

Design and Fabrication of Automatic Wire Cutting Machine Using Fusion 360 and Arduino.

Dr. S.Saraswat¹, Rahul Singh², Rohan Agarwal², Shubha Patel² and Tanmay Jha²

¹Associate Professor, Department of Mechanical Engineering, J.S.S. Academy of Technical Education Noida, Uttar Pradesh, India

²Students, Department of Mechanical Engineering, J.S.S. Academy of Technical Education Noida, Uttar Pradesh, India

-----***-----

Abstract- As the industries grows it needed to be automate everything from small to big process. Such processes that need to be automate is Wire cutting process, for small scale industries as well as large industries. It saves tremendous amount of time and labour cost as well as it is accurate. So here we Design Automatic Wire Cutting and Stripping machine in Fusion 360. After the Designing we fabricate the machine using Cheaper materials and Automate it using Arduino Uno.

Keywords- Automatic wire cutting machine, Arduino uno, stepper servomotor, PCB.

I. INTRODUCTION

In the modern world where everything is becoming more automated, it is need of the hour to Automate every single process and machines which saves time as well as labour. This also reduce the cost price and help us to estimate the future requirement accurately. In big or small industries where the wiring process or process related to wires need to be automatic. To solve this problem we tried to make a Automatic Wire Cutting Machine using Arduino Uno.

In the market there is many Automatic Wire cutting machine are available but they are very costly and only qualified labours can operate them. We tried to make as simple as much reliable so everybody can use this machine, even in house it can be usable.

Many prototypes and researches are done on This machine and we add Designing part using Fusion 360 and SolidWorks. Designs of various parts of machine are of the ISO standard and tolerance are given to every part as required. The whole machine divided into different section like- cutting section, Height adjustment block, Guide Tubes etc. For the Automation part we used Arduino Uno , Nema motors, stepper motor. Etc.

As **Sammed Narendra, et al. (2017)** tells us that In an automatic wire cutting machine a stepper motor driven knurled roller is positioned between two wire guide channels to drive a wire toward a cutting station. The length of wire to be cut is set in a length counter. Drive cycles, during which the wire is driven apredetermined distance, are counted in the length counter. Then, the stepping motor is disabled and cutting blade is energized. This system prevents operation of the cutting blade solenoid at less than an acceptable duty cycle with short lengths of wire. This automatic cutting machine is fully electric, microprocessor controlled bench machine for processing wire, round and flat cable. It features LCD display prompts for easy-to-follow set-up and operation, automatic wire loading and unloading and universal V-type blades.

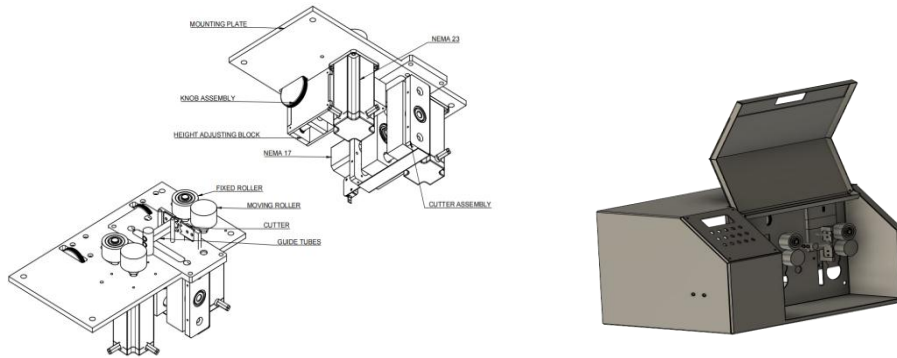
II. PROBLEM STATEMENT

We deal here two types of problem first, To build a sustainable design for manufacturing process in future need. And second to reduce the market cost of our Automatic Wire Cutting Machine. The first problem was regarding the design so we used Fusion 360 and SolidWorks for that. Second problem solved by Market analysis and fabrication process.

III. METHODOLOGY AND LITERATURE REVIEW

1. Design Model-

We designed our model using Fusion 360 And SolidWorks. Our Design are Divided into different sections. 1) Full Cutter Assembly, 2) Height Adjustment Block, 3) Straightning Block, Guide Tube. These Assembly have different parts which was designed as per as ISO ratings.



2. Market Analysis-

We searched online as well as offline stores for the query of Automatic Wire Cutting Machine price. We are amused to see the prices of Machines. The average cost of one machine is ₹50000. Mostly machines Comes from the China which adds the shipping cost to the cost price. Then we calculate our estimate price of machine, include every components price and process price and we found out that our machines costs very less as compared to the market value. And once this machine will manufactured in bulk its price become more less.

Company Name	Specification				
	Weight	Cutting Length	Stripping Length	Productivity	Price
BOIYUE	36kg	4mm-800mm	0.1mm-999mm	1500-3500 pcs/hr	Rs. 68,000
SHENZHEN	40kg	8mm-999mm	0.1mm-990mm	2000-4000 pcs/hr	Rs. 1,57,000
Velocity Engineers Private Limited	31kg	Continuously Programmable from 50mm - 9999mm	Head 0.25mm - Tail 0.15mm	3000-5000 pcs/hr	Rs. 1,82,000
Speed Tech Engineer Limited	400kg	20mm-1000mm	1mm-38mm	2500-4000 pcs/hr	Rs. 1,04,000
KCL Cable India	100kg	50mm-900mm	0.1mm-40mm	2200-4000 pcs/hr	Rs. 78,000
KEI Industries Ltd.	200kg	20mm-1000mm	0.1mm-800mm	1500-4000 pcs/hr	Rs. 1,01,000

Table 1. MARKET PRICE

COMPONENT	QUANTITY	PRICE PER QUANTITY	TOTAL PRICE
SERVO MOTOR	1	Rs 300	Rs 300
NEMA 17	1	Rs 1000	Rs 1000
ARDIUNO	1	Rs 1500	Rs 1500
LCD	1	Rs 500	Rs 500
ROLLER	2	Rs 60	Rs 120
CUTTER	1	Rs 100	Rs 100
GUIDE TUBE	1	Rs 50	Rs 50
MISCELLANEOUS			Rs 6430
TOTAL			Rs 10,000

Table 2. Our total estimate.

3. Specification-

Sammed Narendra Patil, et. Al (2017) already conducts the calculation for the various requirements of the parts of machine. They had done the calculation for the power of motor and torque of motor. They also done calculation for the size of rollers for the accurate measurement of wire.

4. Mechanical & Electronic Components-

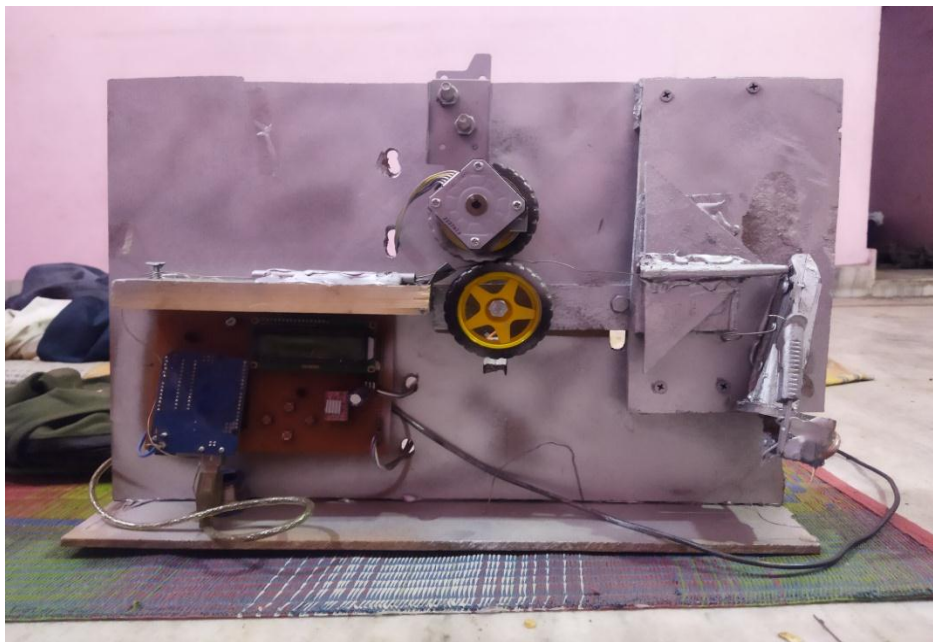
In this machine various components are used which are divided into two category- Mechanical component and Electronic Components. In Mechanical components its comprises of Wheels ,rollers, thick plywood sheets, guide tube, Wire stripper and Cutter handy tool, fastners etc. In Electronic component its comprises of Arduino board, male-female connectors, microprocessors, micro-controllers, LCD screen, buttons, servo motors etc.

5. Conceptual Design-

In our machine first of all the lengths and number of pieces are given through the commands using buttons. Selecting the length and number of pieces, the command is initiated by the Arduino program . then Arduino gives signal to the stepper motor and servo motors . the rollers are connected to the stepper motors which turns according to the command, this pulls the wire and feed them into the guide tube. Then the cutter is connected with the servo motors which turns only specific angle this helps to work the cutter. Whole machine requires 220V Ac/dc supply.

6. Final Assembly-

First we take the thick 5mm Ply sheets for the Assembly of all parts. We install the Rollers and stepper motor using fastners. Then we install the guide tube after that for straightening of the incoming wire. Then we fix the cutter and with cutter we connect the servomotor. Then we fix the Arduino , LCD screen, button in mother board and connects everything using wires.



IV. CONCLUSION

We made the Cheap and Handy Automatic Wire cutting machine which reduces the cutting time and reduces the labour cost. It is accurate because of the different Arduino program is behind it. As we can increase the production of these machines the making cost will more reduced. We Designed the Product and make its prototype.

V. REFERENCES

1. Sammed Narendra Patil, Sourabh Popatlal Karyappa, Suraj Rajendra Patil, Shubham Deepak Patil. "Design and Development of Automatic Wire Cutting Machine: A Case Study in Small Scale Industry" International Journal for Research in Applied Science & Engineering Technology (IJRASET)(2017) 2321-9653
2. Ms. Poonam Mane, Ms. Shalaka Mali, Ms. Pooja Korade, Mr. Suhas Katkar. "Automatic Wire Cutting Machine" International Research Journal of Engineering and Technology (IRJET)(2017) 2395-0072.
3. YevgenyRapoport(Dec2012) "Design of an Automatic Machine for Stripping and Bending Insulated Electrical Wire"
4. V.B. Bhandari "Mechanical elements"
5. Mahalik, TATA MGH. "Mechatronics"