Speed control of 230v ac motor using Thermistor

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Abstract: *Aim of the project is to control the speed of the ac motor using thermistor. Over the time, advancements in electronics have made devices faster, cheaper and smaller. This project is to control the speed of the motor, based on the temperature sensor. It can also be used in home application where the speed of fan will increase gradually as the temperature increases.*

The thermistor used in the circuit decreases its resistance with increment in temperature of the surroundings. Hence the electrical conductivity also increases which results the increase in voltage across the circuit. This increased voltage will increase the speed of the motor according to the program dumped in microcontroller.

Generally, we need regulators to increase or decrease the speed of the fan according to variation in the temperature, it requires a lot of efforts to regulate the fan speed. In order to reduce the efforts and to add comfort this method of speed control can be used. The same principle can also be used in the exhaust fans where the temperature rises, like in mega kitchens, exothermic labs, etc.

*Key Words***:** Thermistor, Temperature, Speed, Motor, Resistor, Microcontroller

1. Introduction

The purpose of the project is to validate an alternating current electric motor to automatically change the speed according to the change in temperature.

The circuit explains the property of sensor to operate ac motor. A sensor is basically a form of transducer, which is a device used to convert energy from one form to another. Thermistor is a type of resistor that depends upon temperature. In order to achieve the higher precise value,

a thermistor should be used within the range [-90 Degree C to 130 Degree C]. These are basically of two types:

1. Negative Temperature Coefficient (NTC)
2. Positive Temperature Coefficient (PTC)

Negative Temperature Coefficient Thermistor increase its resistance when the temperature decreases and vice versa.

Positive Temperature Coefficient Thermistor increase its resistance when the temperature increases and vice versa.

2. Components Used

1. Power Supply (230V, 5V)
2. LCD (16X2)
3. Optocoupler
4. TRIAC
5. LED
6. Thermistor
7. Resistors (470E,2.2K,10K,1K)
8. ATMEGA328
9. Motor (230V, AC, 0.5HP, 750RPM)
10. Arduino

3. Working

1. GENERATION OF 5V DC FROM 230V AC

Generally, we use 230V AC supply but a lot of electronics devices used in this project works at 5V DC. So the first step is to convert 230V AC to 5V DC. Steps to convert 230V AC to 5V DC is as follows

A. Step down voltage by using step down transformer
B. Bridge rectifier (AC to DC)
C. Filters used to smooth the ripples
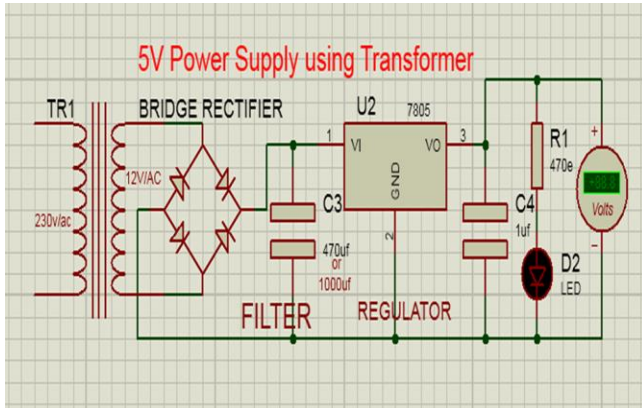D. 12V DC to 5V DC using Voltage regulator 7805.

Fig -1: Conversion of 230V ac to 5V dc

2. CONNECTION OF 5V SUPPLY TO MICROCONTROLLER AND LCD

Microcontroller and LCD both works on 5V DC supply. Microcontroller detects the change in voltage and generates PWM accordingly.

A 16X2 LCD is used here to display the speed of the motor and temperature detected by the thermistor.

3. 230V AC IS GIVEN TO 230V INDUCTION MOTOR. (POWER CIRCUIT)

Induction motor needs 230V AC supply to run on the full speed (750 RPM), to control that speed a control circuit is required to control the speed of the motor.

4. OPTOCOUPLER AND TRIAC ARE CONNECTED TO MOTOR (CONTROL CIRCUIT)

Optocoupler is used to transfer electrical signals between two isolated circuits by using light. It prevents the components that works on low voltage values from the higher voltage values. Basically, it isolates the two circuits physically.

TRIAC is a semiconductor device used to control power and switching purpose. Here it is used to control the speed of the motor.

5. THERMISTOR AND RESISTOR (10K) CONNECTED TO ADC PIN OF MICROCONTROLLER.

A thermistor and resistor is connected so as there is change in voltage at the ADC pin according to the voltage division rule.
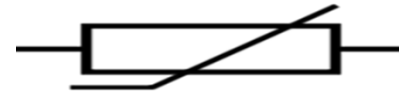

Fig -2: Thermistor

4. Application

1. Industrial application for the use of cooling purpose.
2. Can be used in mega kitchens for cooling purpose.
3. Can be used in domestic fans to automatically adjust the speed according to temperature.

5. Future scope

The developed control approach is not only simple but also genuine and may be easy to apply in real-time applications.

Programming can be done according to the requirement of the application.

Simple tempering in the project will make it to use in homes and industry as well.

6. Result

The speed of the motor gets increase as the temperature of the surrounding increases and vice versa. The characteristics of temperature and speed is being recorded.
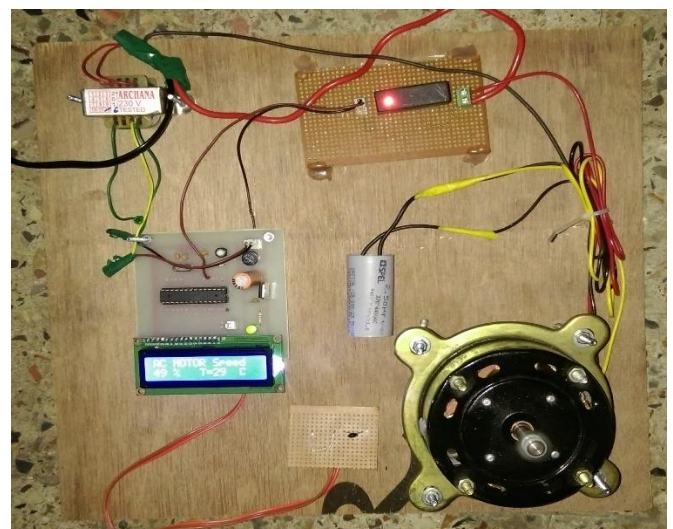

Fig -3: Working model of speed control of 230v ac Motor using thermistor

7. Advantages

1. Easy to operate.
2. Increase comfort level.
3. Can be easily adjusted according to required conditions.
4. Smaller size.

8. Conclusion

The accomplishment of the model using a power electronic circuit that works on the operation of thermistor has been done.

The graphical representation has been done between the values of temperature of the surrounding and the speed of the motor.in this case the speed of the motor increases with the increase in temperature.
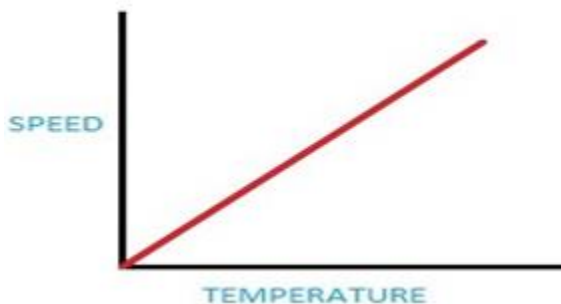

Chart -1: Temperature vs Speed Curve

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[3] International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 International Conference on Industrial Automation and Computing (ICIAC-12-13th April 2014) Jhulelal Institute of Technology 29 Chaitanya N. Jibhakate, Asstt. Prof.(Mrs.) Vijaya Huchche (Department of Electrical Engineering Shri Ramdeobaba College of Engineering & Management Nagpur Maharashtra, India Email: chaitanya.n.jibhakate@gmail.com) (Department of Electrical Engineering Shri Ramdeobaba College of Engineering & Management Nagpur Maharashtra, India Email: vijaya.huchche@gmail.com

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