

# DESIGN AND FABRICATION OF PLC BASED PAPER CUTTING MACHINE

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## ABSTRACT

Now days we have seen hacksaw, chisels, metal cutter, for cutting the paper on industries. In this project we use chart paper as a cutter for doing cutting operation. For using this project we can reduce the man work and the fabrication effect and also reduce the effect of noise at the time cutting operation. The paper roll cutting machine the principal of paper cutting used in industrial application. Paper cut occurs when a piece of paper or other thin, sharp material. If we can use a loose paper sheet is usually too soft to cut, it can be very thin, being then able to exert high levels of pressure enough to cut.

**Keywords:** thin, sharp material, high level of pressure.

## 1. INTRODUCTION

Today engineers are finding many ways to reduce human efforts which ultimately save labor cost and valuable time. Raw materials to be used, it is necessary to cut them and then take for further operations. This cutting machine is therefore designed and developed for raw materials like solid or hollow metallic or non-metallic cylinders, bars of square or rectangular cross section, etc. The number of papers that are counted can be directly read on the Resettable count meter fixed to the frame stand. The paper cutting machine can be operated by using a permanent Magnet D.C motor. The machine is useful to count papers very accurately. The advantage of the machine is that it is portable and low cost machine.

## 2. LITERATURE REVIEW

Paper-cutting arts have been around as long as paper. Different cultures have different names for it, and different styles of execution. In Northern Europe, it is called scherenschnitte. German for "scissor cuts," it involves cutting symmetrical shapes or silhouettes out of paper and displaying them against lighter or darker color paper for contrast. Scherenschnitte is easier to do than it is to pronounce, so it can be an enjoyable craft for children and adult paper crafters who like to scrapbook and make cards and other paper creations. With practice, a skilled paper-cutting artist can make elaborate designs. Although paper cutting can be traced back to ancient China, credit is given to German immigrants in Pennsylvania for turning it into a popular folk art. In the 1800s, paper cutting was referred to as "scherenschnitte", which means "scissor cutting" or "scissor snipping" in German. Paper cutting involves making small cuts into paper to create designs. Artists often create visually elaborate designs that incorporate landscapes, flowers, trees, animals and hearts. Some basic techniques will get you started on paper cutting. The paper roll cutting machine the principal of paper cutting used in industrial application. Paper cut occurs when a piece of paper or other thin, sharp material. If we can use a loose paper sheet is usually too soft to cut, it can be very thin, being then able to exert high levels of pressure enough to cut.

## 3. OBJECTIVES

1. Reduction of lab our and material cost
2. Reduction of overall cost
3. Increased production
4. Increased storage capacity
5. Increased safety

6. Reduction in fatigue
7. Improved personnel comfort

## 4. METHODOLOGY

The modular method is employed with a design. The design involves two parts; the hardware and software parts.

### HARDWARE DESIGN:

The hardware part is designed to drive the DC motor for the required application in forward and reversed directions using wireless technology. The proposed system demonstrates a technology to rotate a squirrel cage induction motor in both clockwise and counter clock wise direction. It also has a provision to control the direction of the motor.

### SOFTWARE DESIGN:

The main purpose of using the microcontroller in our project is because high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the ATMEGA 328 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

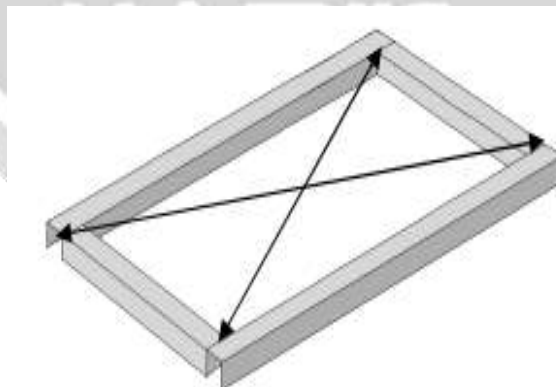
The programs of the microcontroller have been written in Embedded C language and were compiled using ARDUINO, a compiler used for microcontroller programming. The communication between PC and the microcontroller was established MAX 232 standard and those programs were also done in C language. The following programs are used at various stages for the mentioned functions. Serial communication in this program, the various special function registers of the microcontroller are set such that they can send and receive data from the PC. This program uses the serial library to communicate with the ports.

## 5. MANUFACTURING PROCESS

### 5.1 Structure Fabricating Process:

For structure fabrication we are using the c-channel of size 75 X 40 mm. The approximate wt. of it per meter is 6.8 kg. Steps in fabrication of structure are given below:

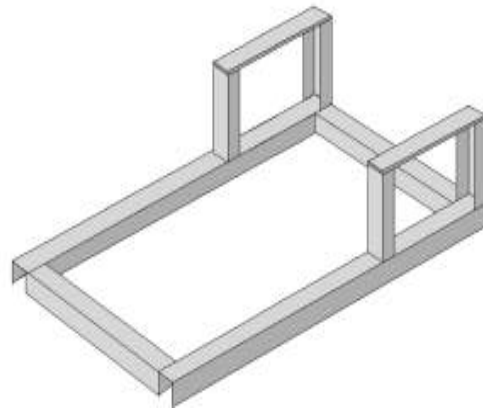
**Step One:** First cut the c-channel in pieces of length 71" (i.e. 6 feet – two pieces) and in 36" ( i.e. 3 feet – three pieces). Then Put the two lengths of 6 feet parallel to each other at a distance of 3 feet from each other. Then put the lengths of 3 feet on either end of two parallel lengths and weld them as shown below. The two diagonals Must be same.



**Fig.5.1.Step One**

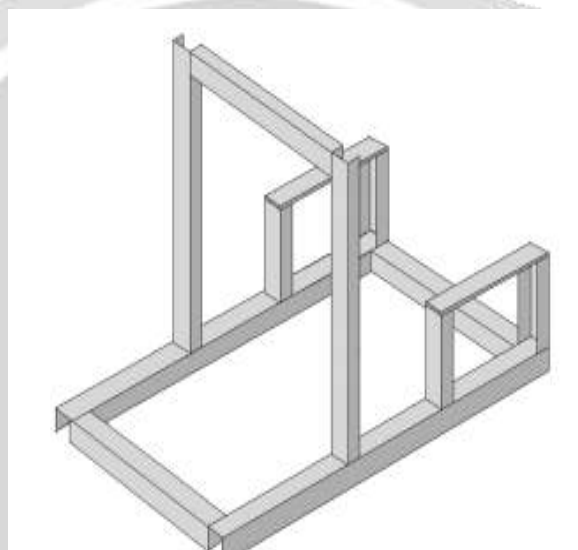
**Step Two:** Then cut four pieces of c-channel of length 24" (i.e. 2 feet) and weld two of them on one end of rectangular structure vertically using engineers block. Then weld remaining two pieces vertically at a distance of 30" from previous pieces.

**Step Three:** Then brought the two pieces of flat of size 75 X 12 X 760 mm and weld them on the top of four columns as shown.



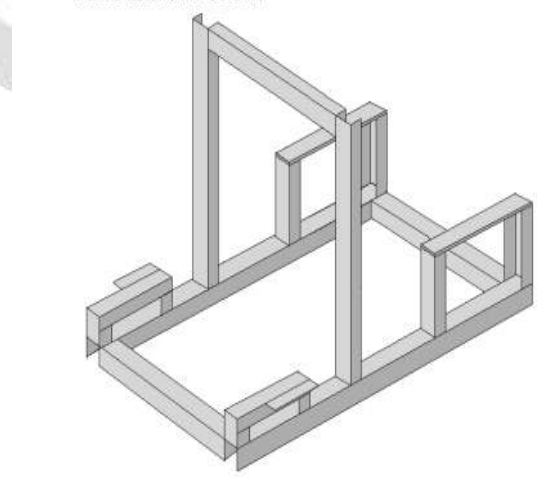
**Fig.5.2.Step Three**

**Step Four:** Then cut another two pieces of length 48” (i.e. 4 feet) and weld them vertically at a distance of 16” from previously welded columns. Afterwards weld the previously cut piece of 36” on top and in between the upper ends of these columns.



**Fig.5.3.Step Four**

**Step Five:** Then cut two pieces of c-channel of length 15”. and four pieces of 4” length. Then at a distance of 4.5” from nearest end weld them to form a frame as shown below.



**Fig.5.4. Step Five**

## 6. WORKING PRINCIPLE

In our project first of all the switch is turn on at that time the current flows from battery and passed to electric motor. Due to that current rotor arrangement of dc motor will rotate which produce rotating motion of the motor. Rack and pinion arrangement which is connected to dc motor will move forward and backward based on the rotation of dc motor. At the end of the rack and pinion arrangement a paper cutter blade arrangement is fixed for the purpose of cutting operation. continuous movement of motor will produce the cutting operation continuously The proposed system consists of fabrication system and PLC. Here PLC is the main controller which will accept the inputs from proximity sensor, and then take control action on the conveyor, fabrication and necessary cutting process assembly. fabrication : It is an assembly of pneumatic actuators integrated together with the help of mechanical assembly controlled through PLC via Solenoid valves. Pressurized air is supplied through air compressor

## 7. ADVANTAGES

1. Increased storage capacity
2. Increased safety
3. Reduction in fatigue
4. Improved personnel comfort
5. Fully automatic cutting
6. Equal length paper cutting
7. Small & portable machine

## 8. DISADVANTAGES

1. Compact size
2. Small size paper only cutting

## 9. APPLICATION

1. To prepare a sensor control circuit board.
2. To analyze the properties of the paper cutter.
3. Conducting the experiments with necessary equipment to study the performance characteristics paper cutter using the prepared PLC machine.
4. To compare the performance characteristics of PLC based paper cutting machine.
5. To prepare the manual frame box.

## 10. CONCLUSION

For cutting machine based on programmable logic controller based machine has got faster execution time and is more efficient in working along with safety measures to reject faulty material and ease in operation. Due to relay contactor logic more hardware is required as well wiring is more complex which has now been overcome by present programmable logic controller machine. The present system is superior in both performance and is more flexible in operation. Moreover, the running time has got shortened. Thus, desired requirement of customers has been fulfilled by this automation

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