{pressure} = ?$$

$$F = \text{force} = 1200\text{N}$$

$$A = \text{area} = 200 \times 0.5 \times 2$$

$$P = 1200 / (200 \times 0.5 \times 2)$$

$$P = 6 \text{ bar}$$

$$3. \quad \text{For calculating diameter of cylinder}$$

$$F = \pi/4 \times d^2 \times P$$

$$D = 46.72 \text{ mm}$$

### MATERIALS

Raw material used

- Mild steel for base frame
- Shearing blade
- Cylinder fitting like fork end ,base plate ,support link
- Connecting link

- Blade link
- Ready material used
- Pneumatic double acting cylinder
  - Direction control valve
  - Flow control valve
  - Pneumatic pipe and pipe fitting
  - Bolt and nut
  - Antirust coat and paint

## **SPECIFICATION**

### **1. Pneumatic cylinder**

Quantity: 1  
 Total Length: 375mm  
 Bore: 40mm  
 Stroke: 200mm  
 Piston Rod Diameter: 20mm  
 Max Working Pressure: 8 bar  
 Weight: 3kg

### **2. DC Valve**

Quantity: 1  
 Operation: Manual  
 Type: Hand Lever, Detent Type  
 Number of Ports: 5  
 Number of Positions: 3  
 Construction: Sliding spool type

### **3. Pneumatic Pipe**

Quantity: 3000mm  
 Diameter: 8mm  
 Thickness: 1mm

### **4. Fork end nut**

Quantity: 2  
 Length: 16mm  
 Size: M16

## **TABLES**

Material	Tensile strength, 1,000 lb/in <sup>2</sup>	Yield strength 1,000 lb/in <sup>2</sup>	Ultimate elongation %
Cast iron	18-60	8-40	0
Aluminium alloy	56	34	26
Stainless steel	85-95	30-35	60-65

## **FUTURE SCOPE**

Since old age man is always trying to gain more and more luxurious. Man is always trying to develop more and more modified technique with increasing the aesthetic look and economic consideration. Hence there is always more and more scope. But being the Diploma Engineers and having the ability to think and plan. But due to some



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time constraints, and also due to lack of funds, we only have thought and put in thereport the following future modifications-

- It can be made hydraulically power operated by installing the gear oil pump at the place of aircompressor and pneumatic cylinder arrangement.
- It can be made rack and pinion operated or spring and lever operated, by replacing the pneumatic circuit by rack and the pinion arrangement by the square threaded screw and nut arrangement.
- The place where there is scarcity of the electricity the electric motor operate compressor is replaced by an I.C. Engine installed compressor. thus in future there are so many modifications, which we can make to survive the huge global world of competition.

### CONCLUSION

We know that pneumatic sheet cutting machine are very cheap as compare to hydraulic sheet cutting machine. The range of cutting thickness can increase by installing high pressure cylinder and more harder blade. The small sheet metal cutting industry are cannot afford the expensive hydraulic shearing machine so they use pneumatic sheet cutting machine.

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### REFERENCES

1. *Machine Design* by R.S. Khurmi.
2. *Manufacturing Process* by O. P. Khanna and Lal.
3. *Workshop Technology* by R.K. Jain.
4. *Pneumatic System: Principle & Maintenance* by S.R. Mujumdar.
5. *Machine Tool Design Handbook*.