

## **STUDY OF SMART THERMOCOL CUTTING**

**SanjivaniSangale<sup>1</sup>, Poonam Sangale<sup>2</sup>, Suhas Kale<sup>3</sup>, <sup>4</sup>S.R.Kale**

<sup>1,2,3</sup>*B.E. E&TC Scholar, PRES SVIT Nasik, India),*

<sup>4</sup>*Assistant Professor E&TC Dept., PRES SVIT Nasik, India*

### **ABSTRACT**

*As we know many cutting instruments are available in market for example radium cutting from that, we got the idea of our project i.e "Smart thermocol cutting". In this project PIC microcontrollers are done by every controlling action. PC is used for the interfacing of PIC microcontroller using USB connection. So this project is used for the cutting different shapes, alphabets, numbers etc. as per the program of PIC microcontroller. In this project the length and size of cutting parameter i. e number, alphabets, and shapes are changeable with the help of PC. Limit switch are used for the figure and shapes are cutting up to limit of work platform. There are three stepper motor are used for the control the three direction i. e X-axis, Y-axis and Z-axis. The thickness of thermocol is depend on the length of the cutter i. e heating rod.*

**Keywords – PIC microcontroller, Stepper motor, Pc, Relay, Limit switch, heating Rod, Isolator.**

### **I. INTRODUCTION**

This is a PIC microcontroller based device. The PC is interfaced with PIC microcontroller using USB connection. The program is fed to the PIC microcontroller. This program also stored in PC and is delivered to the cutter using PIC microcontroller. This system is two dimensions. There are three stepper motor used for the three axis. Each axis has separate stepper motor. The PIC microcontrollers send the data from isolation circuit, the isolator given the data stepper motor driver. The stepper motor driver are control the actions of stepper motor.[2][3]

The main purpose of relay is ON-OFF switch. The relay driver is used for the controlling relay. In this project the length, angle, diameter of shapes and figures are changeable using PC. The program is fed PIC microcontroller through PC, then it possible to change length, angle, diameter and size of shapes and figures.

### **II. LITERATURE SURVEY**

Our project is PIC microcontroller based thermocol cutter. In market radium cutting machine and CNC machine are available. The conveyer belt also used for the cutting purpose, using conveyer belt motor will rotate different direction .But , in our project metal is used for cutting is changed and speed of stepper motor also increases by changing step angle of stepper motor. This project is small size and cost also reduced. In this project PC is used for changing the radius, size, dimensions so no need of more skilled labor. [2][3]

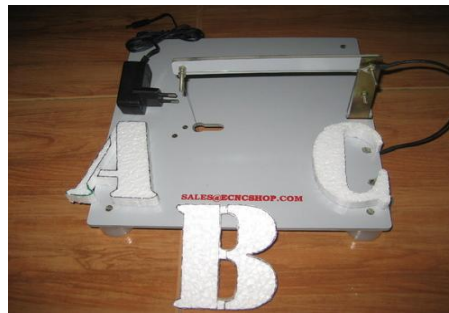


Figure 1: Manually Cutting.

### 3. MODELING AND DEVELOPMENT OF SYSTEM

#### 3.1 Block Diagram

The basic block diagram of the Smart thermocol cutting using PIC micro-controller is shown in fig 2. Mainly this block diagram consists of the following essential blocks: Power Supply, PIC18F4550 microcontroller, stepper motor, Isolator, Relay, Heating Rod, PC.

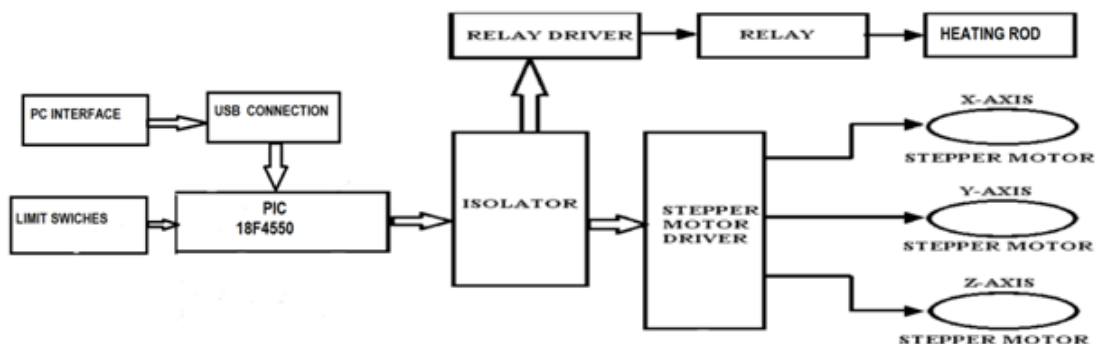


Figure 2: Block Diagram of system

##### 3.1.1 Power Supply

Linear regulated power supply, all the electronic circuit needs a dc voltage is derived from the single ac phase main supply. For this purpose we have to use a regulated dc power supply. The basic building blocks of regulated dc power supply are Step down transformer, Rectifier, Filter, Voltage regulator IC's, Load.

##### 3.1.2 PIC 18F4550 Microcontroller

PIC (Peripheral Interface Controller) is an 8 bit Microcontroller used in this system and it is the heart of the overall system. PIC18F4550 series controller used here seems to be efficient and cost effective for this Thermocol cutting system. The proposed design uses PIC micro-controller. It is a low power controller that provides support for high speed communications, with the ability to be programmed using different commands.[1]

##### 3.1.3 Stepper motor

There are three stepper motor used for the three different direction i. e X-axis, Y-axis, Z-axis. Each axis is control by a separate motor, for the up and down movement and linear movement. Stepper motor is a basically designed DC motor that can be driven by giving excitation pulses to the phase windings. They cannot be driven

by just connecting the positive and negative leads of the power supply. Two main part of stepper motora stator and rotor.

The rotor is made up of three components: rotor1, rotor2 and a permanent magnet. The rotor is magnetized in the axis direction so that, for example, if rotor 1 is polarized north, rotor 2 will be polarized. Magnetic pole: A projected part of the stator, magnetized by excitation, Small teeth: The teeth of the rotor and stator.

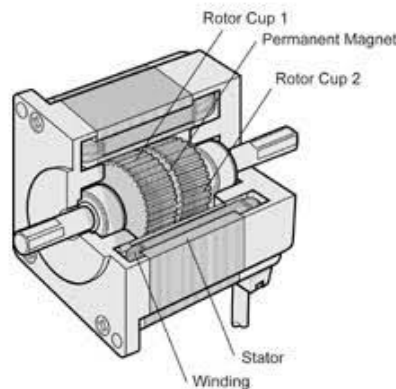


Figure 3: Stepper Motor

### 3.1.4 Relay

Relays are switches that open and close circuits electromechanically and electronically. Relay control one electrical circuit by opening and closing contacts in another circuit. As relay diagram show, when a relay contact is normally open(NO), there is an open contact when the relay is not energized.

A relay allow circuit to be switched by electrical equipment: for example, a timer circuit with relay could switch power at a present time. For many years relays were the standard method of controlling industrial electronic system.

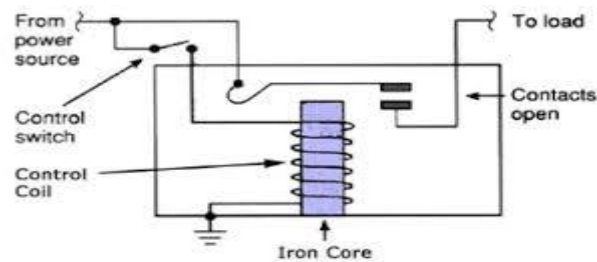


Figure 4: Relay

### 3.1.5 Heating Rod

A hot rod basically the soldering gun is used for the cutting purpose. This rod is heat in a particular temperature, then thermocol is not actually cut, but it is melted at a specified temperature.



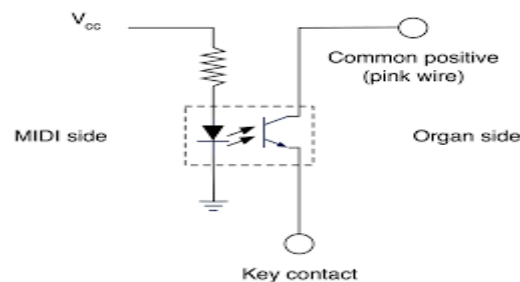
**Figure 5: Heating Rod**

### 3.1.6 Isolator

Isolator is used to isolate the circuit permanently after a fault. Circuit breaker is used to disconnect the circuit temporarily. In power systems an isolator is a switch is used to completely open a circuit which has been rendered dead by means of opening circuit breaker for maintenance of equipment. It can be visually seen that an isolator is open and hence service men are assured that it is a safe of work on the isolated equipment.

Isolators are devices they are auto-operated or manually in off load condition, mainly for maintenance purpose of a fault line. Circuit breaker trip during fault or heavy current flow in the transmission line. Isolator are used for the detect the any effect on the hardware circuitry.

An opto-coupler, also known as opto-isolator or photo coupler, is an electronic component that interconnects two separate electrical circuits by mean of light sensitive optical interface.

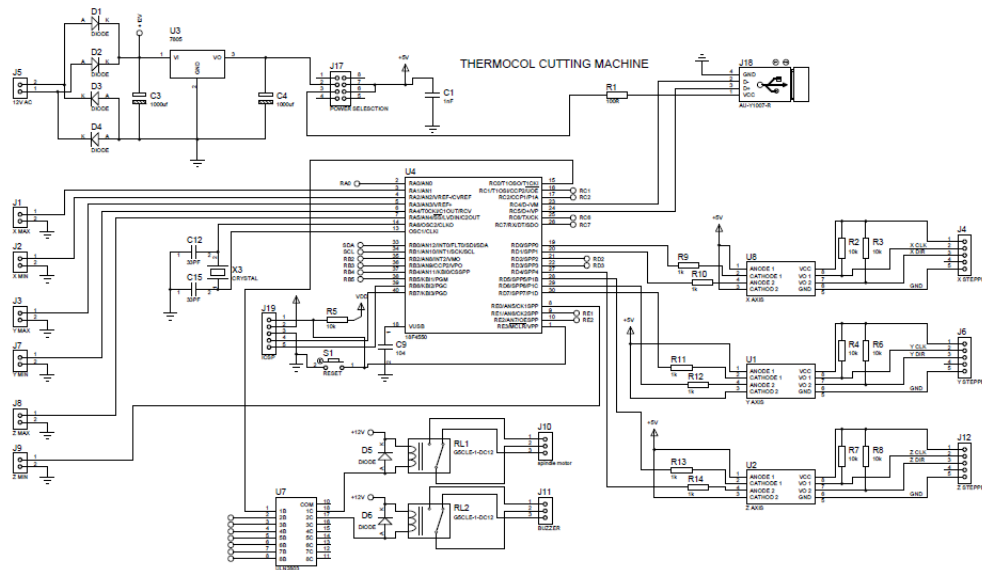


**Figure 6: Isolator**

### 3.1.7 PC

PC is interfaced with PIC microcontroller using USB connection. In PC the program is fed with PIC microcontroller .The size, length, diameter, of shapes and figures are change by using PC. In pc three software are used from that Coral draw, HPGL and G code convertor.By using three softwarethe cutting of thermocol is properly cut. This software are interface PIC microcontroller using PC.

### 3.2 Circuit Diagram



**Figure 7: Circuit Diagram**

### 3.3 Working

Circuit diagram is shown in above figure. In this circuit diagram 18F4550 PIC microcontroller is used. Stepper motor are used for the control the actions of movements. X axis and Y axis is used for up and down movement and Z axis is used for linear movement. Relay driver circuit to drive the gun lifting mechanism. The output of PIC microcontroller given to the motor. PC is interface with PIC microcontroller using USB connection.

### 3.4 Algorithm

The thermocol cutting follows a sequence as discussed above. The functions are as follows:

1. Start
2. Initializing the PC
3. Enter the character, number, shape, or figure to be cut
4. Enter the font size of character, number, shape or figure
5. Read the character from PIC microcontroller and display on the display
6. Turn on heater
7. if the cutting is over then turn off heater and motor also stop
8. After cutting is completed display the message on PC
9. if not completed then go to step no
10. Stop

### 3.5 Flowchart

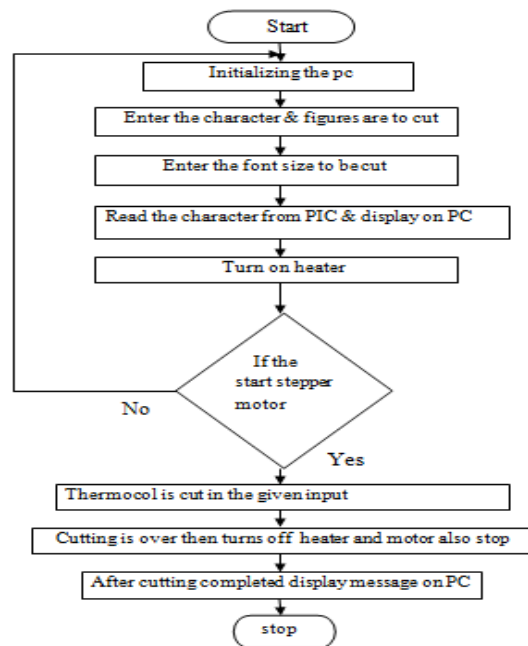


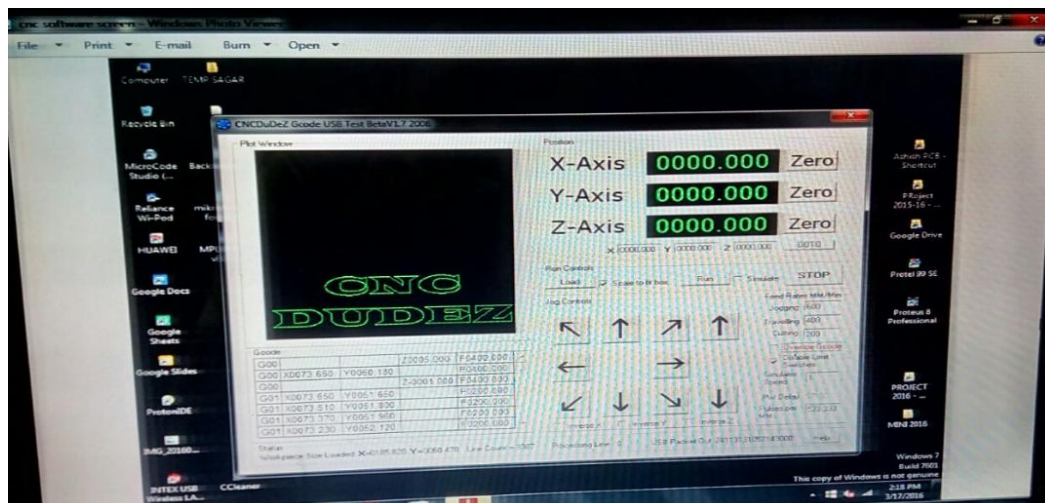
Fig 8: Flowchart

### IV. FUTURE SCOPE

In the future ,it will possible the image processing for cutting of different images.We can increase the platform area as per the requirement of the user.It can be possible cutting of the metal sheet and diamond.

### V. RESULT

From this project the cutting of thermocol at different axis shows the different values or rotational movement and the graph shown in image frequency of the rotation of changing stepper motor andThe final result shows on display.



## VI. CONCLUSION

This project is designed for the cutting purpose of thermocol with the help of PIC microcontroller. thermocol is used for decoration purpose, electrical application packing, road indicator etc. in this project stepper motor controlling the different axis. PIC microcontroller backbone of the hardware circuitry so all controlling actions done by PIC microcontroller

## REFERENCES

- [1] Muhammad Ali Mazidi, Janice Gillespie Mazidi, RolinD.Mckinly "The microcontroller and embedded system", person publication, 2008
- [2] Meng Chang Lau; Baltes J.; Durocher, S. Advanced Intelligent Mechatronics (AIM), 2012
- [3] TejalJagdale,Monikakirodiwal,fatemasheikh,PranamiSharma.Low cost thermocol cutter.IJETR,ISSN 2321-0869,Volume-3,Issue-4,April 2015.
- [4] <http://www.ustudy.in/node/7519>
- [5] <http://www.sparkfun.com/datasheet/Robotics/L298HBrid.pdf>