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MICROCONTROLLER BASED ON INDUCTION MOTOR CONDITION MONITORING AND CONTROL

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ABSTRACT-*This project is done for monitoring and controlling of three phase induction motor. It is necessary to monitoring the condition of induction motor to get better efficiency and output. Hence, we monitoring the condition of motor such as speed, direction, voltage, current, frequency and temperature. In addition to this we use modern technology which is GSM model(Global Sim Modulation) and Theft Detection technique. For Protection of induction Motor Microcontroller based system is proposed which plays major role than other technique.*

Keywords*: PIC16F886 microcontroller, SIM800C, GSM, Induction Motor, LCD*

I. INTRODUCTION

Circuit Condition monitoring means the process which is done before any failure occur induction motor. Induction motor is reliable ,robust ,simple in construction and less expensive. Due to this it is used in industrial applications.

This project is done for monitoring and controlling of three phase induction motor . It is necessary to monitoring the condition of induction motor to get better efficiency and output. Hence, we monitoring the condition of motor such as speed, direction, voltage, current, frequency and temperature. In addition to this we use modern technology which is GSM model(Global Sim Modulation) and Theft Detection technique. For Protection of induction Motor Microcontroller based system is proposed. Various types of motor condition is monitored by using microcontroller which plays major role than other technique. one more advantage of this technique is, it require less interaction of human body. Microcontroller based protection is better than any other computer and classical techniques. So we use PIC16F886 microcontroller.

II. SYSTEM STRUCTURE

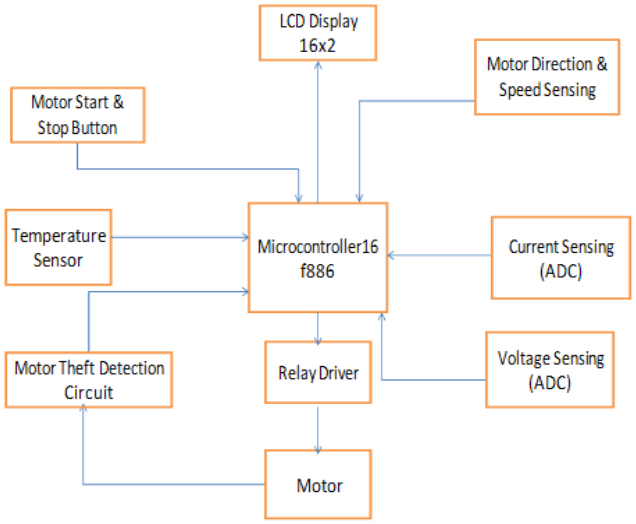


Fig 1 System Architecture

LCD interfacing with microcontroller- LCD consist of 16 pins out of them 8 pins are data lines from D0-D7 but here is 4 bit mode is used sofrom D4-D7 data lines is connected to RC0-RC3 i.e. Pin11-Pn14 of PIC microcontroller 3 pins is a control pins i.e. RS, R/W & E. RS is register selecting pin which is connected to RC4 Pin 15, R/W read and write pin and E is a enable pin Which is connected to RC5 pin 16 of PIC Microcontroller and GND is ground and VCC for power and resistor is connected to contrast control pin to increase and decrease brightness of display and LCD positive and LCD negative is for backlight LED's

LM35 interfacing with microcontroller-LM35 Temperature Sensor is used 3 no leg of LM35 is connected to ground,1 no leg is connected to 5v but there is one 1k resistor of strong pull up used. 2 no pin is connected to output and 3 no pin is connected to GND and output of this is given to ADC Theft Detection Circuit interfacing with PIC Microcontroller- pin of PIC Microcontroller i.e. pin no 7 in this analog input is converted into digital output. Coil having particular resistance which is 30 ohm, 15 ohm, or below 30ohm. We have measure resistance of coil which is 30 ohm which is measured with the help of microcontroller through giving square wave pulse Voltage drop is measured through V=IR formula R15 IS 100K resistor and input of this is given to RA pin of PIC Microcontroller theft detection part is same as a relay section

Voltage ADC Circuit interfacing with PIC Microcontroller-1 Megha ohm resistor is used and input gives 440v At J3 R phase is connected to pin 1 and B phase is connected to pin2. R12 and R11 is used as voltage divider analog voltage is obtained which is given to ADC pin of PIC Microcontroller. in which analog input is converted into digital output.By voltage circuit frequency is sensed and output of voltage circuit is AC because bridge is absent

Current ADC Circuit interfacing with PIC Microcontroller- At J1 i.e. between pin 1and pin 2 we connect current transformer and Diode D15,D6,D7And D8 are bridge rectifier which convert AC to DC.C10 is 100microFarad capacitor is used.R1 And R2 220 ohm resistor is used which work as voltage divider and R3 is 10 k which is pull down resistor when CT is not connected. Input of this is given to ADC pin of PIC Microcontroller. in which analog input is converted into digital output.

Proximity Sensor Circuit interfacing with PIC Microcontroller- PNP Proximity sensor is used. It has 3 pins pin 1 is connected to 5v i.e. vcc , 2 pin is connected to GND, 3 pin is PNP output When obstacle part is present at front of it then PNP is activated In this R17 And R18 is used as pull up. Pull up means when pin is not connected to anything then itgives +5v output (VCC).

Power Supply Circuit- In power supply D1,D2,D3 And D4 (1N4007) Diodes is used.C1capacitor 470 microfarad 35 v is connected to input of 7812 to maintain voltage 7812 which gives 12 v regulated supply

7805 which gives 5 v regulated supply For positive supply we use 78series and for negative we use 79 series. In this we connect filter capacitor C2 And C8 are 4,17& 10 microfarad capacitors.

Diodes is used as bridge (full wave bridge) Rectifier input of this given to input of 7812 which gives 12 v At J2 transformer is connected because it require 18v supply

SIM800C & GSM Circuit interfacing with PIC Microcontroller- For sim and microcontroller communication UART protocol is used. UART means universal asynchronous receiver transmitter. It consist of sim card holder in which 51 ohm resistor is used it directly connected to SIM 800c ICCapacitor used in pikofarad, high pass filter is used. Maximum voltage require is 4.4 v and minimum voltage is 3.1v We gives operating voltage range 3.3 to 4.1 v to manage 4.1v separate power supply is used.

Relay Circuit interfacing with PIC Microcontroller- 12v/5A Relay is used transistor (BC547) (NPN).Base of the BC547 is connected to the digital pin of the microcontroller through 14 res. If 5v is provided to base of the Bc547 From micro then coil (2) is sinked to the ground so voltage betweencoil 1and coil 2 becomes 12 v and relay common to NC Pin gets Shorted. R26 is connected to pin 28 i.e. RB7 pin of PIC Microcontroller which gives digital output i.e. 0 or 5v BC547 has 3 pins base emitter and collector if we give voltage more than 0.7 v to base then transistor is activated. And current start flowing from collector to emitter i.e. pin 1-3 when ground connected to relay, relay starts hence magnetic coil is present in relay is activated and normally close which becomes normally open contact. Here we are using two relay because in starter there is link is present hence we disconnect link in starter and we use relay to start and stop whenever we need. And second rely work as a starter and this relay is connected to PIC Microcontroller.

III. HARDWARE DESIGN

Three Phase Induction Motor

Fig 2 Induction Motor

In this project we are using 3phase 415v, 2820 RPM , 0.75H.P ,2.0A star connected Induction motor is used because it is simple, robust and less expensive and it is widely used in industry.

Relay (12v/ 5A Sugar cube)

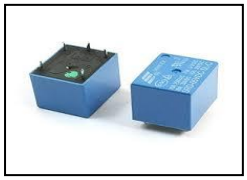


Fig 3 Relay

Relay used here is 12 v/ 5amp. Coil pin 1 of the relay is connected 12v directly and coil pin 2 is connected to the collector of the transistor (BC547) NPN. Base of the BC547 is connected to the digital pin of the microcontroller through 1K resistor. If 5v is provided to base of the BC547from microcontroller then coil 2 is sinked to the ground so voltage between coil 1 and coil 2 becomes 12v and relay common to NC pin gets shorted.

7805 & 7812 Voltage Regulator

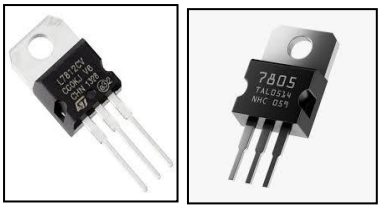


Fig 4 voltage Regulator

7812 AND 7805 Voltage Regulator is used in our project 7812 is used for 12 v supply and 7805 is used for 5v supply. We require positive supply hence we used here 78 series if we require negative supply then 79 series is used.

LM35 Temperature Sensor

Fig 5 LM35 Temperature Sensor

For Temperature sensing we are using LM35 Temperature Sensor. Because output of this is an analog signal is proportional to the temperature which is instantaneous LM35 does not require any external calibration.

BC547 NPN Transistor

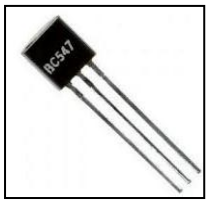


Fig 6 BC547Transisitor

BC547 NPN Transistor has two working states forward biased and reverse biased. In forward biased to allowing current pass through the collector and emitter is connected to it and in reverse biased this transistor works as a open switch and current is not flowing through it.

Proximity Sensor

Fig 7 Proximity Sensor

We have measured pulses using proximity sensor over one second time period. So to convert it to RPM we have multiplied the count we got from sensor by 60

Count x 60 = RPM Rev/ Min

Second proximity sensor is used to determine direction of the motor. If sensor 1 is leading then direction of motor is clockwise and if sensor 1is lagging behind the sensor 2 then direction of motor is anticlockwise.

PIC16F886Microcontroller

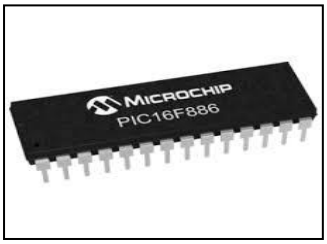


Fig 8 PIC886 microcontroller

This type of microcontroller is easy for programming . It has 28 input and output pins. Its features is 256 bytes of EEPROM data memory. It consist of 10 Bit Analog to Digital Convertors.

RESULT

Fig 9 Motor starting

After giving power supply through relay to motor motor will start after 005 sec time delay.

Fig 10 Motor Turn on

When we give power supply then their will be 30 sec starting delay motor will turn ON then message will display on LCD.

Fig 12 Motor connected

After 2sec of delay motor is connected will displayed on LCD

Fig 11 Motor Direction

After 3 sec of delay direction of motor will displayed on LCD

Fig 12 Motor Temperature

After 2sec of delay temperature is displayed on LCD

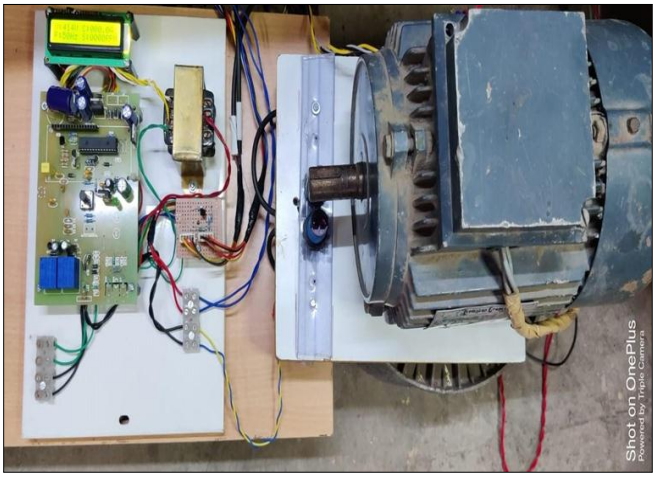
Fig 13 Motor current, voltage, frequency, speed

After 2sec of delay voltage, current, frequency, speed is displayed on LCD

Fig 14 Motor Disconnection

When wire connection is disconnected or anyone trying to theft the motor by cutting cable then it will shown on LCD display that motor is disconnected

FINAL WORKING MODEL



ADVANTAGES

- Availability more
- We can control the device easily by sending sms and signals.
- More effective.
- Cheaper cost and easy to exchange.
- High accuracy
- When manually operated there are more chances of errors so automation helps in less humanerror.
- It is reliable as it is automated

DISADVANTAGES

- Three Phase supply is not easily available to normal consumers.
- Due to increase in heat motor winding will burned.

FUTURESCOPE

- Expansion of this project is we can use current setting scheme.
- When temperature is exceed then motor will burn to prevent this damage then we can give specific cutoff.

CONCLUSION

In this paper cheaper and simple scheme to start and control the induction motors using microcontroller is successfully explained. We can remotely access the motor using microcontroller. This project has prepared for controlling , monitoring and theft detection circuit for 3 phase induction motor .This circuit can ON and OFF the motor through CALL by mobile. LCD display and GSM module is interfaced with motor so every start , stop condition of induction motor is displayed on LCD module as well as call is send to user.

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