IOT Based Remote Monitoring for HT Motors in Thermal Power Plant

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Abstract. This paper explains about IOT Based remote monitoring for HT motor. HT motor were normally used widely in the industrial field in which it works on 3.3kv, 6.6kv and in 11kv. If any fault occurs, that causes HT motor to be failure. Which it leads to an shut down of generating station or in industrial field and there will be an chance of occurrence of heavy loss. To avoid such a failure, an continuous monitor had to be done. The main motto of this paper is to continuous monitoring of various parameters of motor like speed, vibration, temperature, current and voltage of HT motor and controls it by using an IOT.

1. Introduction
Motors which plays a vital role in our day to day life and also in industrial field. For better performance and efficiency of motor we need to maintain it properly. As HT motor normally works on 3.3kv, 6.6kv and in 11kv. There may be an chance of occurrence of failure in HT motor. So continuous monitoring of HT motor will leads to be an avoidance of such a failure in motor, which were used in the industrial field [1].vibration which can exit beyond its limits may lead to critical situation and motor cannot be handle over it [2]. When the temperature of the motor rise, there is an occurrence of stator and rotor winding to be damage and also an possible of getting explore of motor [3].

The health of HT motor can be viewed by continues monitoring. So that we can avoid the fault and can maintain issue of the motor [4]. In which this also provide an avoidance of insulation failure and reduce the maintenance cost [5]. Here in this proposed method, the condition of HT motor is continuously monitor and data like temperature, pressure, vibration, current and voltage were viewed to know the health condition of the HT motor.

In which these data of the motor were analysed through the arduinouno. From the arduinouno, the data were stored in the cloud by wifi module with the help of an Internet connection or wifi. These data can be viewed through the mobile app.

2. Outline of the system
The main objective is to increase motor reliability application by using the recent technology internet of things. This method ensures the continuous monitoring of HT motor and easy control. By ensuring the system reliability abnormal conditions are easily identified and easily rectified. Mostly 90% of industries used HT motor, so monitoring method is important.

- To monitor and control the HT motors using internet of Things (IoT) for safe and data communication in industrial fields.
- It also provides faster intimation about the motor condition.
- To start or stop the HT motor to avoid system failures.
This system has various types of sensors to sense the parameters like temperature of the machine, voltage and current of the machine & speed and vibration of the motor. Once the data is sensed, it is given to the arduino and the arduino gives to the cloud storage through the wifi module ESP8266. The user can monitor the actual status of the machine by receiving data from the cloud server through the mobile application. The block diagram is shown in fig.1.

3. Hardware Description

3.1. Motor
HT motor full form is high tension motor means the motor rating for high voltage 3.3KV,6.6KV and 11KV. LT motor full form is low tension motor means the motor rated for low voltage operation generally in the ratings of 230V motors single phase and 415V in 3 phase.

3.2. Sensor
a) Current Sensor
Current sensors are used to detect current in the motor and also the signals which are proportional to that current in the motor. This is needed during the purpose of current control. Basically there are two types of current input but they are two types of current input, they are alternating current input and direct current input.

b) Temperature Sensor
Thermocouple sensor is used as the temperature sensor. It is made up of two wires with different metals but joined together. A thermocouple gives a temperature dependent voltage. Thermocouple are popularly used temperature sensor. Commercial thermocouples are inexpensive and can measure a wide range of temperatures. It gives output in millivolt signal. The voltage is measured in sense of change in resistance.

c) Voltage Sensor
A voltage sensor is a sensor used to measure the amount of voltage in the motor. It determines both AC and DC voltage level in the motor. Voltage sensors are Non-saturable, eco-friendly, highly accurate. Voltage sensor works in wide dynamic range. The output of voltage sensor be sine or pulse train.
d) Vibration Sensor
The vibration sensor is otherwise called as piezoelectric sensor. Vibration sensors are the sensors used
to display, analyze the linear velocity, displacement and proximity. It is also used to detect problems
in the motor. The abnormal vibrations in the sensor indicate the problems in the industrial machines.
so this can reduce time and cost requirement.

Fig.2 Voltage sensor

Fig.3 Vibration sensor

e) Speed Sensor
Speed sensor is the sensors used to read the speed of the motor. The output of this sensor is send to the
motor control unit to monitor the motor speed. There are two speed sensor one is input shaft speed
sensor and the another one is output speed sensor. These two sensors are works together activate relay
and send back the relay information to the control unit.

Fig. 4 speed sensor

3.3. Arduino UNO
It is an open – source microcontroller board. It is based upon the microchip ATmega 328P
microcontroller developed by Arduino.cc. This board is equipped with sets of digital and analog
input/output pins that may be interfaced to various expansion boards and other circuits. The board has
14 digital I/O pins, 6 analog I/O pins and is programmable with the Arduino IDE, via a type B USB
cable.

Technical specifications

- Microcontroller: Microchip AT mega328P
- Operating voltage: 5 volts
- Input voltage: 7 to 20 Volts
- Digital I/O pins: 14
- Analog Input pins: 6
3.4 Wifi- Module
The ESP8266 wifi module is one of the leading platforms in internet of things. It is connected to
arduino board to access the web. The wifi module is a very cheap and available in low cost. However
this module is already preloaded in firmware with set up 9600 baud rate. This module consists of 8
pins Tx, Rx, Vcc, reset, CH-EN CPIO-0, 1 pin. The CPIO pin is connected to receiver pin through
USB board. They communicate arduino configuration is employed to attach with wifi module. It
requires 3.3v only. The main exciting feature of ESP8266 module that can be programmed using the
arduino IDE which makes it a lot more user friendly.

3.5. Contactor
A contactor is also called electrically- controlled switch. Contactors acts as a switch which is coupled
with relay for tripping the motor, when any fault or disturbance may occur. It is also used to suppress
the heavy currents in the motor.

3.6. Relay
A relay is a device, which is also used as electrically operated switch. relay act as switch for, turn ON
or OFF of HT motor. It is used for tripping purpose.

3.7. LCD
An LCD is used for continuously displaying a data. In this project use 16*2 display. The LCD display
contains 16 pins. The arduino is connected through LCD the motor is running condition the measured
sensor values are displayed in the LCD display. In LCD display the brightness can be changed

4. Blynk Application
The blynk is an android app. It is used to control arduino board and works with the help of internet.
The operating server of blynk app is an open source. At new user, the blynk gives free limited energy
to purchase widgets. The blynk page is open, start a new project and gives project name, choose the
devices. However auth token was sent to a given mail id to run a blynk app. Then the sensor were
connected on the module. The sensed data are displayed on the blynk app and also it can store data and visualized. This app is used to control hardware remotely and notification sends on the mobile.

![Fig. 8 Blynk screen](image1)

![Fig. 9 Widget box in blynk app](image2)

5. Implementation & Methodology

For continuous monitoring the motor is connected with current sensor, vibration sensor, speed sensor, current sensor and voltage sensor to measure the parameter of the motor. When the supply is given to the motor, it began to operate. The sensor will start to sense the parameter of the motor and the sensed data were given to the controller i.e. Arduino. The parameters of the motor were monitored continuously. From the controller, the data were uploaded in the cloud using WI FI modulo 8266. WI FI modulo is operated with the help of an internet.

Here we used BLYNK IOT platform to upload, view and for controlling purpose. The data or parameter of motor are viewed through blynk mobile app. When any parameter values exit its value or range, an intimation will received through mobile app and also can control through it. The relay was connected between the motor and controller. When the parameter of the HT motor exits its limited range or value, the motor get trip through the relay.

![Fig. 10 Hardware Setup](image3)
6. Result & Conclusion
When the HT motor is running condition the parameter of the motor are viewed in LCD display screen and notification were also send to blynk app. Suppose any fault occurs in the motor parameter, we can switch OFF the motor through blynk app. The motor data are also displayed serially. So that we can able to monitor the parameters of the motor continuously and protect the motor from failures. Failures of motor leads to an shut down of generating station or in industrial field and there will be an chance of occurrence of heavy loss. To avoid such a failure, an continuous monitor had to be done. The advantage of this project is simple and fast monitoring and accessing of data automatically.

![Fig. 11 Output](image)

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