

AUTOMATIC TEMPERATURE CONTROLLER FOR VARIOUS APPLICATIONS

Professor.H. P. Thakre ¹, Akhil K. Gonde², Swapnil D. Balge³, Shubham D. Dhawale⁴,
Ashwin P. Waghade⁵, Akshay N. Sabal⁶, Prajkta K. Nagrale⁷

¹Professor H.P. Thakre, Electrical Engineering Department, Priyadarshini college of engineering, Nagpur, Maharashtra, India

²³⁴⁵⁶⁷Students, Electrical Engineering Department, Priyadarshini college of engineering, Nagpur, Maharashtra, India

ABSTRACT

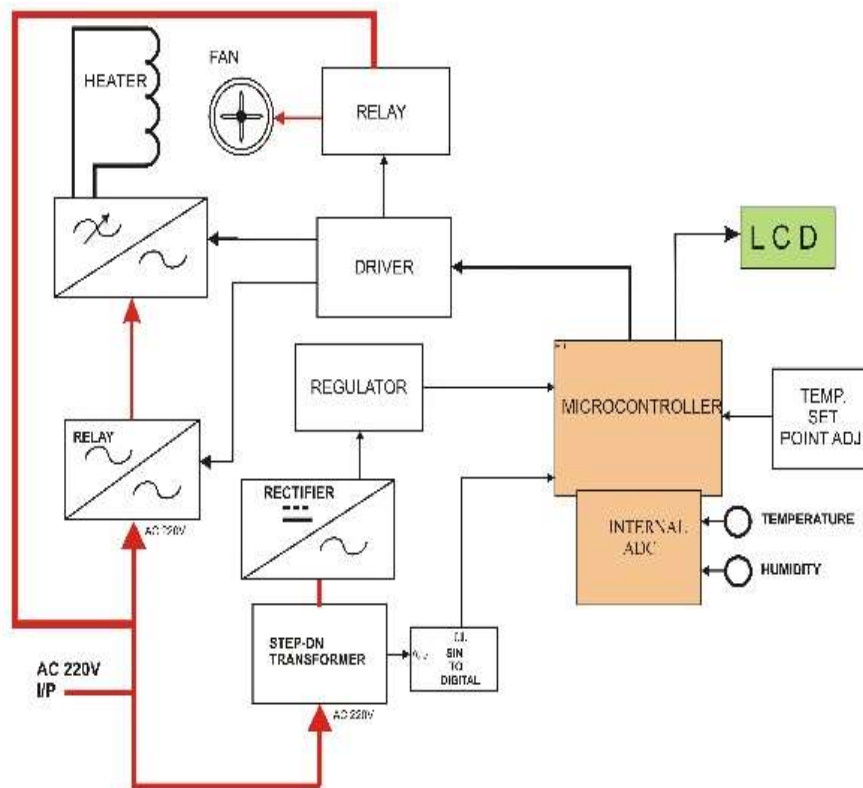
The objective is to design and implement an automated temperature control system using PIC microcontroller in order to control the temperature of system. As such, it is vital that those in engineering field understand the technologies associate with this area. This paper will include the design and construction of microcontroller – based automated temperature control system along with a temperature display using LCD. A working system will ultimately be demonstrated to validate the design. The system made is only a prototype. A large system can be made using this prototype as a model.

Keyword: Phase Angle Control, Triac, PIC Microcontroller, Opto Coupler, Heating Coil.

[1] INTRODUCTION

The concept of this paper is to create an automatic temperature control system to control the temperature of a system. This circuit maintains the temperature of the system in a particular range. Automatic control plays an ever-increasing role in human way of life. The problem of the precise control of temperature of liquid flowing through a tank containing heater is one which is important and familiar in the process-control industry. In rainy season, the most common problem is drying the clothes. Due to humidity it takes a long time for drying. During winter season, room temperature must be maintained in order to ensure the human convenience. This project mainly includes the temperature control of heater, temperature control of surrounding in winter, voltage control i.e. it works as stabilizer & also as dryer in rainy seasons. It consists of Temperature sensing unit, LCD module, switching device, driver, a fan and heater. It will operate based on the value or range of Temperature in the system which is detected by Temperature of the sensor. The Temperature sensor detect the temperature of the system. The Temperature sensor is connected to the ADC input of the PIC. It converts the analog input to digital value. The PIC is connected to a switching device relay. It is use to switch on the heater. The LCD module is also connected to the PIC microcontroller. The module display the current temperature. The LCD display used is a 16x2 Alphanumeric display. It is parallel LCD which is connected to the microcontroller I/O ports.

[2] BLOCK DIAGRAM:



[3] PRINCIPLE

This paper mainly includes a closed loop system in which the feedback element is the actual temperature of the heater that is to be monitored. On basis of this feedback, the temperature of the heater can be easily maintained within the required range. The basic of this project is to replace manual settings of fan in accordance with temperature so that it detects temperature variation automatically and control its speed. The application dictates that temperature settings are usually kept constant for long periods of time

[4] METHODOLOGY

The circuit present the design, construction, development and control of automatic switching electric fan and also automatic control of temperature of heater. The idea is based on the problem occurs in human's life now-a-days by improving the existing technology. The microcontroller (8051) based automatic fan system is applied to upgrade the functionality to embed automation feature. The electric fan will automatically switch on according to the environmental temperature change. The circuit is using a microcontroller to control the fan according to the temperature variations. The system measure the temperature from the integrated circuit, where it will control the fan according to the setting values in the programming.

Also the temperature of the system is measured using sensor. This value is provided to the microcontroller. The microcontroller then provide the signal increase or decrease the input voltage given to the heater coil such that the temperature of the hearter can be maintained within the required range.

(12VDC to 5VDC) The voltage regulator is designed to automatically maintain a constant voltage level, where they stabilize the DC voltages used by the processor and other elements.

Zero crossing detector:-

A zero crossing detector is a one type of voltage comparator, used to detect a sine waveform transition from positive and negative, that coincides when the i/p crosses the zero voltage condition. In alternating current, the zero-crossing is the instantaneous point at which there is no voltage present. In a sine wave or other simple waveform, this normally occurs twice during each cycle. It is used to create firing pulse to the TRIAC for positive and negative cycle.

Opto-coupler:-

An opto-coupler are designed to provide complete electrical isolation between an high voltage and low voltage circuits. It contain mainly two elements i.e. LED(Light emitting diode) & LDR(Light dependent resistor).

DRIVER:-

A Microcontroller digital logic output pin supplies only 10mA of current. External devices such as high-power relays can require >100mA and they need more voltages. In order to control such devices which use high DC current, a transistor-based driver circuit is used to amplify current to the required levels. If the voltage and current levels are in perfect range, the transistor acts like a high-current switch controlled by the lower current digital logic signal. It amplify the voltage from micro-controller i.e. 5V to 12V.

LCD :-

LCD (Liquid Crystal Display16*2) screen is an electronic display module and find a wide range of applications. In this project it is used to show temperature and humidity.

Thyristor/TRIAC:-

These are Static devices used to perform switching action . Here it is used to control voltage across heater (resistive coil) by applying firing pulse. Firing pulse is generate by micro-controller for particular voltage.

Relay:-

Relay is a switching device used to perform switching action. The relay before fan is used switching of fan .The relay before the Resistive coil(Heater) is use for protection of circuit from high and low voltages.

Potential Transformer:-

It is used to measure voltage towards Heater. If the voltage across heater is greater than the rated voltage then controller switch the relay and does not allow that voltage send to further circuit. Same action will takes place for low voltage instant.

Controller:-

In this project PIC micro-controller is used. PIC controller is cheap, fast and easy for programming than other contro

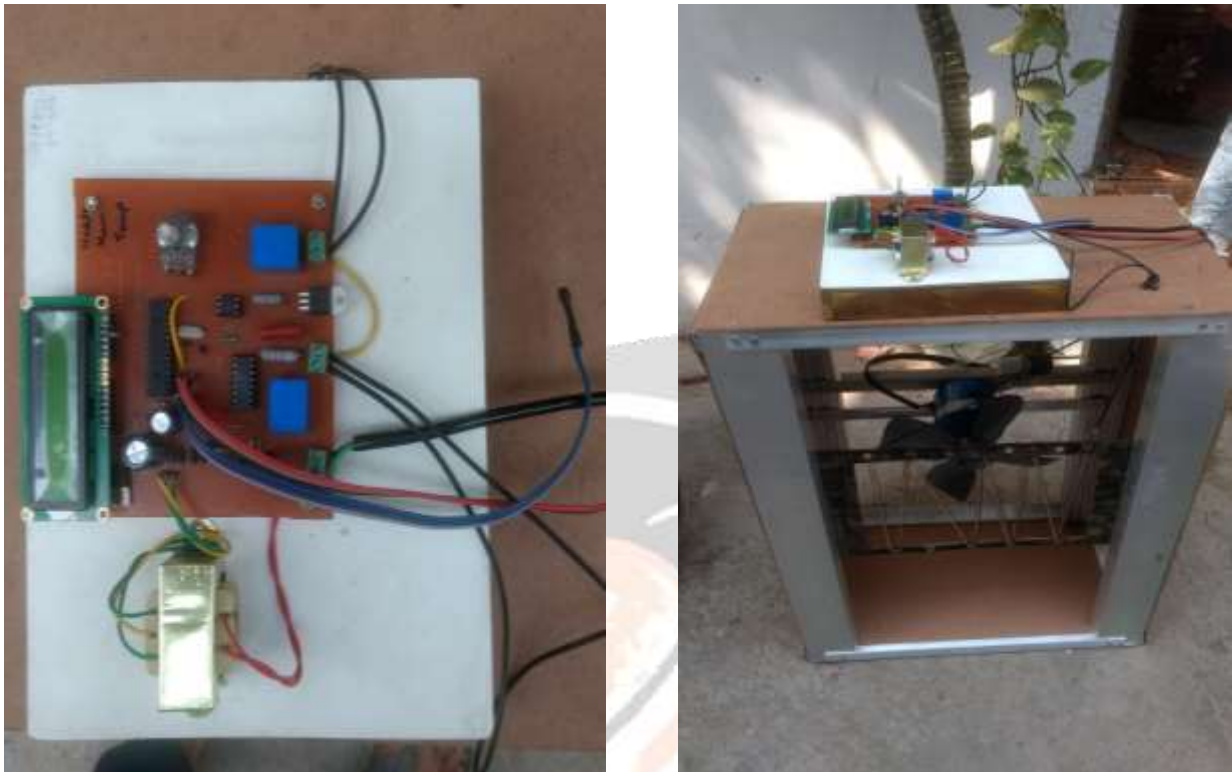


Fig : Hardware of controller

[7] APPLICATIONS

This project has wide range of applications such as, it can be used in electric furnace to control the temperature of the furnace to a required value. It can be used in food industry for humidity control in the storage cabinets.

This project also finds application in medical field, such as in baby incubators. It can also be used in seed testing for incubation.

Also it is used for maintaining the room temperature according to requirement.

[8] FUTURE SCOPE

Use as Heating purposes Drying purposes. As a stabilizer and also Speed control of a motor .The project can be enhance in future by increasing the number of exhaust fan; so it will help in industries and for medical purpose.

[9] CONCLUSION

Can be used in electric furnace and in food industry for humidity control also medical purpose- in Incubator. In seed testing for incubation Used for maintaining the room temp. according to requirement

REFERANCES

- [1] Madhukar S. Chavan, V.S.Suryavanshi&S.S.Sankpal, "AVR Microcontroller Based Temperature Control System," *IJARCSMS*, ISSN2321-7782, 2014.
- [2] AakankshaPimpalgaonkar, Mansi Jha, "A Precision Temperature Controller Using Embedded System" *IJSRPISSN* 2250-3153, 2013.
- [3] R.Suguna, V.Usha, Mr.S.Chidambaram "A temperature control by using PID based SCR control system" ISSN: 2278- 8735, 2014.
- [4] Tarun Kumar Das, Yudhajit Das, "Design of A room temperature and humidity controller using fuzzy logic" *AJER* ISSN 2320-0847, 2013.
- [5] B. Levarda& C. Budaciu, "The Design of Temperature Control System Using PIC 18F46201," *ICSTC*, PP 282-286, 2010.
- [6] M. Suruthi, S. Suma, "Microcontroller Based Baby Incubater Using Sensors," *IJIRSET*, ISSN 2319-8753, 2015.
- [7] I.G. Saidu& M. Momoh& A.S. Mindaudu, "Temperature Monitorig& Logging System Suitable for Use in Hospitals, Incorporating GSM Text Messaging," *IJIST*, 2013.
- [8] Gaurav S. Ashara, Dipesh S. Vyas, "Design and Simulation of Temperature Control of Chamber Based on Automatic Fan Speed Conrol," *IJAERD*, ISSN 2348-6406, 2015.