International Journal of Research in Engineering, Science and Management
Volume-2, Issue-2, February-2019
www.ijresm.com | ISSN (Online): 2581-5792

Development of Automatic Billet Cutting Machine

Kalpan Desai[1], Krunal Kansara[2], Krutgna Mehta[3], Mayank Mistry[4], Mayank Kumar Patel[5], Mahammad Ali Ahmed[6]

[1]*Asst. Prof. and HoD, Dept. of Mechanical Engg., S. S. Agrawal Inst. of Engg. and Technology, Navsari, India*
[2]*Asst. Engineer, Department of Production, Kosan Industries Pvt. Ltd., Sachin, India*
[3,4,5,6]*Student, Dept. of Mechanical Engg., S. S. Agrawal Inst. of Engg. and Technology, Navsari, India*

***Abstract*: We are working on the project "Development of Automatic Billet Cutting Machine". In modern Era of industries in automation, the production rate is most important step that companies are working on quicker and cheaper production. We saw that cutting action is done through a circular band saw blade or with simple hacksaw blade.so, we have a modification to existing machine by redesigning parts like Auto feeding, Slitting Circular Cutter. Basic aim of our project is to increase production rate and reduce cutting time.**

***Keywords*: lead Screw, Servo motor, Pulley, Hydraulic Cylinder, and Circular Saw Cutter**

1. Introduction

The tug of war between the industries has given birth to Automation- The new era in the field of manufacturing. Competitive market condition has forced the industries to adopt processes which can be automated and get done through machines as a replacement to manpower. Often, the things done heartily guarantees success. The interest of the team members from the beginning of the engineering has been in Automation and the active participation in robotics events in so called Tec fest's has always a fruitful experience.

A. Manual vs. Automation

- Automation means making a specific task (which was previously done manually) free from human intervention trough some sort of mechanism which does that task more effectively and meet the required demands by using the modern technology.
- Present trend of fast technology demands less laborious work and accurately carried out processes.
- Hence from the point of view of industries, preference to manual working strategy is diminishing and the knot of automation is strengthening.

Manual working strategy leads to following limitations:-

As a fruit of Shodh Yatra, we found out something that we already liked and that was a great opportunity to develop something we liked the most. So, without much delay we came up with idea to "Develop the Automatic Billet Cutting Machine".

2. Problem definition

The problem was defined by a visit in a company located in OLD GIDC Gundlav, Valsad. Named VYAS TECHNICAL CENTRE.

The Firm manufactures:

- Shafting
- Aluminum die

After having understood the whole process layout and the methodology of manufacturing from beginning of billet till the finishing, we saw a point where automation could be done. Discussion on those points led us to come on the conclusion that the point was valid and it could really be helpful for the firm. Actually, they had a Power Hacksaw Machine, but it was taking more time and more periodic maintenance. So, we thought to remove the above-mentioned problem by developing the machine to fulfill the same activity in a unique way to remove the burdensome work humans through replacement of the same through machine. Here it is shown how to style a subsection and sub sub-section also

3. Objectives

The major objectives of project are:

- To develop an appropriate design procedure for the designing and fabrication of automatic billet cutting machine.
- To reduce the manufacturing cost up to 20% - 30% by using cost reduction in material, but having required strength.
- To reduce the unnecessary use of manpower.
- To increase precision and accuracy in cutting operation.
- To increase production rate.

4. Literature review

S. Palani1, K. Suresh1, A. Thanesh1, S. Muthukumar and V. Parthasarathy The rod rest area and feeder area of the auto loader has been modified by raising the height of the rod resting area and also designed the feeder to hold two rods vertical. The

saw machine thus enables to cut rod at the time in order to reduce the cutting time and also could be improved 60 to 85 % of the productivity in modern manufacturing.

P. B. Patole, N. V. Gawade, A. R. Jagadale, G. A. Bugade, S. R. Bhopale The actual implementation of the project it is very necessary to understand the current work done in this. They concludes opening the end of the cutting machine they have shown numerically that the production time could be decreased by up to 56% such improvement would help production managers in tube mills reduce costs such as finished product inventory, labor cost.

N. N. Panode, S. S. Hiwale, S. R. Bannagare, We examined various research papers related to the subject. There have been significant research and development on design of fabrication of pneumatic operated cutting machine for general and industrial use.

Bijay Lipcha, Amar Kadam, Sachin Gadakh Amarjeet Yadav, F. U. Pathan, Theorems and different factors that affects the performance of machine. “Theory of machines” helps to understand Velocity diagram of slider crank mechanism that the saw blade must be select for fine operation and fine cutting by selecting number of teeth per inch. There are types of blades namely High Carbon steel and High-speed steel blades. Based on the properties of materials, Bi-metallic blade is suitable blade for cutting hard materials like Mild steel bar.

5. Design

- *Feeding mechanism:* We have design feeding mechanism such as half nut mechanism in that the length of lead screw should be minimum 3048 mm, pitch will be 6mm and nominal diameter will be 36 mm. The servo motor is used with two pulley to give rotation to lead screw.
- *Clamping Mechanism:* The most preferable mechanism is Hydraulic Mechanism as peak power is high and positioning accuracy is also high.
- *Cutting Mechanism*: The cutting action will be in vertical direction and diameter ranges from 300-500mm. The cutter feed mechanism is hydraulic and simple regular AC motor is used for cutter feeding.

Fig. 1. Design

6. Selection of system for feeding and cutting mechanism

Selection of system for feeding and cutting is one of the most influencing factor to meet required design constrains. We have work out some of the main comparison points as follows. From discussing below points comparing with one another.

Table 1
Characteristics

Characteristics	Power hacksaw	Band saw	Our Design
Speed	Slow	Medium	High
Size	Medium	Medium	Large
Reliability	Good	Good	Excellent
Peak Power	High	High	Very High
Position Accuracy	Good	Good	Excellent
Purchase Cost	Low	Medium	Medium
Operating Cost	Low	Medium	High
Maintenance Cost	Medium	Medium	Medium
Efficiency	Low	Medium	High
Utilities	Hacksaw Blade	Circular Blade	Circular Saw Cutter
Complexity	Low	Medium	Low/Medium

7. Selection of material.

- Bed: Cast iron
- Lead Screw: Pre-Hardened Steel (SAE 4140 or 4150)
- Pulley: Cast Iron
- Bearing: Chrome Steel (SAE 52100)
- Cutter: HSS with Carbide tip

8. Conclusion

This paper presents the design and fabrication of development of automatic billet cutting machine.

References

[1] Kshirsagar Prashant R., Rathod Nayan J, Rahate Prashant P, Halaye Prashant P, Surve Sachin S, “Theoretical Analysis of Multi-Way Power Hacksaw Machine” International Journal of Research Advent Technology, Vol. 3, No. 4, April 2015.
[2] Khurmi R.S and Gupta J.K. (2004), Machine Design, 4th Edition.
[3] E. J. Yerxa Taylor and Francis “Occupational Science: A new Source of power for Participants in Occupational Therapy” – Journal of Occupational Science, Volume: 13, Issue 1, April 1993, pp 254 – 259.
[4] Jon Leary “Putting Research into Practice: from a Steel City Drawing Board to the Heart of the Maya”. The University of Sheffield – EWB – UK National Research Conference 2010, 19th February, 2010.
[5] R. S. Khurmi, J. K. Guptal, (2012), “Theory of machines”, pp. 143-168
[6] PSG College of Technology, (2007) “Design Data Book”, Page no. 1.4-1.37
[7] V. B. Bhandari, Design of machine elements, Year 2007, Page no. 5-7 & 20-39
[8] Nitinchandra R. Patel, Mohammad A. Vasanwala, Balkrushna B. Jani, Ravi Thakkar, Miteshkumar D. Rathwa, “Material selection and testing of hacksaw blade based on mechanical properties”, International Journal of Innovative Research in Science, Engineering and Technology, volume 2, Issue 6, June 2013.
[9] Micro, Small and Medium Enterprises Development Institute, “Project profile on hacksaw blade manufacturing”, NIC code: 28939, ASICC code: 71303, 2010-11. 157.
[10] D. V. Sabarinanda, V.Siddhartha, B. Sushil Krishnana, T. Mohanraj , “Design and Fabrication of Automated Hacksaw Machine”, International Journal of Innovative Research in Science, Engineering and Technology, volume 3, April 2014.
[11] Bradford Dittmer, “Build a power hacksaw from washing machine parts”.