

Overview of Sensor based Cutting Machine used for Low Cost Automation

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Abstract: "Low cost" and intelligent automation is an efficient tool especially for small and medium sized companies today. While "low cost" devices and concepts for automation of continuous processes are commercially available today concepts for discontinuous processes especially for manufacturing automation are in developing. Therefore, in this paper modular and open "low cost" will be presented and shortly discussed.

Keywords: Production control, manufacturing processes, assembling, robots.

1. Introduction

Industrial automation involves usage of advanced control strategies like cascade controls, modern control hardware devices as PLC's, sensors and other instruments for sensing the control variables, signal conditioning equipment's to connect the signals to the control devices, drives and other significant final control devices, standalone computing systems, communication systems, alarming and HMI (Human Machine Interface) systems.

Using the automation equipment various, process is handled simply without getting any complex environment particularly in manufacturing processes. Operator friendly and improves the safety complexity of operating the equipment or processes is reduced with industrial automation. It changes the position of the operator as operator to the supervisory role. In October 2014, the President's Council of Advisors on Science and Technology (PCAST) released the report of the Advanced Manufacturing Partnership (AMP) 2.0 Committee entitled, "Accelerating U.S. Advanced Manufacturing". The report motivated next generation advanced manufacturing focusing on enabling innovation, securing the talent pipeline, and improving the business climate for U.S. growth and competitiveness. The report further identified and recommended the alignment of efforts and resources to address next generation advanced manufacturing IT infrastructure technologies critical to U.S. competitiveness, encompassing growth, dynamic performance, energy and material usage, environmental sustainability and zero incidents.

2. Literature survey

- Ashwin S. Patel-Research on "A review on innovation of Wire straightening cutting Machine" There are wide

verity of wire products like welding electrode, weld mesh, heat treated kitchen baskets, automobile spark plugs and exhaust valves etc. [1].

- 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. [2]
- 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 [6]
- Pandit Mandar Bipinchandra, Pathan Arfat Sher Khan, 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 [7].
- 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 [8]

- Sawaragi, T. and Ogura, T - Research on “Study of Automatic Pipe/ Rod Slitting Machine (Pneumatically Controlled) Singhgad 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. [9]
- 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 [10].

3. Working principle

The sequence of operation is as follows:

- Feed bar stock to stopper that is set according to length of work piece to be cut.
- Clamp the bar stock.
- Feed the cutter blade to cut the required length.
- Retract the cutter.
- De-clamp the work piece.

The above sequence if observed has the human intervention throughout the process is necessary and more over the process of bar cutting does not add to the value of the product hence can be treated to be an idle time. Thus there is an attempt in the form

of continuous cutting off machine to reduce the idle time to a minimal value. In the machine once the bar stock is fed to the stopper the machine automatically feeds the cutter to the work piece until it is cut to the required length during the cutting stroke and during the return stroke the bar will automatically fed to the stopper by the machine itself.

4. Figure

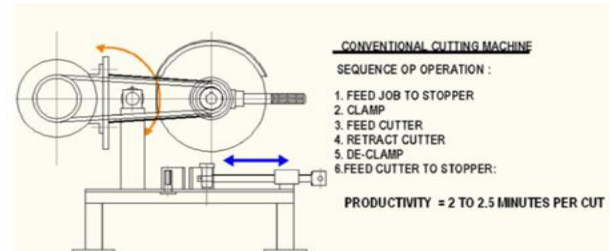


Fig. 1. Advance Sensor used for low cost conventional cutting machine

5. Advantages

- Job feeding up to stopper is sensor based .so job size accurate.
- Job feeding takes place during return stoke of the machine there by reducing the idle time further.
- Minimal human intervention only limited to replacing the bar stock on to the machine.

6. Conclusion

In this seminar, it is concluded that current sensor development is tending toward increased complexity in sensor systems. The greater flexibility and lower production cost associated with advanced, integrated electronic technology allows computer processing that once required large and sophisticated signal processing systems to be reduced to a microelectronic chip; for example, smart sensors have transduction, signal amplification, filtering, and other processing on a single substrate. However, from the perspective of the end user, the sensor system now appears simpler even with its increased functionality and internal complexity.

References

- [1] Ashwin S. Patel, 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, (ICRTESM.16).
- [2] Carlos Machado, (2002). Is High Automation a Dead End? Cutbacks in Production Over Engineering in the German Industry. In: Proceedings of the 6th IFAC Symp. Cost Oriented Automation, Elsevier Science Ltd. Oxford.
- [3] Marzi, R. and John, P. (2002). Design and Evaluation of a Competence promoting Decision Support System. In: Preprints of the 8th IFAC/IFIP/IFORS/IEA Symp. On Analysis, Design and Evaluation of Human-Machine Systems, Kassel, Germany Masten, M. K. (1997).
- [4] Nong Ye (1994). Machine Fault Diagnosis: Operator Strategies and Performance Support. In: Advances in Agile Manufacturing (P.T. Kidd and W. Karwowski, (Eds.)), pp. 445-448. IOS Press, Amsterdam.
- [5] Ollero, A. (2002). Low Cost Automation in Field Robotics. In: Proceedings of the 6th IFAC Symp. Cost Oriented Automation, Elsevier Science Ltd. Oxford.

- [6] P. Balashanmugm and G. Balasubramanian, "Design and Fabrication of Typical Pipe Cutting Machine", IJRDO-Journal of Mechanical and Civil Engineering.
- [7] Pandit Mandar Bipinchandra, Pathan Arfat Sherkhan, Kasar Pawan Prakash, Gajbhar Kunal Prakash, Vishal P. Chaudhari, "International Journal of Modern Trends in Engineering and Research".
- [8] Ramkumar Chandekar, Tushar Deurmalle, Pravin Bhaga, Shivam Pawar, S. V. Deshmukh, "Automation Sensor Based Automatic Feeding Cutting Machine", International Journal of Research in Science & Engineering, Special Issue 6-ICRTEST January 2017.
- [9] Sawaragi, T. and Ogura, T. (2000). Concept sharing between Human and Interface Agent under time criticality. In: Advances in Networked Enterprises, Boston, MA, pp. 269 – 278.
- [10] 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, (ICRTE SM.16).