HEALTH MONITORING AND PROTECTION SYSTEM FOR INDUCTION MOTOR

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ABSTRACT

Our idea is to continuously evaluate the health of Induction Motor. By doing so, we would be able to have warning before any damage due to fault.This paper is to study an improvement in protection of Induction Motor. It solves the problem of damaging of Induction Motor due to unnoticed fault.
Condition monitoring can be explained as the continuous evaluation of the health of the plant and instrument throughout its working duration. It is important to detect faults while they are developing which is called incipient failure detection. Incipient failure detection can provide safe operating environment. In many applications, these motors are operated under environmental stresses, such as high ambient temperature, high moisture, etc, which could lead to motor malfunction. Malfunction of these motors leads to not only high repair expense, but also extraordinary financial loss due to unexpected downtime. Therefore, reliable monitoring and protection for MV motors is of great value to avoid catastrophic unscheduled downtime. By using the condition monitoring we can give the warning, well in advance to correct the situation and avoid shutdown. This can result in minimum downtime and optimum maintenance schedule. Condition monitoring and fault diagnostic technique can help the operator to be ready with the spare parts before occurring the shutdown situation and hence reduce outgoing.
Keyword *– SPDT, ATMEGA16, LCD display, CT,PT.*

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1. Introduction-

Condition monitoring can be explained as the continuous evaluation of the health of the plant and instrument throughout its working duration. It is important to detect faults while they are developing which is called incipient failure detection. Incipient failure detection can provide safe operating environment. In many applications, these motors are operated under environmental stresses, such as high ambient temperature, high moisture, etc, which could lead to motor malfunction. Malfunction of these motors leads to not only high repair expense, but also extraordinary financial loss due to unexpected downtime. Therefore, reliable monitoring and protection for MV motors is of great value to avoid catastrophic unscheduled downtime. By using the condition monitoring we can give the warning, well in advance to correct the situation and avoid shutdown. This can result in minimum downtime and optimum maintenance schedule. Condition monitoring and fault diagnostic technique can help the operator to be ready with the spare parts before occurring the shutdown situation and hence reduce outgoing time.

1.2 Overview -

The focus in most industry is shifting from scheduled maintenance to the predictive maintenance by constantly observing and predicting the machine condition in advance Predictive maintenance by condition based monitoring of electrical machine is a scientific approach that becomes new strategy for maintenance management. Most industrial motors are being monitored using vibration, current and temperature sensors which either provide warning signals or shut down the system, before any catastrophic failure occurs. Though they are able to prevent permanent damage to the need of an advance system called on-line health monitoring system. Traditionally, health monitoring system is realized in wired systems formed by communication cables and various types of sensors. The cost of installation and maintenance are difficult and expensive especially when the equipments are not at the same location.

1.3 Objective & Significance-

- To avoid unprecedented failure of induction motor component that may cause a huge financial loss to the utilities.
- To give the warning, well in advance to correct the situation and avoid shutdown.
- This technique can help the operator to be ready with the spare parts before occurring the shutdown situation and hence reduce outgoing time.
- To make induction motor more efficient and reliable.
- To increase the life of induction motor.

2.CONSTRUCTION AND WORKING PRINCIPLE:

During the working period of induction motor any fault may occurs unexpectedly which may cause huge financial loss or shutdown. Proposed project helps to monitor various parameter of induction motor & provide warring before occurrence of fault to protect the motor from such fault.

16*2 LCD display continuously shows the various parameter such as speed, power factor, vibration, temperature. Thus we can continuously monitor such parameters. The different values of parameter are obtain using various sensor such as rpm, power factor, temperature, vibration

Proposed project consist of 4 sensors, rpm, power factor, temperatue,vibration which provide protection for respective fault. Sensors are used to sense the faults. These sensor are mounted on the outer periphery of induction motor.

Whenever the fault occurs or is going to occur the sensors provide the signal to the microcontroller (AT MEGA 16). IC converts the analogise signal to the digital & generate output which is given to the buzzer to give warning or relay for shutdown of induction motor for safety point of view.

Programming is done such that, if fault is of low level warning is provided & if fault is of high level induction motor is cut off from supply. To do this, limits are set primary & secondary. When fault level reach primary limit, indication of fault is given using buzzer so that the person can become ready with spare parts or backup. But if fault level reach secondary limit it means the fault is dangerous for induction motor hence IC will give signal to relay & motor is shutdown automatically.

High temperature in induction motor may cause due to failure of cooling fan or eddy current may damage insulation. For protection against temperature LM35 is mounted on motor body. Primary & secondary limits of temperature vary with size, rating of induction motor for eg. Consider primary limit 50^0 C & secondary 55^0 C. Thus if motor temperature reach 50 buzzer will blow & if temperature reach 53 the relay shutdown the motor.

Sometime motor may run at lower speed than rated speed may due to low supply current. Such low speed again produces losses. To avoid these losses IR sensor is used to measure speed continuously. Different motor have different rated speed. Consider for particular motor with speed 1000rpm. Primary limit is set at 90rpm & secondary at 85 rpm. If speed reach 90rpm buzzer will blow & if speed reach 85rpm relay will shutdown the motor.

Power factor shows the amount of current performing useful work. Low power factor of rotating machine is responsible for the losses. Hence it is beneficial that the power factor to be nearer to unity as much as possible. Hence monitoring of power factor is of great importance. Proposed project used zero crossing detectors for the calculation of power factor. Limit can be set to avoid working of machine at low power factor. Here also two limit can set, primary & secondary to have warning and shutdown respectively. Power factor model is shown in component description.

Induction motor sometime may undergo vibration which may cause due to damage in bearing. Hence monitoring of vibration is also of same importance. Vibration sensor is mounted on the motor body which continuously measure vibration in motor. If the vibration become abnormal sensor will send the signal to the microcontroller which will give warning, if the abnormal vibration is of low level & shutdown the motor if abnormal vibration is high level to protect the motor from any damage due to vibration.

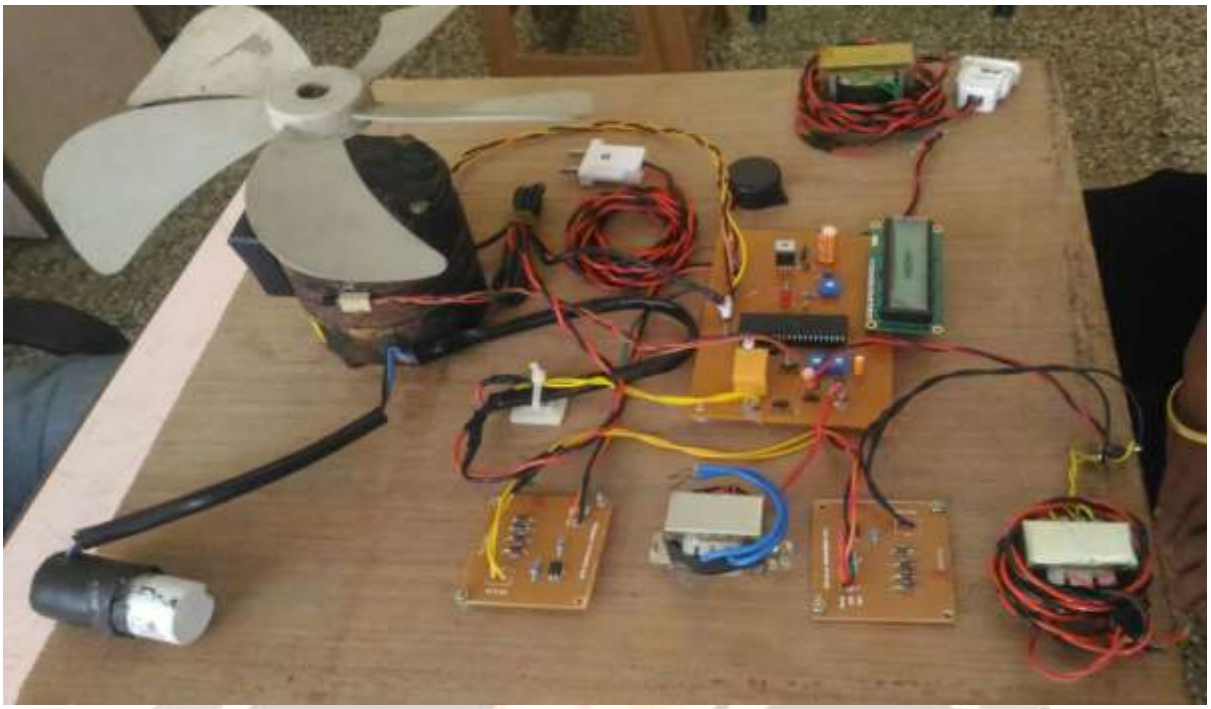

Fig.1- System Model

3. CONCLUSION:

- Circuit is designed for health monitoring system of Induction motor using PROTEUS software.
- Simulation result of temperature sensor, current measurement, voltage measurement has been obtained.
- Attempts are made to get the same parameters on PCB design
- Using these parameters, health monitoring of Induction Motor can be successfully achieved.

4.ACKNOWLEDGEMENT

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