WIRELESS DATA MONITORING AND FAULT IDENTIFICATION BY USING IoT IN THERMAL POWER PLANT

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Abstract: *Thermal Power Plant has to operate regularly. It is difficult to monitor the parameters at each and every moment manually. In order to increase the reliability of thermal power plant, then to reduce maintenance and operating cost, remote monitoring is necessary. This paper develops IoT based monitoring system. It consists of Temperature, Vibration, Pressure and Level sensor. These sensor's data are processed by ATmega 328 controller which is transmitted through IoT module to remote place. It provides current updates through SMS anywhere in the plant and outside of the plant.*

Keywords : *AT mega 328 controller, IOT module, Monitoring system, Reliability, Operating Cost, Sensors*

1. INTRODUCTION

In Thermal Power Plant, It is necessary to monitor parameters like Temperature, Pressure, Level, and vibration because the equipment like Boiler, Turbine are affected by this parameters. If any of these blades in turbine gets damaged , it create unbalanced condition so that vibration level gets increased. If vibration level increases, it causes desirable damages to system. If percentage of the steam flow is increased, the pressure of the steam is also increased. So that it rotates the turbine at high speed. Because of the high speed, it causes damage to turbine blades. If level of the steam is increased, the pressure in the boiler tube increase. If

Presssure in the drum in the increases, the drum get blast. If temperature increases above the specified value, it leads to damage to the system. This paper mainly concentrate on how to monitor the temperature, vibration, level and pressure in boiler and turbine.

2. COMPONENTS

2.1. Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (nonUSB) power can come either from an AC to- DC adapter (wall -wart) or battery. The adapter can be connected by plugging a 2.1mm center -positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

TECHNICAL SPECIFICATIONS:

Operating Voltage is 5. Input Voltage is 7-12V. Input Voltage is 6-20V. Digital I/O Pins is 14. Analog Input Pins is 6. DC Current per I/O Pin is 40 mA. DC Current for 3.3V Pin is 50 mA. Flash Memory is 32 KB of which 0.5 KB used by boot loader. SRAM is 2 KB (ATmega328). EEPROM is 1 KB (ATmega328).

2.2. Relay

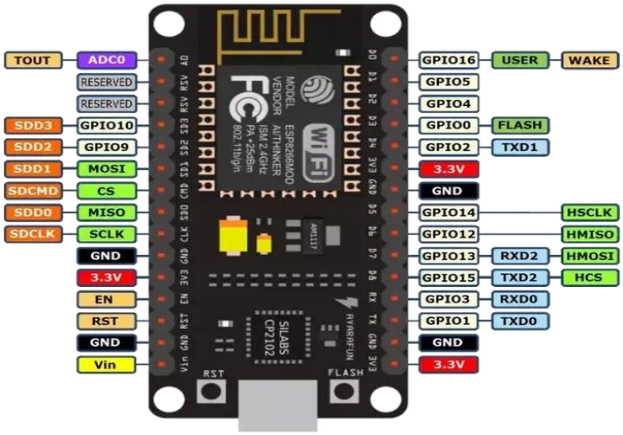
A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw **(**changeover) switch contacts. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay.

2.3. IOT module

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC (System on Chip) from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

Specifications:

802.11 b / g / n wireless standards, STA / AP modes support, TCP / IP protocol stack, One socket, Supports standard TCP / UDP Server and Client. Temperature is between -40°C ~ + 125°C. Humidity is 10%-90% non-condensing. Weight is about 20g (0.7oz).



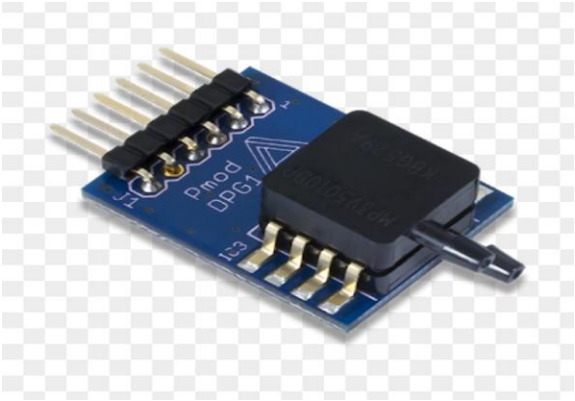
2.4.Temperature sensor

Various types of temperature sensors are available. Depending upon the temperature to be measured, the required accuracy of the measurement, and other factors such as durability , the type of sensor to be chosen

In this paper using NTC thermistor as a temperature sens233weor. NTC thermistor is a precision IC temperature sensor with its output. The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With NTC thermistor, temperature can be measured more accurately than other types of sensor. It also possesses low self-heating.

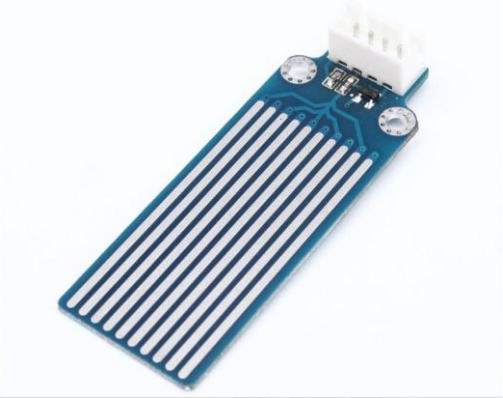
2.5. Pressure sensor

Pressure sensor is uses to measure the pressure in the steam. It measures the amount the amount of force applied on a unit area. There are different types of pressure sensors are available for power plant operation. In this paper use KRD532C High Precision Digital Pressure Sensor Board Module.



2.6. Level sensor

It is used to determine the liquid level which flows in an open or closed system. The level measurements can be possible in two types namely continuous measurements and point level measurements. The continuous level sensor measures level within a specified range and give exact results. Point level sensors is used to determine the amount of liquid substances whether it is low or high.



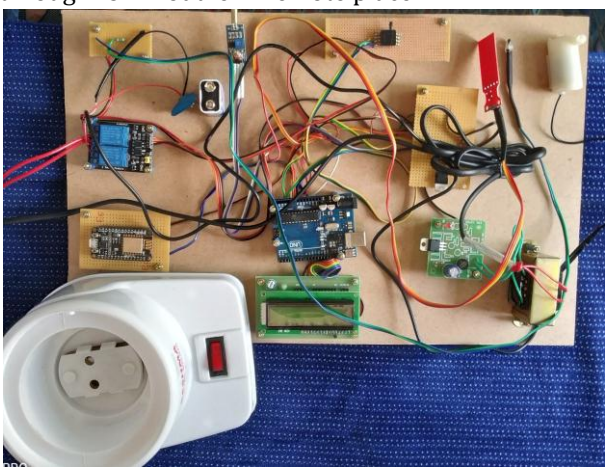
2.7 Vibration sensor

Vibration sensors are used for measuring , and analyzing liner velocity, displacement and acceleration .

Vibration sensor is used to measure the number of vibrations produced in turbine in a given amount of time. Selections of sensors depend on frequencies of. Interest and signal levels involved

3. Working

Transmitter section consists of temperature, pressure, vibration, and level sensor. In this system, these sensor senses various types of parameters in thermal power plant. As the output of the sensors are physical quantity, it is connected to analog pins of arduino to convert the analog information into digital format. Then the sensor's data are stored in controller memory and monitored continuously. If any of the sensor output exceeds or below the threshold level, it send a information to workers through display in work place and through IOT module in remote place.



4. CONCLUSION

This paper proposes a novel approach to monitor various parameter like temperature, pressure, level, and vibration based on internet of things. By using this technology, reliability and efficiency of thermal power plant is increased. In this, system can be monitored anywhere in and out of the plant continuously.

4. REFERENCES

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