International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 10 Issue: 04 | April - 2026 SJIF Rating: 8.659 ISSN: 2582-3930

Pneumatic Shearing Machine

Kiran V. Khokale[1], Sanskar R. Kamble[2], Gaurav P. Gaikwad[3], Onkar M. Magar[4], Aditya V. Borbane[5]

[1]*Lecturer of Department of Mechanical, Sanosh N. Darade Polytechnic, Yeola*
[2]*Student of Department of Mechanical, Sanosh N. Darade Polytechnic, Yeola*
[3] *Student of Department of Mechanical, Sanosh N. Darade Polytechnic, Yeola*
[4] *Student of Department of Mechanical, Sanosh N. Darade Polytechnic, Yeola*
[5] *Student of Department of Mechanical, Sanosh N. Darade Polytechnic, Yeola*

Abstract - In the age of automation machine become an integral part of human being. By the use of automation machine prove itself that it gives high production rate than manual production rate. In competition market everyone wants to increase their production & make their machine multipurpose. The engineer is constantly conformed to the challenges of bringing ideas and design into reality. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. So we are going to make a machine for sheet metal industry which made it multipurpose & should be used as cutting a metallic strips & metal blades. The machine is simple to maintain easy to operate. Hence we tried our hands on "Pneumatic Shearing Machine" shearing Machine is one of the principal machines in sheet metal industry. It is mainly used as the name indicates to cut strips & metal blades up to 2 mm thickness & it made automation in industrial processes.

Keywords: Sheet metal, industrial, automation, cutting.

1. INTRODUCTION

The most common cutting processes are performed by applying a shear force, and are therefore sometimes referred to as shearing processes. Cutting processes are those in which a piece of sheet metal is separated by applying a great enough force to cause the material to fail. When a great enough shearing force is applied, the shear stress in the material will exceed the ultimate shear strength and the material will fail and separate at the cut location. This shearing force is applied by two tools, one above and one below the sheet. Whether these tools are a punch and die or upper and lower blades, the tool above the sheet delivers a quick downward blow to the sheet metal that rests over the lower tool. A small clearance is present between the edges of the upper and lower tools, which facilitates the fracture of the material. The effects of shearing on the material change as the cut progresses and are visible on the edge of the sheared material. When the punch or blade impacts the sheet, the clearance between the tools allows the sheet to plastically deform and "rollover" the edge. As the tool penetrates the sheet further, the shearing results in a vertical burnished zone of material, finally, the shear stress is too great and the material fractures at an angle with a small burr formed at the edge. The height of these portions of the cut depends on several factors, including the sharpness of the tools and the clearance between the tools. Cutting processes are those in which a piece of sheet metal is separated by applying a great enough force to cause the material to fail. The most common cutting processes are performed by applying a shear force, and are therefore sometimes referred to as shearing processes. When a great enough shearing force is applied, the shear stress in the material will exceed the ultimate shear strength and the material will fail and separate at the cut location. This shearing force is applied by two tools, one above and one below the sheet. Whether these tools are a punch and die or upper and lower blades, the tool above the sheet delivers a quick downward blow to the sheet metal that rests over the lower tool. A small clearance is present between the edges of the upper and lower tools, which facilitates the fracture of the material. Pneumatic systems are used extensively in industries and are mostly powered by compressed gases or compressed air. An electrically powered and centrally located compressor powers air motors, cylinders and other pneumatic devices. A pneumatic system can be either controlled through manual or automatic solenoid valves which are selected because they provide low cost, more flexibility and safer alternative to electric motors and actuators. Pneumatic systems also have applications in mining, dentistry, construction, and other areas.

2. Body of Paper

2.1 CONSTRUCTION

It consists of mainly;

1. Frame:

The frame is made of M.S. material. Lower part of frame is basically used to support the pneumatic components support mounted on it. That is Piston cylinder, Direction control valve are mounted on lower frame. On the upper frame vertical cylinder is mounted.

2. Pneumatic cylinder:

Our project is on Pneumatic control system. The Pneumatic piston-cylinder is an actuator which converts pressure of compressed air to displacement. When the pressure on one side of the piston is relatively higher than on the other side, it results in a linear displacement. The speed of traversal is proportional to the pressure difference. A double acting cylinder has two ports through which the supply of air is reversed to cause displacement in either direction. We used double acting cylinder to hold the wok piece that is to be weld.

Fig.1. Pneumatic cylinder

3. 5/2 Valve DCV:

In our machine, we used two 5/2 valve to direct the flow of compressed air on the either side of piston for the reciprocating motion of same**.** The directional control valve must direst the flow from the compressor either to port A or port B. The fluid exhausted by the cylinder must be directed from the other port to back to tank. The valve shown has 5 ports and 2 positions so called as 5/2 valve. Valves are necessary to control the pressure, flow rate and direction of the fluid. Pneumatic systems are low pressure systems. Pneumatic valves are made from cheaper materials (e.g. aluminum and polymer) and are cheaper to manufacture. The directional control valve must direct the flow from the compressor either to port A or port B. The fluid being exhausted by the cylinder must be directed from the other port back to tank. The number of ports (External connections) and the number of positions describe such valves. The valve we used and shown above has 5 ports and 2 positions so it is designated as a 5/2 directional Control Valve. It is noted that the third position in a 5/2 valve is a center position. The air control mechanism inside 5/2 valve (usually a spool of some sort) is shifted into the center position inside the valve by one of two internal spring valve actuators. There is a spring located inside the valve at each end of the internal spool.

Fig.2. 5/2 Toggle DCV Valve.

4. Pneumatic hoses and fittings:

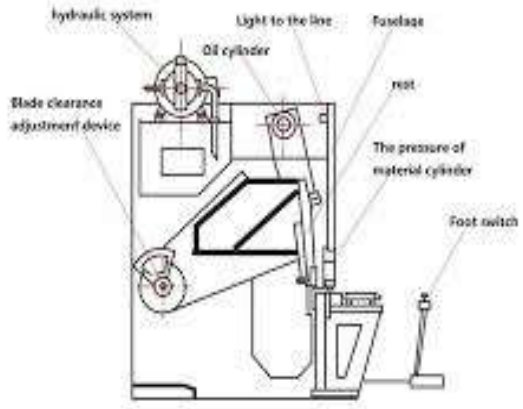
This can be used for connection of pneumatic system with total drill assemble.

Fig.3. Pneumatic hoses and fittings

2.2 WORKING

A frame is supporting all pneumatics & shearing tool of a machine as shown in fig. Here we used a compressor for a generation of compressed air. A compressed air is supply to the double acting cylinder by means of pneumatic hose pipe & 5/2 Direction control valve. The shearing tool is provided at end of the pneumatic cylinder rod. When compressed air is supply by the DCV to double acting cylinder due to pressure & force created by compressed air causes Shearing action of the

sheet metals strips & cutting blades. Here the advancement of the shearing tool is carried out in the upward and the downward direction using the pneumatic double acting piston and cylinder unit arrangement along with the hand lever operated direction control valve. In this type of machine high pressure air is used as the working fluid for the transfer of power, force, and the motion to the system.



We developed a model of the pneumatic shearing machine. In this we have used piston-cylinders with small stroke. But if we want to develop a pneumatic shearing machine that is to be used in the factory floor, we can use the piston-cylinders with higher stroke & Bore diameter to get the large movement & force of the shearing tool. Also, for high shearing capacity to cut the heavy material blades.

3. Problem Statement

In the manual sheet metal shearing machine variable forces can be obtained by manual work. This manual equipment can also be used to cut larger thickness sheets with some additional accessories are required. But it is observed that for more thick sheet metals shearing it required more manual efforts, time & labor cost. Hence for reducing problems in manual sheet metals shearing the machine will be alter by pneumatic sheet metal shearing mechanism is so simple and versatile it can be handled by any operator; constriction of the unit is very simple. Handling the machine is easy and smooth operation is achieved. Pneumatics is one of the technologies now a days widely using in automobile industries. The statement of project is **"development of pneumatic shearing machine"** for the cutting of metal strips & Blades of different sizes as per requirements for die making industry.

4. ADVANTAGES

1) Machine work on the low power consumption as compare to the old Shearing machine.

2) It provides multiple cutting sizes of the metallic blades & aluminum sheets.

3) The operation of the new Shearing machine is well controlled.

4) Complex shapes can be Shearing as per requirement easily.

5) Very thin sections up to 0.5mm to 1mm can cut easily.

5. APPLICATIONS

1. Shearing of Cutting metal sheets up to 0.5 to 1mm thickness.

2. Shearing card board & foam from 1mm to 5mm.

3. It is used to Shearing a plastic sheets and paper.

6. CONCLUSION

By using high pressure pneumatics system, we can improve the performance of pneumatic shearing machine particularly designed for Cutting Dies blades, cork, leather, plastic, and PVC materials etc. Most Handsome and compact patronized Model requires Minimum Space.

Minimum "Make-Ready" Time and provides sufficient hourly production. By using proper balancing of pneumatic systems & parts we can use this pneumatic shearing machine for high speed & high production rate applications.

By using proper pneumatic balancing parts, we can use this pneumatic shearing machine for cut the hard material & for more thick sheets or blades. Improve performance by adopting imported guide rails stopper, advanced controlling system. Match up our multi-function pneumatic shearing machine, can realize the full automatic processing of cutting in future. If we increase pressure of working air then we cut different thickness of blades by different forces.

7. REFERENCES

[1] Pramod S N ,Vinay A M, Amith Sreenivas, Gireesh.S Manoj.J , Pneumatic Shearing Machine, International Journal Of Innovative Research In Science, Engineering And Technology, Volume 7, Special Issue 7, June 2018,PP. 279-298.

[2] Khagendra Barman, Md. Nesar Ali, Md Rayhan Hasnat, Dr. S. M. Humayun Kabir, Fabrication Of A Pneumatic Sheet Metal Cutting Machine, International Conference On Mechanical Engineering And Renewable Energy 2017 (ICMERE2017) 18 – 20 December, 2017, Chittagong, Bangladesh,PP.1-8.

[3] M.Khaja Gulam Hussain, T. John Babu, Fabrication Of Pneumatic Shearing Machine, International Journal For Research Trends And Innovation ,2016 IJRTI | Volume 1, Issue 2 | ISSN: 2456-3315,PP.23-32.

[4] Neeraj Pandita, Naren Kesar, Akshit Jasrotia, Surya Dev Singh, Lakshay Jolly, Anant Khajuria6, Vishwarth Singh, Pneumatic Sheet Cutting Machine- A Review, Nternational Journal Of Scientific And Technical Advancements, Volume 4, Issue 1, Pp. 105-108, 2018.

[5] Swapnil Laxman Gaikwad, Rohit Ramnath Pawar, Mayur Bapugunjal,Pritam Bajirao Bhawar, Design & Development Of Pneumatic Shearing Machine,ICITSEM-2017.PP.34-41.