



IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 Issue: VII Month of publication: July 2016 DOI:

www.ijraset.com

Call: 🛇 08813907089 🕴 E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Design and Implementation of Microcontroller Based Motor Controller with Temperature Sensor

S. Nicklesh¹, Dr. S. PalaniKumar², Mrs. M.Priya³ M.E PED Design, Shreenivasa Engineering College

Abstract: The objective of this project is to reduce the unwanted power used in electrical equipment's for sensitive, less tolerant and power loss problems. This Project presents the design and simulation of a motor speed control system, based on temperature using Pulse width Modulation Technique and to improve the usage of power and to increase the life time of electrical machines. In such case, the motor will be controlled by a temperature sensor based PIC Microcontroller. Motor can be adjusting by the speed, based on ambient temperature. By the setting value of temperature, speed of the motor varied (real time applications). It reduces the machine speed so automatically unwanted energy usage reduces up to 20% of energy approximately. In such case, the unwanted energy will be saved. The simulation of the system has been done and simulation output taken based on Proteus and Lab view software.

Keywords : Maximum Power Point Tracking (MPPT), Variable Voltage Variable Frequency (VVVF), Pulse Width Modulation (PWM), Resistance Temperature Devices (RTD), Pulse Width Modulation (PWM)

I.

INTRODUCTION

Aim is to design a microcontroller based induction motor controller with heat sensor. This design is mainly applied to a 1phase induction motor which will function automatically in adjusting the speed according to the ambient temperature. This design is mainly applied to a motor/fan which will function automatically in adjusting the speed according to the ambient temperature. Besides that, it is also said to be more energy saving as the speed of the motor depends on the ambient temperature based on the system and hence no extra power is needed to drive the motor at higher speed which is not necessary at low ambient temperature. The design is expected to be simple yet can be functional. In order to accomplish this aim, there are several objectives to be achieved.

Induction motors are the most widely used motors for in most Powered home Appliances. Simple and rugged low cost, design, low maintenance and direct connection to an AC power source and the main advantages of an AC induction motor. When power is supplied to an induction motor at recommended specifications, it runs at its rated speed. However, many applications need variable speed operation. One of them is a fan. This report presents a design Of a Pic Microcontroller ATMEGA328P Based Motor Controller with Heat Sensor which is used to vary the speed of a motor.

The Microcontroller Based Motor Controller with Heat Sensor project aims to design a controller that varies the speed of the motor with respect to the ambient temperature. This controller will be embedded as an addict ion to a stand motor. The speed of the motor is expected run in low speed at low ambient temperature and vice versa. A phase control method is chosen to be used for this design. The power delivery to the motor is controlled by the firing angle of a Triac where it will control the AC power supply. When the ambient temperature is sensed, temperature sensor produces an output voltage to the microcontroller.

The microcontroller acts as a digital signal processing (DSP) body where it will convert the analogue voltage into digital form and compare with the pre-set values. After that, it generates a signal and sends it to trigger the triac. The triac is used to control the switching the phase control circuit and hence, the firing time of the Triac can be controlled.

With the controlled of firing time of the Triac, the input power to the motor can be controlled as well. Besides that, a circuit is also included in this project. The circuit acts as a switch to activate or deactivate the motor. This motor will be speed controlled based on PWM technic. In this method to controlled unwanted energy will be consumed.

II. SYSTEM MODEL

The fig 2.1 showing of proposed system shown below. In this method the induction motor speed changes, based on temperature. In the proposed system, the input reference temperature is given to microcontroller, the controller programming to base on reference temperature. The controller can be changed the speed of motor.

Volume 4 Issue VII, July 2016 ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)



Fig 2.1 System Block diagram

As discussed in the earlier section, the speed of a stand fan is independent of the ambient temperature; hence there will be wastage of power. Besides that, each motor has its own lifespan. The lifespan of a stand fan motor is the total number of revolution made. As the motor speed does not change with the ambient temperature, there might be extra revolution (high speed in low ambient temperature) and hence the lifetime of a motor will be shortened. This project consists of several steps. First is to set the desired highest and also the lowest temperature and some of the preset values into the microcontroller. Next as the system is on, the ambient temperature will then be sensed by the temperature sensor. The output of the sensor will then feed to PIC Microcontroller.



2.2 Circuit diagram

The PIC Microcontroller will generate the desired output signals which are correspondent to the difference ambient temperatures by comparing the output voltage from the temperature sensor with the preset values. These output signals will then be sent to the firing angle control circuit to trigger certain relay to control the firing angle of the Triac. Therefore, the average power supply to the motor will be varied; hence, speed of the motor can be controlled. This project will be improving the speed controlling of induction motor this method we are implementing temperature sensor used to regulate the speed based upon various industrial applications. This controlling using temperature based speed changing of induction motor. So speed will be decreases based of power consumption will be increased so the cost of unit is reduced and life time of motor is increased

III. SOFTWARE SIMULATION AND RESULT

The software simulation result will be shown in fig 3.1. This system can be controlled a single controller it can controller can











B. Wave form for 50 °C





PWM technic used to controlling the speed of the motor. In AC motor can get the pulse signal in ATMEGA controller pin no 5. That PWM pulse given to opto-coupling unit that opto-coupling unit convert light energy. The pin no 1,2 is incoming LED unit .The light can ON/OFF based on digital Pulse. The output of opto-coupler is connected internally one LDR unit .that LDR works the light ON the LDR resistance is Low .So current passing to trigger the Triac gate to turn ON the Triac. Pulse not came the LED not ON, and then LDR resistance is very high so current not passing to the Triac circuit so Triac is not triggered then motor is not on.

DC motor that pulse given to Driver IC. The driver IC externally +5V Power given that pulse based the Voltage of Motor is adjusted automatically. That driver circuit automatically reducing voltage based upon the PWM technic to controlling the speed.

IV. APPENDIXES

PIC MICROCONTROLLER ATMAL EMBBED C CODE

#include <LiquidCrystal.h>

www.ijraset.com IC Value: 13.98 Volume 4 Issue VII, July 2016 ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

```
LiquidCrystal lcd(12,13,8,9,10,11);
int previous_temp,current_temp;
int temp,temp1;
int temperature=A0;
int motor=3;
void setup()
{
pinMode(temperature,INPUT);
pinMode(motor,OUTPUT);
lcd.begin(16,2);
lcd.setCursor(0,0);
lcd.clear();
analogReference(EXTERNAL);
}
void loop()
{
temp_calc();
lcd.setCursor(0,0);
lcd.print("TEMPERATURE:");
if(previous_temp<100)
lcd.print(0);
if(previous_temp<10)
lcd.print(0);
lcd.print(previous_temp);
if(previous_temp<25)
analogWrite(motor,previous_temp*2);
}
void temp_calc()
{
 previous_temp=0;
 for(int i=0;i<5;i++)
 {
  temp=analogRead(temperature);
  temp1=map(temp,0,1023,0,500);
  current_temp=temp1;
  if(current_temp>previous_temp)
  {
   previous_temp=current_temp;
   }
   }
  }
```

This code in Embedded C Language it will be converted into hexa File using Arduino software and upload the hexa code to that ATMEGA 328P IC chip

Volume 4 Issue VII, July 2016 ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering

Technology (IJRASET)

v.

HARDWARE AND RESULT



5.1. Block diagram hardware kit

A. Motor Rating

www.ijraset.com IC Value: 13.98

Dc Motor:	Range: 12 to 24 V Dc	, Rpm :- 110 rpm
Ac Motor:	Range: 230V AC/50 Hz	, Rpm :- 1200 rpm



5.2 Triac and Opto-coupler units

www.ijraset.com IC Value: 13.98 International Journal for Research in Applied Science & Engineering

Technology (IJRASET)

B. Calculation Temp :- 25 ° C Ac/dc Motor Off condition Temp :- 35 ° C Ac Motor :- motor run at 205rpm Dc Motor :- motor run at 40rpm Temp :- 45 ° C Ac Motor :- motor run at 435rpm Dc Motor :- motor run at 65rpm Temp :- 55 ° C Ac Motor :- motor run at 620rpm Dc Motor :- motor run at 73rpm Temp :- 65 ° C Ac Motor :- motor run at 825rpm Dc Motor :- motor run at 85rpm Temp :- 75 ° C Ac Motor :- motor run at 1170rpm Dc Motor :- motor run at 96rpm Temp :- above 75 ° C Ac Motor :- motor run at 1200rpm Dc Motor :- motor run at 110rpm

C. Tabulation

TEMPERATURE	DC MOTOR SPEED (RPM)	AC MOTOR SPEED (RPM)
BELOW 25°C	0	0
35°C	40	205
45°C	65	435
55°C	73	620
65°C	85	825
75°C	96	1170
Above 75°C	110	1200

5.3 Temperature Vs AC/DC Motor (RPM)

VI. CONCLUSION

A Project design speed control of Motor based on temperature using PWM technique is proposed in this paper. The simulation of the system is working properly and the design is appropriate according to the modern needs and technology. The speed of Motor depends on the temperature and there is no need for regulating the speed manually. Various graphs have been plotted to show the varying relationships between different parameters. PWM technique is found to be appropriate for controlling fan speed according to temperature.

www.ijraset.com IC Value: 13.98 Volume 4 Issue VII, July 2016 ISSN: 2321-9653

International Journal for Research in Applied Science & Engineering

Technology (IJRASET)

REFERENCES

- [1]Vaibhav Bhatia EEE., Bhagwan Parshuram Institute of Technology, New Delhi, Room Temperature based Fan Speed Control System using Pulse Width Modulation Technique.
- [2]Shilpa V. Kailaswar, Prof. R.A.Keswani , Speed Control of Three Phase Induction Motor by V/f Method for Batching Motion System.
- [3]Padmaraja Yedamale, Speed Control of 3-Phase Induction Motor Using PIC18 Microcontrollers, Microchip Technology Inc.
- [4]M.Deepa, Department of Mechatronics Engineering, Bharath University, Design of VFD Drive for a 3-Phase Induction Motor
- [5]Rockwell Automation. (June 2000). AC Drives Using PWM Techniques. USA: DRIVES-WP002A-EN-P.
- [6]Sajed K. Abed & M. S. Khanniche. (1995). A Microprocessor-Based Induction Motor Drive System Using Sliding Mode Control. IEEE IECON 21st International Conference, 1, 530 535.
- [7]Minas, G., Martins, J.S. & Couto, C. (1999). A Microcontroller Based Voltage Space Vector Modulator Suitable for Induction Motor Drive. IEEE International Symposium, 2, 469 – 473.
- [8]Yashvant Jani, 2000. Implementing Embedded Speed Control for AC Induction Motors.
- [9] Zhong, H.Y., Behera, A.K., & Rashid, M.H. (1991). 8096 microcontroller based Field acceleration method control for induction motor with new digital PWM Inverter technique. Conference Record of the 1991 IEEE, 2, 1662-1668.
- [10]Howard Abramowitz, 2003. Phase-Control Alternatives for Single-Phase AC Motors Offer Smart, Low-Cost, Solutions. Power Systems World 2003
- [11]Seyi Stephen OLOKEDE, 2008. Design of a Clap Activated Switch. Leonardo Journal of Sciences ISSN 1583-0233
- [12]Ahmed A. Mahfouz, Gamal M. Sarhan & Abdel-Nasser A. Nafeh. (17 November 2004). Microcontroller implementation of direct torque control. INTERNATIONAL JOURNAL OF NUMERICAL MODELLING: ELECTRONIC NETWORKS, DEVICES AND FIELDS, 18, 85 – 94.
- [13]Aung Zaw Latt & Ni Ni Win. (20 April 2009). Variable Speed Drive of Single Phase Induction Motor Using Frequency Control Method. ICETC '09. International Conference, 30-34.
- [14]Cuauhtemoc Medina, 2008. Ceiling Fan Speed Control. Free scare application note.
- [15] Jianming Yao, 2000. Single Phase Induction Motor Adjustable Speed Control Using DSP and Microcontroller. UW-Madison.











45.98



IMPACT FACTOR: 7.129







INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 🕓 (24*7 Support on Whatsapp)