

Introduction & Overview of Pneumatic Press with Various Attachment

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Abstract:- In this paper, we will discuss about Basics of pneumatic press with various attachments, its components and working. A pneumatic press is a machine using a pneumatic cylinder to generate a compressive force. Frame, pneumatic cylinder and press table are the main components of the pneumatic press with various attachments. Presses are one of the most commonly used machine tools in industry for the forming of different materials. In the past, for the pressing tasks in industry, mechanical presses were more frequently used, but nowadays pneumatic presses take precedence due to their numerous advantages, such as, compact in design, simple and safe in handling, highly adaptable to harsh environment, environment friendly, economically preferable. In current industries working environment, we are using number of machines to perform different kinds of operations like Bending, Shearing, and Pressing etc. which are having various types of inputs like Electrical, Mechanical, Hydraulic and Pneumatic. It is not very convenient for a small scale Industries. In a point of view cost, place and number of skilled workers, which are producing less number of parts and for that we have to perform number of operations on same components and on same machine. Using the optimum resources possible in designing the pneumatic press components can effect reduction in the cost by optimizing the weight of material utilized for building the structure and press attachments.

Keywords:- *Pneumatic press, Pneumatic system, Press components, Press tools, Actual model.*

I. INTRODUCTION

In today's industries sheet metal is a main raw component used for various products, on sheet metals mainly operations performed are shearing, bending,

punching etc. and aluminium as well as plastic are widely used as sheet metal materials. In shearing operation sheet metal is placed between upper and the lower blade. The lower blade is stationary while upper blade is moving and downward force

is applied to upper blade for shearing. In shearing cutting action takes place perpendicular to the direction of blade movement, as the upper blade moves downward towards the sheet metal, the pressure applied by the upper blade cause plastic deformation of sheet metal. Two separate sections can be seen on sheared sheet metal. The first section is plastically deformed and second one is fractured. Clearance between upper blade and the lower blade is very small. The sheet metal adjacent to the cutting edges which is localized area where plastic deformation of sheet metal takes place. The shearing action is not a very uniform first the fracture starts at the weakest point on force localized area and continues to the next weakest point until the entire sheet metal has been sheared.

In bending operation the bend is made with the help of punch and bending attachment. Large force applied to the work piece by punch. The amount of force applied by punch for proper bending should be between the range of the material's yield point and its maximum tensile strength. The force applied by the punch is achieved with the help of pneumatic system.

In punching operation various shapes can be produced with the help of punch and die arrangement. Holes of various shapes and external counters of various shapes are cut in single stroke by punch. The sheet metal is placed between the punch and the die. As the punch moves downward it plunges into the die. When the punch move passed the die the sheet metal is cut. Punching action can be divided in four stages. In first stage punch touches the sheet.

In second stage the sheet is deformed due to pressure applied by punch. In next stage the tension within the material is gradually increased up to the amount at that amount sheet breaks along the contour of the cut and finally the cut-out piece of sheet metal is ejected by punch in downward direction which is also called as punching slug. There are four operations performed like bending, shearing, punching and embossing.

A. Introduction of Pneumatic System

In pneumatic system compress air is used to transmit and control forces. In today industries various works are done by using pneumatic systems like automatic production lines, mechanical clamps, controlling train doors etc.

B. The Advantages of Pneumatic System

- The design of pneumatic components are relatively simple and they are highly suitable to use in automatic control systems.
- Air is freely available in our atmosphere in unlimited quantity. That's why most of the factories are equipped with compress air supplies and movable compressors. Compress air can be easily transported from one place to another using pipes. And after that used compress air is released into the atmosphere.
- Speeds and pressure are can be easily adjusted by simple controlling devices. The volume of air and pressure of air can be adjusted by pressure regulator.
- Compared to other power transmitting systems, components used in pneumatic systems are more durable and reliable. These components are cannot be damaged easily that's why they are having long life.
- In pneumatic systems safe working can be easily achieved without making large changes in the working systems. In pneumatic systems overloading will only lead to sliding or cessation of operation, and also components of pneumatic systems are does not burn or get over heated when overloaded due to compressed air is used as power source.
- Elements of pneumatic systems are less affected by various environmental parameters like high temperature, dust corrosion as compared to the elements of other systems.
- Pneumatic systems works on compressed air thus the operation of pneumatic systems do not produce pollutants.
- All components of pneumatic system are not expensive and easily available and hence the maintenance cost of significantly lower than the other system.

C. The Disadvantages of Pneumatic System

- Using of cylinders in pneumatic system that are very large in size and hence the heavy load is not suitable for pneumatic system.
- The main source of pneumatic system is compressed air. The using of air their operation is subjected to the volume. In working condition, sometimes the volume of air is compressed or heated. The supply of air is not

accurate. Causing losses in the system and is affected on overall system.

- An air can easily be compressed and also the highly chances of fluctuation in speed of compressed air. It's all affected on moving parts. The moving speeds of piston are also uneven.
- Compressed air is main source of pneumatic system, it is essential to process the air before use. When the air is processed, the presence of water vapor and dust is remove. And hence the life of pneumatic components are last longer.
- When the compressed air is released from the pneumatic components, the noise is produced.

D. Components Using Pneumatic System

• Air Compressor

An air compressor is a heart of the pneumatic system. It is a device which pressurized the atmospheric air with the help of electric motor. Atmospheric air is forced in large quantity into a storage tank and by that pressure is increased. When the pressure in the tank is reached to the upper limit the air compressor is shuts off. This compressed air is held in tank with pressure unless and until it is called for use. This stored energy in the form of compressed air is used for various applications. When the air is released tank to perform work at the time the tank is depressurized. After a continue use the pressure of tank is reduced. When this pressure reached to lower limit the air compressor is turned on again and pressure increased of the tank. Electric and gas/diesel powered compressor are the most common types of the compressor. We can find out in reserve compressed air capacity with the help of gallon size of the tank. HP (Horse Power) and CFM (Cubic Feet of Air per Min) are the units used to measure the power of compressor. Electric power compressors are widely used in workshops, production and garages where electricity is easily available. Common workshop compressor are of 110 to 120V OR 230 to 240V and mostly used in remote areas where electricity is not available. Compressor tank can be produced in various shapes depending on the purpose and size of compressor like horizontal, vertical, twin tank etc. Compressor can be stationery or portable as pre requirement.

• Double Acting Cylinder

Double acting cylinders have two parts one is outstroke and the other is in stroke. It uses the force of air move in extraction and retraction stroke. When the piston rod is unprotected for punching and sharing, then the stroke length of piston is not confined. The various cylinder sizes from 2.5mm which is used for peaking components.

• Filter Regulator Lubricator

In FRL, the air leaving from the compressor is dirty and wet and hence it can be filtered, regulated and lubricated before use. Otherwise it can damage and reduce the life of equipment like valve and cylinder. In this the air is strained and trap solid particles and separates the liquid from compressed air. Filter installed in the line of regulator, dcv etc. the airline filters are performing combine and safer operations like remove contaminants from pneumatic system

it can prevent damage and reduce losses. The overall system is maintained with the help of FRL unit. With the determining pressure drop, selection of proper size of filter can be done for any application. The pressure drop in the air is the main cause of the filter and it can be determined by the referring to flow curves by the manufacturer.

- *Direction Control Valve*

In this project we use the 3/2 spool operated DCV. It has three ports and two spool positions. DCV is the fundamental part of the pneumatic system. The DCV controls the fluid flow. From one or more source they allow fluid flow into different paths. They are mechanically or electrically controlled.

II. WORKING PRINCIPLE

The pneumatic multipurpose machine works on the compressed air with the help of pneumatic double acting cylinder. The piston rod is connected to the various attachment with the help of locknut and threads, to produced movement and cutting tool. This machine is used to cut, to punch hole and produce embossing on the sheet metal of small size and thickness. This machine is portable in size and that's why it is easily transportable from one place to another. it required less space. so it can easily place in workshop.

Compressor converts atmospheric air to compressed air. at the pressure between 7 to 10 bar then this compressed air passed through pneumatic pipes which are connected to the direction control valve, which is 3/2 spool operated dcv. The dcv is operated manually with the help of lever. Direction control valve has 1 input and 2 outputs to control the direction of compressed air. Firstly the compressed air enter into input port and goes out from one of the input port and when the lever operated then this compressed air goes out from another output port.

When the lever is at position one the higher pressure air passing through dcv actuates the piston of cylinder from top position to bottom and when lever is shifted to second position, the dcv changes the input ports connection to the output port and by this piston moves from bottom position to top position.

For shearing operation, first the shearing attachment is attach to the base frame with the help of nut and bolts and upper blade is attached to the piston with the help of locknut. The material is to be cut is place between the upper blade and the lower blade. Lower blade is fix and upper blade is moving with the help of piston. When dcv operated the piston moves the upper blade downward and by shearing action material is cut.

In hole punching operation , the hole punch is attach to the piston with the help of threads, and hole die is secured on the base frame with the help of nut and bolt. Alignment of punch and die is checked properly before starting the machine. to punch a whole material placed on the die properly. Then dcv is operated and by that action punch is lowered by piston and punch produces the hole in material with the help of die.

For embossing operation the embossing punch is attached to piston with the help of thread and the locknut. The material on which the embossing is needed to produce is holed to the help of vice. After that the lever is operated and by the action embossing tool get lowered with the help of piston and hence the design on the embossing tool is embossed or produced on the material.

III. WORKING MODEL OF PNEUMATIC PRESS

A. Actual Model



Fig 1:- Actual Working Model

B. Shearing Attachment



Fig 2:- Shearing Attachment

C. Punching attachment



Fig 3:- Punching Attachment

B. Punching tool



Fig 6:- Punching Tool

D. Embossing attachment



Fig 4:- Embossing Attachment

C. Embossing tool



Fig 7:- Embossing Tool

IV. PNEUMATIC PRESS MACHINE TOOL

A. Shearing tool



Fig 5:- Shearing Tool

D. Stamping tool

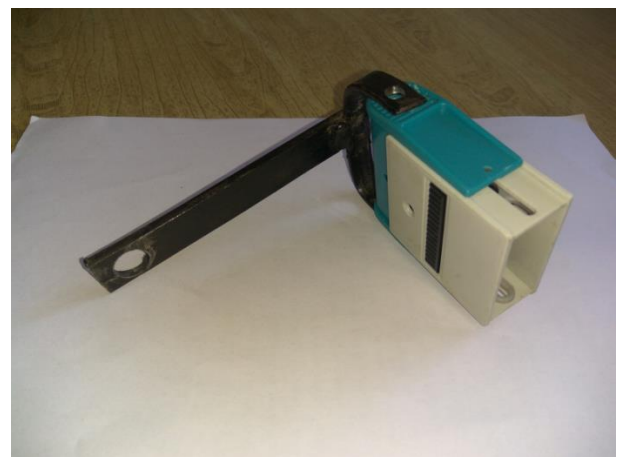


Fig 8:- Stamping Tool

V. CONCLUSION

After the design, development of pneumatic press for various attachment, we concluded that machine can be used for different operations using different attachments economically and efficiently.

This project work will helpful for small as well as medium scale industries in economical view. Thus the limitations of conventional machining can overcome using the developed pneumatic press machine.

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