



Automatic PVC Pipe Cutting Machine

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ABSTRACT

Pipe cutting operation plays the important role in pipe extruding industries. In small scale industries the pipe cutting operation in pipe extruding company is done by manual operation. During manual cutting the chip formation is high also there may be a chance of cross cutting of the pipe. These cross cutting occurs due to the tight holding of the pipe. Such that to avoid these kinds of difficulties the pipe cutting operation is done by pneumatically controlled systems. The working of the system is to carry out three processes feeding, clamping and then cutting. The main concern is to regulate the pressure conferring to requirement. The chief work of this system is to slice out huge number of jobs in pipe form rendering to the batch production. The arrangement of the pneumatic valves deployed in this system is accordance to the circuit planned. Automation in the modern world is inevitable. Any automatic machine aimed at the economical use of man, machine, and material worth the most. The pipe feeding and cutting machine works with the help of pneumatic double acting cylinder. The piston is connected to the moving cutting tool the machine is portable in size, so easy transportable.

Keywords: Automation, Plc, Pneumatic System, Pipe Cutting

INTRODUCTION

The main concern of this system is to carry out three processes Firstly Feeding then Clamping and lastly cutting. Pneumatic system mechanization is upcoming technology in automation system. Benefit of system is to cut the rod/pipe/cylinder with comfort. The main concern is to regulate the pressure conferring to requirement. The sequenced processes of the system

must be accurately timed. The chief work of this system is to slice out huge number of jobs/tasks in rod or pipe form rendering to the batch production. The arrangement of the pneumatic valves deployed in this system is accordance to the circuit planned. The choice of cutter is based on the stress calculated bearing in mind the pipe or rod material. The material favored in this system is a PVC (Polyvinyl Chloride) pipe for demo. But mild steel rods and pipes can also be worked out by using diverse cutter provisions. The cutter to be used in the machine system has been well-thought-out by calculating the torque essential for cutting PVC object by help of the design data offered. With the help of this system the period required to slice the substances like the pipe or rod will be fewer. The accuracy of slicing or cutting of the material will also be enhanced. The system can be controlled and maintained by semi-skilled workers with ease. The design of the machine is compact to be placed in small workshops. The worker during the working of this system should lone turn the switches on/off with the pneumatic valve and gather the sliced pieces.

PROBLEM IDENTIFICATION

The common problem they are facing are cross cutting of pipes, time management, cutting time etc. The base of the pipe cutting operation is not properly fixed such that while cutting there occurs a cross-cutting. The base part is hold by hands such that while cutting the pipe will move rapidly and due to that the cross cutting operation. If a pipe diameter is larger in size, then it is more difficult to cut the pipe by hand.

DESIGN

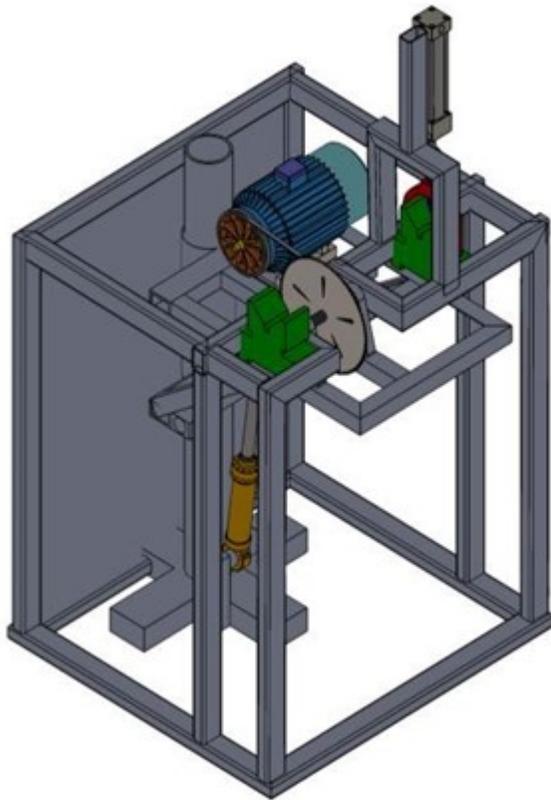


Fig 1: Isometric view of overall design

DETAILED DRAWING OF COMPONENTS

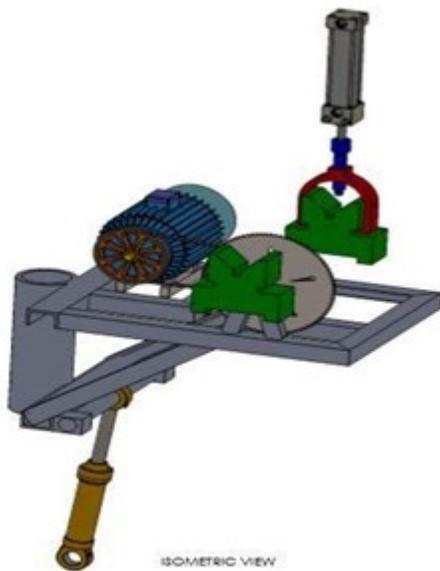


Fig 2: Isometric view of actuation

By considering these constraints and objectives, this work focuses to design a machine which cuts the pipe automatically with very less human efforts. The cutting and clamping mechanism developed for this machine to cut the pipe should be able to meet some

important objectives. Primarily the time consumed from cutting operation must be being less. The device would be user friendly. It would be versatile to cut pipes of varied lengths and sustain pressure while cutting thick pipes. The device would be handy, portable and durable, with anticorrosion property. Apart from all this the device is economical, such that people should buy at low cost.

PNEUMATIC CYLINDER:

The vital part in this system is the pneumatic cylinder whose task is to relocate the cutter vertically upward and downward in accordance to the pressure provided. The selection of the cylinder based on the pressure range attained from the forces eliminated for cutting the PVC material. Following are the specifications for the cylinder chosen:



Fig 3: Pneumatic cylinder

DESIGN OF PNEUMATIC CYLINDER

Force to be exerted is 40N
 Force = pressure × area
 Pressure in the cylinder = $0.4 \times 10^5 \text{ N/m}^2$
 Area of the piston, $(\pi d^2)/4$ = Force/pressure
 = $40 / 40000$
 = 0.001 m^2
 Bore diameter = $0.0356 \text{ m} = 35.6 \text{ mm}$

From Janatics pneumatic products catalogue we have selected 40mm bore diameter cylinder.

ROTATING BLADES:

The rotating blades are made up of High speed steel material, which acts as a cutter for pipes. In this the blades are having a diameter of 125 mm. the blades are actuated by the limit switches after that the blade will do its operation. The figure 7 shows the image for rotating blade



Fig 4: Rotating blade

LIMIT SWITCH

A limit switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection



Fig 5: Limit switch



Fig 6: PVC trigger the limit switch

OPERATION

This project consists of pneumatic cutter which is mounted on bottom side of motor and top sides

sliding structure on upper stand. In between cutter the pvc pipe moved from hall of unit in pipe line and the cutter is mounted at motor and he motor at the middle of the frame. One double acting cylinder is attached at the bottom side to give depth to the cutter when compressed air is when we insert the pipe in jaw and pushes the button then, the compressed air is supplied through compressor using solenoid DCV to hold the job using holding fixture for first pvc holding sequencing operation. When the limit switch is triggered the job holding takes place then the pneumatic cutter is switched ON & vertical cylinder gives cutting depth to the motor with pneumatic compressed air, cutting performance is affected by compressed air pressure & condition. When pipe cutting is done the limit switch turns off the solenoid DCV to stop the supply of compressed air.

ADVANTAGE

- Loading time reduced due to automation achieving faster production.
- Mass production is possible with little modification.
- Easy setup.
- Can be operated with unskilled worker.
- It is portable.
- Less maintenance

DISADVANTAGES

- Additional cost required to do further automation.

CONCLUSION

Thus, this work provides an alternative to the existing automatic PVC pipe cutting machine, in terms of automating the pipe entry into the cutting apparatus, eliminates power fluctuation and lesser initial investment. Time consumption is less when compared to manual cutting. This work provides the desired output for automation and fabrication. This machine is very useful for small scale industries.

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