

LOW COST AUTOMATION SENSOR BASED CUTTING OFF MACHINE

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ABSTRACT

This is an automation based cutting process, it consist of cutting of bar at certain distance. Bar, pipe or any shape pipe can be cut by using this machine without more effort and saving valuable time in manufacturing process. This machine has automatic clamping. Now days, there are wide verity of wire products like welding electrode, weld mesh, heat treated kitchen baskets, automobile spark plugs and exhaust valves etc. For manufacturing all above products, wire is used as primary element and is to be straightening from coil form. Now straighten wire is to be cut into wire rod as per required length. For these sequential operations, wire straightening cutting machine is used. Now days, conventional type wire straightening cutting machine are being used in which wire is cut by stopper cutter head which is limited by its length as well as feeding speed. This machine can be widely applied in almost all type of industries. The pipe cutting process is a main part of the all industries. Normally the cutting machine is manually hand operated one for medium and small scale industries. In our project is pneumatically operated "Typical Pipe Cutting Machine". Automation in the modern world is inevitable. Any automatic machine aimed at the economical use of man, machine, and material worth the most. In our project is hand operated D.C valve and flow control valve is used for semi-automation. The pipe cutting machine works with the help of pneumatic double acting cylinder.

Keyword : Pipe Cutting machine1, Pneumatic Cylinder2, Atomation3, Sensor4, Flow Control Valve5

1. INTRODUCTION

Our wide range of tube and pipe cutting machines includes machines that can handle small or large diameter tubes and that can be equipped with powerhexa. We supply pipe cutting machines for round, elliptic or conical pipes as well as fully automated equipment featuring integrated logistics, or simpler, mobile versions. Pipe cutting machines are popular in offshore, pipe processing, ship building, pressure vessel, structural and mechanical contracting manufacturing because of the complex cuts and profiles typical required in their respective industries. Pipe cutting, or pipe profiling, is a mechanized industrial process that removes material from pipe or tube to create a desired profile. Typical profiles include straight cuts, mitres, saddles and midsection holes.

2. OBJECTIVE

1. Automatic clamping and decamping by using sensor.
2. Reduce cost of automation.
3. To increase productivity, save time and energy.
4. Feeding pipe and circular rod automatically.
5. Job feeding takes place during return stroke of the machine there by reducing the idle time further..
6. Minimal human intervention only limited to replacing the bar stock on to the machine.

3. LITERATURE REVIEW

Literature review is a body of text that aims to review the critical points of current knowledge and or scientific methodological approaches on the topic related to the study. In the chapter, literature will give information about the background knowledge in design and fabrication of automatic pipe cutting machine based on sensor machine that being used as references to generate idea to conduct this study.

3.1 P. Balashanmugm and G. Balasubramanian - Pneumatically operated typical pipe cutting machine d. c. valve and flow control valve is used for semi-automation. The pipe cutting machine works with the help of pneumatic double acting cylinder. The piston is connected to the moving cutting tool. The axes of the multi-axis machine are powered by electric motors and are synchronized to create a path for the torch and pipe that yield a desired profile. The synchronization of axes is accomplished either mechanically, via cams levers and gears, or electronically, via microprocessors and controllers [1]

3.2 Shinde Vaibhav Kailasinh- Research on “Study of Automatic Pipe/ Rod Slitting Machine (Pneumatically Controlled) Singhad Institute of Technology and Science”. To reduce human effort for repetitive work of cutter pieces of pipes as well as providing a convenient fixture to support and hold the pipes/rods during cutting. The subject is undertaken as a part of B.E mechanical project. It can be termed as smart machine. To maintain a low cost automation, the pneumatic circuit is designed as compressed air supply is normally available at many workshops. The design of system is made versatile as this system can be easily adopted for various operations like drilling holes and for handling other small tools. [2]

3.3 Ramkumar Chandekar, Tushar Deurmalle, Pravin Bhagat, Shivam Pawar , Dr. S. V. Deshmukh-Has invention pneumatically operated automatic feeding cutting machine. Automation in the modern world is inevitable. Automatic machine aimed at the economical use of man ,machine, and material. The pipe cutting machine works with the help of pneumatic double acting cylinder. understood the need of automation for the manual pipe cutting machine and have given target to automate the machine which will improve its performance and will reduce time [3]

3.4 Shital K. Sharma Research on “Automatic bar feeding mechanism for pipe cutting machine”. The clamping arrangement can be varied according to need of operations suitable. The overall system is compact in size, light weight, modular and flexible to be used in small works jobs who need batch production. The setup overall configuration can be adopted by a semi-skilled worker easily and can vary the operations by making certain small changes. The system even has the potential to add up a PLC system to control its overall working with ease and with less effort provided. This system has the potential to adopt higher level of automation if desired in future. The bar feeding mechanism is a metal cutting machine tool designed to feed the metal. The machine is exclusively intended for the mass production and they represent faster and more efficient way to feed the metal[4].

3.5 Pandit Mandar Bipinchandra, Pathan Arfat Sherkhhan, Kasar Pawan Prakash, Gajbhar Kunal Prakash, Vishal P.Chaudhari -Automatic pipe cutting machine has used for mass production and aim at reducing the human involvement in order to increase the productivity and accuracy of the product. Automatic pneumatic pipe cutting machine uses a pneumatic circuit for cutting of PVC pipes which ,ultimately reduces the total time required for the complete cutting operation and increases the production rate. [5]

3.6 Carlos Machado Research- on “Automatic velocity control in cutting off machine”. Automatic cutting off machines, of metallic pipes or bars, use constant cutting velocity. This mode of operation constant cutting velocity.Combined with different profiles of materials to be cut, causes variable cutting forces to be applied to the saw. As a result, the cutting off machine is generally set for the worst expected conditions, otherwise excessive wear of the saw and machine require adjustment to be made in order to automatically detect the completion of a cut. The objective of this project is the study of the application of control algorithmic to the process of cutting off metallic pipes or bars, with variable profiles, implemented in an industrial cutting off machine, commercially available. [6]

4. METHADODOGY

4.1 Cutter motor : Cutter motor is 100 watt motor variable speed 0 to 8000 rpm ..with a standard 1:3 ratio gear head thus output speed of cutter will be 2600 to 0.

4.2 Linear slide and cutter feed arrangement: Linear slide comprises of two linear motion bearings on wither side with guide bars and set op helical compression springs. The feeding action is done by a double acting pneumatic cylinderspeed of the piston in forward direction i.e, the cutter feed is controlled flow gradual cutting action using a flow control valve in circuit.,where as the return stroke is standard (fast action). Springs are provided for fast return of the cutter head to original position.

4.3 Job clamping and guide arrangement: Job is guided in the job guide where as the clamping is achieved using a set of clamps namely , the set- clamp (adjustable to accommodate different size of job)where as the movable jaw is connected to another pneumatic cylinder which is operated to the cutter feed cylinder.

4.4 Job Feeding and sensing arrangement : For the semi-automatic version of the machine the feeding action is manual ie, the job is fed in the job guide manually upto stopper. , the proximity sensor is used to sense the job. The sensor then actuates the electrical circuit comprising of an electronic 8-pin relay and push button system..

4.5 Proximity sensor and electrical circuit : Proximity sensor and the electronic relay circuit is a simple electrical circuit used to sequence the operations in the circuit , it can also be replaced by an limit switch arrangement....but sensor is more reliablethe circuit decides the on/off of the 5/2 way direction control valve in the pneumatic circuit and thereby the clamping/cutting /return action.

4.6 Pneumatic circuit: Pneumatic circuit uses two double acting pneumatic cylinders , one 5/2 way direction control valve and one flow control valve., functions of the above components have already being explained above.

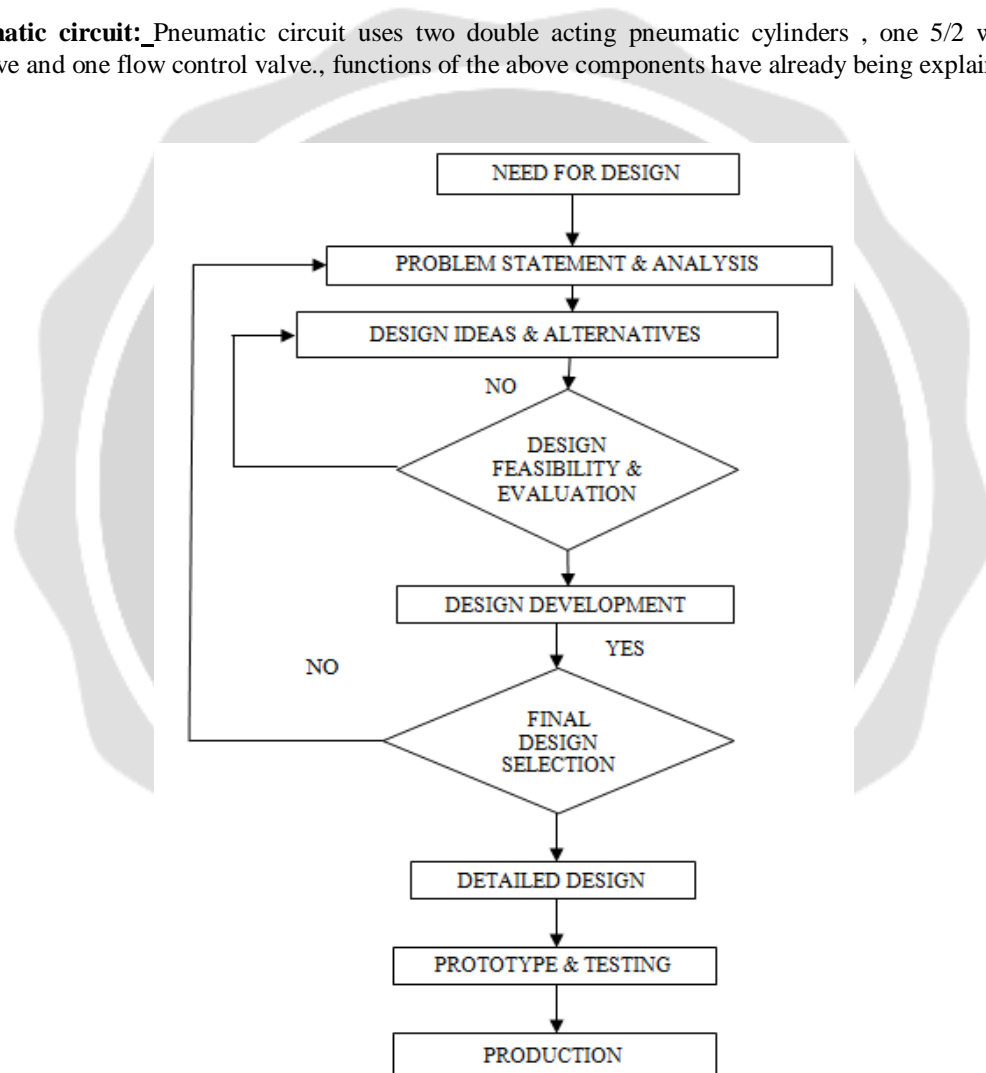


Fig.-1 Design Of Flow Chart



Fig. -2 Low Cost Automation Sensor Based Cutting Machine

4.6.1. Working

The sequence of operation for the machine is as follows:

1. Feed job to length.
2. Proximity sensor senses the job,.....circuit is 'ON'
3. Clamp cylinder operates to clamp the job
4. Cutter feed cylinder operates to feed cutter in downward direction to cut the job....feed rate is adjusted using flow control valve.
5. Press ' PUSH BUTTON'----Sensor is by-passed ...this makes circuit 'OFF'
6. Clamp cylinder reverses stroke ---job is de-clamped.
7. Cutter feed cylinder reversesreturn strokes are faster to save idle time.
8. Feed job againcontinue steps 1 to 7

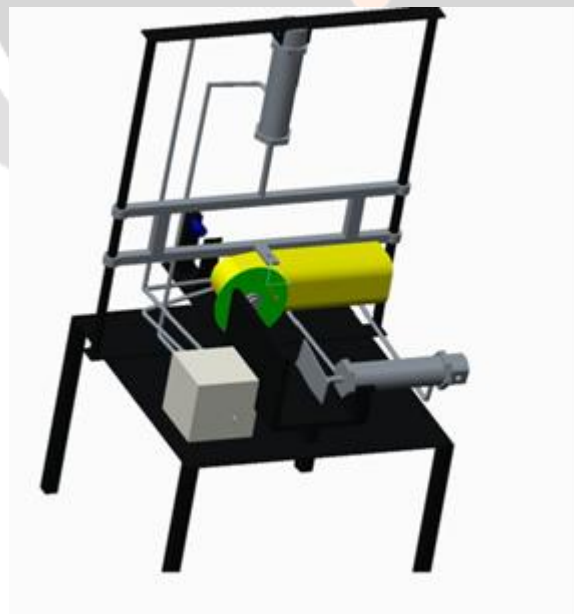


Fig.-3 CAD Model of our Project

4.6.2 Advantages

1. Job feeding upto stopper is sensor based ..so job size accurate.
2. Clamping of bar stock during cutting stroke is automatic.
3. De-clamping of bar stock after cutting stroke is automatic.
4. Job feeding takes place during return stroke of the machine there by reducing the idle time further.
5. Minimal human intervention only limited to replacing the bar stock on to the machine.

4.6.3 Application

1. Job stock cutting in production of automobile and industrial components.
2. Conduit cutting for wire harnesses used in cars
3. PVC sleeve cutting used as insulating material in electrical machine.

5. CONCLUSION

This project is a low cost automation project and time consumption is less when compared to manual cutting. This project report presents a brief mention of our efforts . Project work has given us good exposure to the practical field which in the future is definitely going to help us.

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7. REFERENCES

- [1] P.Balashanmugm and G. Balasubramanian, Design and Fabrication of Typical Pipe Cutting Machine, IJRDO- Journal Of Mechanical And Civil Engineering, ISSN: 2456-1479.
- [2] Kshirsagar Prashant, Rathod Nayan, Rahate Prashant, Halaye Prashant, Surve, Sachin, Theoretical Analysis of Multi-Way Power Hacksaw Machine, 02day, 5th international conference on recent trend in engineering, science and management, www.conferenceworld.in, (ICRTESSM.16), ISBN: 978-93-86171-12-2.
- [3] Nimbalkar Shripad, Velanje Sagar, Patil Abhay, Varpe Pooja, pneumatically operated automatic pipe-cutting machine, Vol-2 Issue-2 2016, IJARIE-ISSN(O)-2395-4396.
- 4] Shital K.Sharma, Ashish V.Waghmare, Pranit S.Wakhare, automatic bar feeding mechanism for pipe cutting machine, 02day, 5th international conference on recent trend in engineering, science and management, www.conferenceworld.in, (ICRTESSM.16), ISBN: 978-93-86171-12-2.
- 5] Ramkumar Chandekar ,Tushar Deurmalle, Pravin Bhaga, Shivam Pawar , Dr. S. V.Deshmukh, Automation Sensor Based Automatic Feeding Cutting Machine, International Journal of Research In Science & Engineering e-ISSN: 2394-8299 Special Issue 6-ICRTEST January 2017 p-ISSN: 2394-8280.
- 6] Pandit Mandar Bipinchandra, Pathan Arfat Sherkhani, Kasar Pawan Prakash, Gajbhar Kunal Prakash, Vishal P.chaudhari, International Journal of Modern Trends in Engineering and Research, www.ijmter.com, e-ISSN No.:2349-9745, Date: 28-30 April, 2016.

- 7] Shinde Vaibhav Kailasingsh, Ahiwale Anish Jahagirdar, Kuldip and Sutar Onkar, Automatic Pipe/ Rod Slitting Machine (Pneumatically Controlled), International Journal of Advanced Mechanical Engineering. ISSN 2250-3234 Volume 4, Number 4 (2014), pp. 447- 452 © Research India Publications
<http://www.ripublication.com/ijame.htm>.

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