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A Conference Paper on Monitoring & Protection of 3 Phase Induction Motor

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Abstract: ***Over decade 90 percent of production and manufacturing industry have been established enourmously and are completely dependent of 3PH 440V motors. This has helped the production to rise massively and can be operated rigorously with higher operating time. The monitoring of parameters of this 3ph motors are done manually and are not taken at real time operation. Our project helps to have continues monitoring of the parameters like phase voltages, current consumed, real time speed, of the motor. We have designed protection system using over current relay and over voltage relay aided by the software which gets the command from the set points of the ratings of motors. The set points are set in the software which gives the signal to relay and the relay trips of motor is shut down. The heart of the project is arduino which gives the LCD the displays of parameters and instruction for protection of the motor via software. This instruction are given by zigbee which is a wireless module and connected to laptop for continuous monitoring and real time display.***
Keywords: signal conditioner, zigbee,arduino Uno R3, Hall Effect sensors, protius software, Visual Basic.

I. INTRODUCTION

In the era of electronic world all the industrial equipment's are aided with electronically protected system. Induction motors play important role in industrial application over wide range and can be operated with rigorously and have higher life time. The faults and failures can lead to degrade the production and can't be afforded. Our project involves on condition monitoring taking measurement on machine. While it is operating to reduce unexpected overcurrent overvoltage which saves the maintenance cost. Condition monitoring reduces the cost of maintenance and early detection of potentially generated faults. Thus the key for our project is to have accurate means of condition assessment and fault diagnosis. Zigbee based motor parameter condition monitoring uses measurement taken while real time operation of motor. The signal conditioner and Hall Effect sensor are used to generate signal protected system. Induction motors play important role

Detection of potentially generated faults this the key for our project is to have accurate means of condition assessment and fault diagnosis. Zigbee based motor parameter condition monitoring uses measurement taken while real time operation of motor. The signal conditioner and Hall Effect sensor used to generate signal to detect the fault via Arduino.

This system is based on low cost electronic devices that can acquire preprocesses current voltage speed related to motor

Operating condition using zigbee wireless technology to the pc side zigbee through database. The method we use to find the current, voltage, speed, torque of 3phase IM is the direct use of the equipment's such as voltmeter ammeter tachometer.

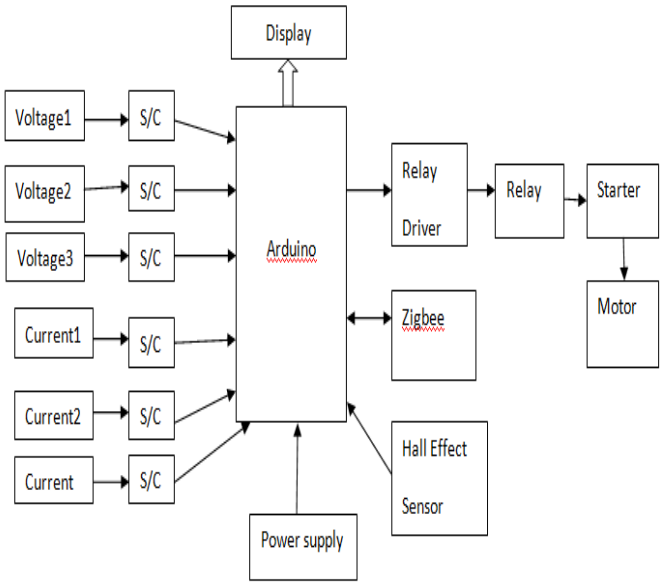
II. PROPOSED SYSTEM

Considering the present system and observing the defect and drawbacks in the existing system plan is to develop the arduino based system which not only monitors the various parameters of 3 phase motor but also keeps safe the motor in hazardous situation and sends the various data on pc side zigbee through database.

A. Objectives of the Proposed System

1) The protection of motor in under voltage and overvoltage condition that is motor will be OFF automatically in both the case
2) The protection of motor in and overcurrent condition that is motor will be OFF automatically in both the case
3) This system continuously sends all parameters to pc side zigbee that data will be saved on database.
4) System size is made small. System is made available at affordable cost.
5) To measure speed of motor.
6) Most of the industries use 3 phase IM. The system used for monitoring is reliable complicated
7) The protection system used is reliable and very expensive
8) We were able to design the system for monitoring and controlling the system by interfacing it with computer.
9) We have added the software for protection of the system which is completely reliable with least investment.

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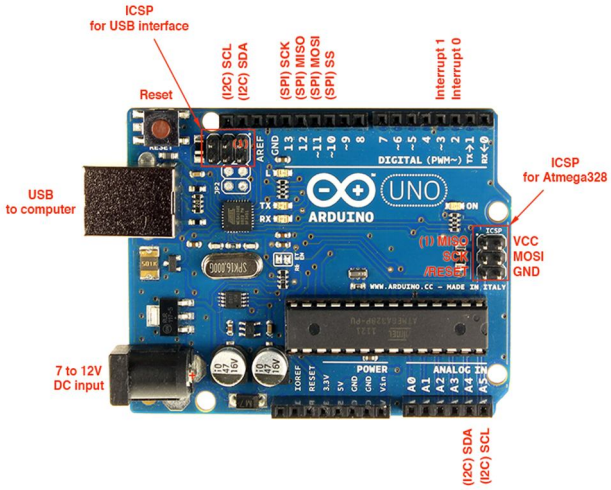
Block Diagram: Monitoring & Protection of Phase Induction motor

III. WORKING

In this project we will use microcontroller arduino which is compatible microcontroller arduino is the key part. The 5 volt DC power supply will have design and mounted on the controller board which provides the operating voltage to microcontroller and the other components like sensor, relay etc. In this project we will have gave input voltage sensor i.e step down transformer along with rectifier is used here the concept is for any change to the transformer altered the voltage at the output side. In case of over voltage and under Voltage conditions are observed. Again is to sense the current a Current transformer is used and a signal conditioning ie a current to voltage conversion circuit is used. For any unfavorable condition ie for any under voltage, Over Voltage, Over Current the Motor will automatically off and the data will be sent to on zigbee though PC & data will saved on database. Also we will be interfacing Hall Effect with arduino. This Hall Effect sensor will sense the speed of the motor & this speed also saved on database.

A. Component Used

1) Arduino Uno R3 Board: The Arduino Uno R3 is a microcontroller board depends on the ATmega328 chip. This Board contains 14 digital inputs and output pins, in which 6 analog input pins, Onboard 16 MHz ceramic resonator, Port for



Onboard DC power jack, USB connection and a microcontroller reset button. It contains everything needed to support the microcontroller. Using the board is also very easy to connect it to a computer with a USB cable or power it with DC adapter.
The Uno unlike from all preceding boards in that it does not requires FTDI USB-to-serial driver chip. As alternative, it features the Atmega16U2Atmega8U2 untill version R2) programmed as a USB-to-serial converter. Where the Arduino UNO can be powered through the USB connection or with an external power supply where the power source is selected automatically.
External power i.e non USB can come either from an AC-to-DC adapter or battery. The adapter can be joined by plugging a 0.21cm center-positive plug into the board. Also leads from a battery can be inserted in the Gnd and Vin pin headers of the Power connector. The board require external supply of 6 to 20 volts for their operation. If the supply is less than 7V, at that time the 5V pin can supply less than five volts and the board becomes unstable. In case,of 12V, the current through voltage regulator increases which increases overheating and it will damage the board. The required range is 5v to 12v for Arduino Uno.

*B. 16*2 LCD*



LCD indicates different mode settings & set point adjustment. Also 16 char are categories to indicate speed output. The LCD Display which we are using is 16 * 2 line display. The 16 characters in both lines are equally divided to indicate commands and speed. In sub routines 'Enter Speed' and 'Current Speed' message, set Speed value is indicated on screen.
In our project LCD is assemblage with the port-0 (D0-D7) i.e. from pin number 32 to pin number 39.The data-bus D0-D7 is joined to port-0 of IC 89s52. Pin RS is directly connected to Pin11 of controller and one more another important pin EN (LCD enable) is directly connected to pin 14 of the controller. On the other hand pin R/W of LCD is connected to ground. The LCD interfacing is used here for indicating displaying messages to the user.
The interfacing is given in detail which is as follows:
In this equipment the LCD which is used is 16X2 type. i.e. 16 characters per rows and two rows. The function of LCD is to display the status of events performed by the respective circuit or to display those resulting parameters which have to be displayed on the screen as per user requirement.

1) *16x2 LCD:* It can display 16 characters per line and there are 2 such lines. In this LCD character is displayed in 5x7 pixel matrix. It has mainly two registers which is Command and Data where command register stores the only command instructions given to the LCD display. On the other hand command gives instruction to LCD for performing predefined task like , controlling display ,clearing its screen initializing it, setting the cursor position, etc. The data register stores the information which is displayed on the LCD.

C. Specification

1) Character LCD 16x2
2) 5x8 dots includes cursor
3) Built-in controller (ST7066 or Equivalent)
4) +5V power supply only
5) Negative voltage optional for +3V power supply
6) 1/16 duty cycle
7) White LED backlight not available

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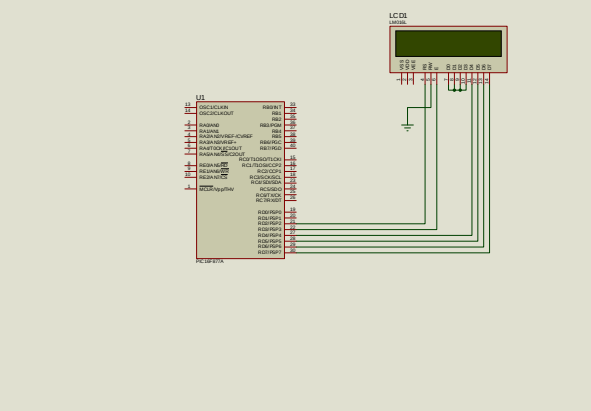


Diagram: LCD interface with Arduino

D. Features

1) 500-mA-Rated Collector Current (Single Output)
2) High-Voltage Outputs: 50 V
3) Output Clamp Diodes
4) Inputs Compatible with Various Types of Logic
5) Relay-Driver Applications

E. Relay



Whenever the supply flows through circuit (1), it energies the electromagnet (brown) which generates a magnetic field (blue) which attracts a contact (red) and energies the second circuit (2). When the power is switched off, a spring pulls the contact back up to its original position, switching the second circuit off again.

This is an example of a "normally open" (NO) relay: the contacts in the second circuit are not connected by default, and switch on only when a current flows through the magnet. Where the other relays are "normally closed" (NC; the contacts are attached so that current flows through them.) and switch off only when the magnet is activated, the contacts are normally pulled or pushing the contacts apart.

Here's it shows that how a relay combines two circuits together. It is mandatory the same thing drawn in a moderately different direction. On the other hand, there is an input circuit controlled by a sensor of that type. Whenever the supply is given to the circuit at that time electromagnet experiences a force due to this electromagnet pulls a metal switch closed and activates a second(2) output circuit (on the other side). So due to the partially small current which is results in the activating of larger current in the output circuit:

F. Features

1) 12V DC SPDT Relay
2) Rated up to 7A @240VAC
3) Fully Sealed

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G. Motor Used

3 phase, 22kw, 415v, 2 pole motor

H. ZigBee



ZigBee is a concord which uses the 802.15.4 standard as a genesis and adds extra routing and networking functionality. The ZigBee concord was discovered by the ZigBee Alliance.It is a group of companies that working for co-operation to develop a network protocol which can be used in a various of industrial low data rate and commercial and applications. As it is designed for low power applications, it suited well in embedded systems.

Zigbee is basically a communication IC; in our project we will be using this for the communication between toll unit and server unit. Basically Zigbee devices are of three types:

ZigBee co-ordinator: zigbee is the most capable device, the coordinator makes the root of the network tree and might bridge to other network. There is one ZigBee coordinator in all network since it is the orignal networ that is started . It stores data related to the network,as it is included acting as the repository for security keys & Trust Center .

ZigBee Router*:*for the purpose of running an application ,a router is act as intermediate device which passes data from the other devices.

ZigBee End Device*:* It Contains just enough functionality to talk to the limked node (either the a router or coordinator); it is unable to relay the data from other devices. A ZigBee End Device requires therefore can be less expensive to manufacture than a ZR or ZC and the least amount of memory.

IV. RESULT

Rated voltage			Rated Current			rated speed
V1	V2	V3	I1	I2	I3	SPEED(rpm)
230	230	230	11	11	11	2000

Table: motor operated under no load

Over voltage (trip values)			Over Current (trip values)			over speed
V1	V2	V3	I1	I2	I3	SPEED(rpm)
150	150	150	6	6	6	1000

Table: motor operated under load

Under voltage (trip values)			Under Current (trip values)			under speed
V1	V2	V3	I1	I2	I3	SPEED(rpm)
250	250	250	13	13	13	3200

Table: motor operated under load

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V. CONCLUSION

Protection of three phase induction motor from under voltage, overvoltage, overcurrent, over speed, single phasing, and phase reversal provide the smooth running of motor improves its efficiency and lifetime. To make induction motor operate efficiently and to protect it from different faults, sensing circuits had been designed. The sensing circuit is used for fault sensing occurred in an induction motor which is monitored by the protection system if any faults occurs the motor directly turned OFF.

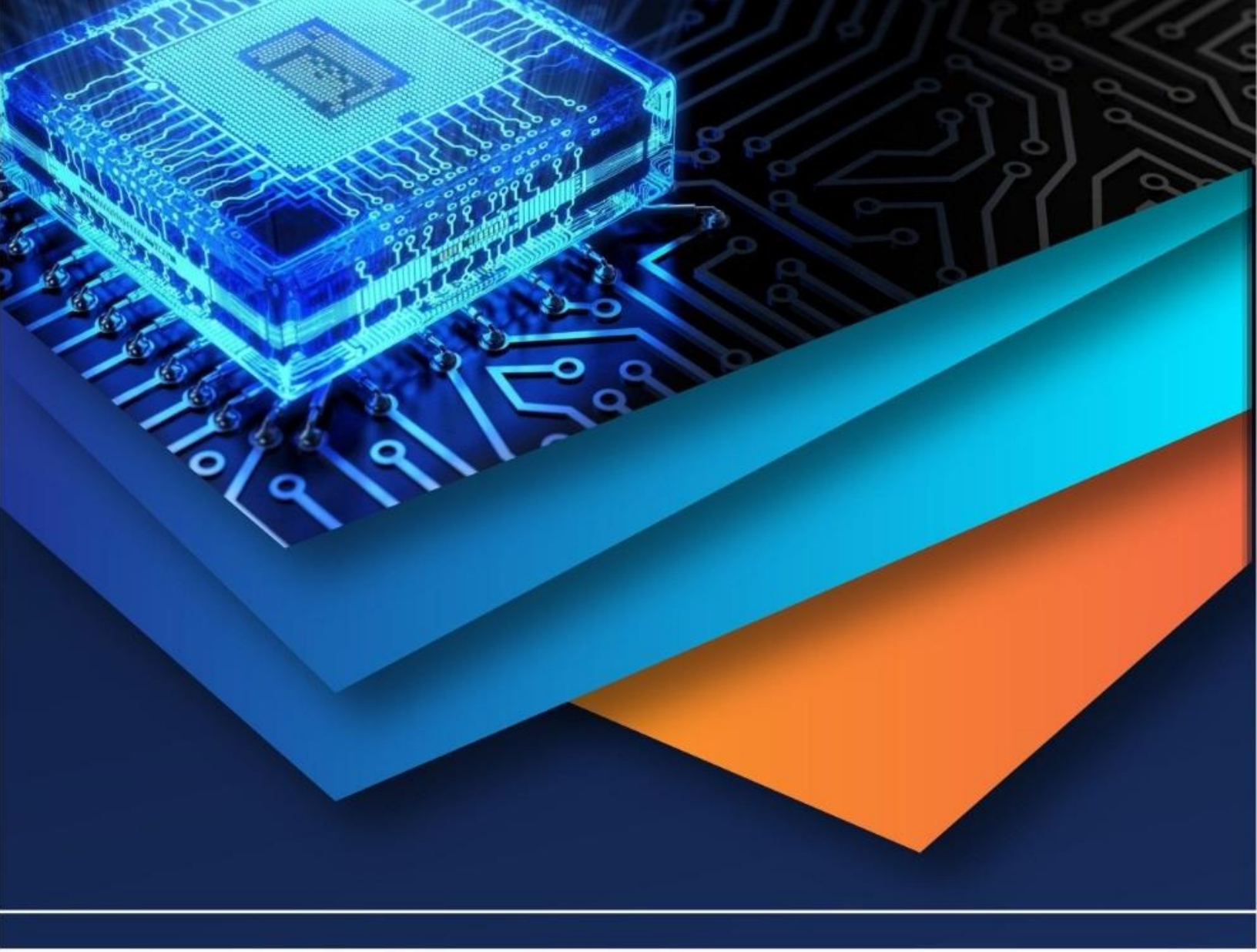
VI. RELEVANCE

Existing system **:-** Now a day's along with the single phase Motors which are used in the Home, Agriculture or in the industrial applications the user uses the direct Switches or we can say a Starter to control the on or off of motor . The MCB is also used for ON /OFF of motor. Sometimes some user uses the Control panel on which some provision of Analog Indicators of Voltage or current are observed .In this case user have to monitor and accordingly On/Off the motor is required. Motor protection circuits are used and again parameter monitoring system.

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