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Distribution Transformer Monitoring System Using Internet of Things (IOT)

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Abstract: *It is used to provide power distribution and electrical isolation. The high voltage transformer falls under the division of electrical transformer and boasts of the highest voltage and current ratings along with maximum power, voltage and current ratings. Electrical energy is transmitted by Electrical transformer and is used to transfer electricity to homes and business from power plants. We are using sensors to monitor the transformer health so that it will be protected and service to the users will be quick. ARDUINO Microcontroller board is used to monitor the parameters like Temperature, oil level, ,current etc. The continuous monitoring is carried out and at the same time if any parameter goes above set limit, the transformer will be disconnected and the information about this will be available at web page and necessary action can be taken by authorized personals. We will place server modules at all the distribution transformers for receiving and storing transformer parameters information periodically in a database application. This database can be a useful source of information for engineers. An analysis of these stored data helps the utility in monitoring the operational behavior of their distribution transformers and identifies faults.*

Keywords: *Distribution transformer; ARDUINO Board; GSM modem; WI-FI module; Sensors; Monitoring Unit ; LCD Display.*

I. Introduction

Transformers are the important element to transfer the electricity from one form to another. Distribution Transformer have a long life, if they are operated at rated conditions and minimum life, they are overloaded. The way a doctor analyses the different symptoms in a human being to understand the disease and suggest cure, same way monitoring system make use of different internal as well as external parameters associated with a transformer.

Now days, where a person visit into a transformer site distribution transformer are monitored manually for maintenance and recording the parameter. So, that is why we can use the online monitoring technique. If any fault occurs, the system send alert message to the mobile phone as well as monitoring unit [11]. This paper will help us to finding the problem before any catastrophic failure.

II. Project Description

A 230V AC supply is given to the 12 -0-12v transformer. If any fault occurs in transformer while operating, its fault can be sensed using different sensors. Voltage is sensed by bridge rectifier. Current is sensed by using current sensor, Temperature is sensed by using temp sensor. All analog signals is converted into digital by ARDUINO. Output is viewed in phone by BLYNK WEB SERVER through NODE MCU WIFI module. And also system will send the text message to the mobile phone by using GSM modem.

III. System Structure

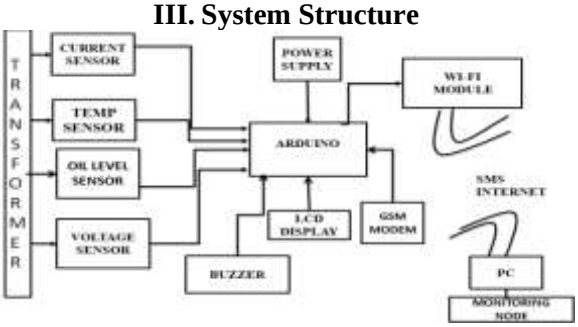

Fig. (1) Block Diagram Of Distribution Transformer Monitoring System Using Arduino.

The block diagram shows Distribution Transformer condition with monitoring node with different sensors such as current sensor, voltage sensors, temperature sensor, oil level sensor comes in hardware design as I/P devices at remote. These sensors are connected to the transformer and digital output is given to the WIFI module, LCD, Buzzer and GSM modem are connected to ARDUINO at mega328. When fault occurs due to any reason then there changes will be shown on LCD and quick SMS will go to the control room via WIFI module. Also the system can send the text message to the mobile phone personally to the corresponding area engineer by using GSM modem.

a) Temperature Sensor:

It measures the heat or cold (energy) that is generated by an object, allowing us to "sense" or detect temperature producing either an analogue or digital output [17]. The LM35 sensor is use which is connected to the analog port of ARDUINO, gives values of temperature of the winding.

b) Oil Level Sensor:

Oil level sensor is a float which connected to the angular potentiometer. Float is immersed in the oil and its mechanical output is given to the angular potentiometer [9]. When there is any mechanical movement of the float, there is a voltage generation corresponding to the mechanical movements of float.

c) Voltage Sensor:

A voltage sensor is a device which detects the voltage in a wire and generates a signal proportional to it. The generated signal may be analog current or voltage or even in digital output. Then this will be utilized to display the measured voltage by a voltmeter or may be stored for more analysis in the system for controlling purpose.

d) Current Sensor:

A current sensor is a device that detects electric current in a wire and generates a signal proportional to it. The generated signal could be analog or current or even digital form. Then utilized it to display the measured current in an ammeter or can be stored for analysis in the system for control purpose. The current sensed by sensor the output signal can be: Direct current input, unipolar, with a unipolar output, which duplicates the waveform of the sensed current digital output, which switches when the sensed current exceeds a certain threshold.

e) Arduino Microcontroller:

In this system, the micro-controller plays a vital role. Micro-controllers were originally used as components in complicated process-control systems, because of their small size and low price. Here, ARDUINO microcontroller is used to convert the analog value of parameter into digital. If fault occurs, it will display on LCD and relay will trip the circuit.

Fig. 2) ARDUINO microcontroller

f) LCD Display:

In this project we are using LCD 16x2 connected to the ARDUINO. That means 16 characters per line by 2 lines.

Fig. 3) LCD Display

IV. Software Design:

The software is responsible for managing the ARDUINO microcontroller & devices are connected to it. Firstly at the remote terminal unit analog signals are manipulating for further processing and secondly the values of current, temperature, oil level, humidity are calculated from real samples and send these values along with time and date to monitoring.

V. Wifi Module:

The ARDUINO Uno WIFI is an ARDUINO Uno with an integrated WIFI Module. The board is based on the ATmega328P with an ESP8266 WIFI Module integrated. The ESP8266WIFI Module is a self contained SoC with integrated TCP/IP protocol stack that can give access to our WIFI network.

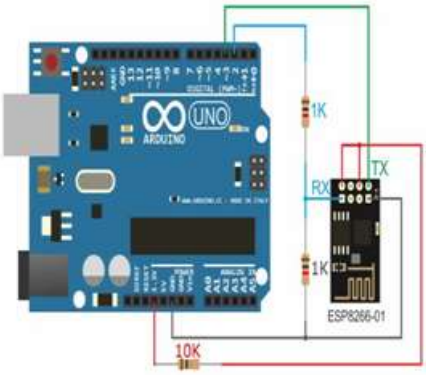

Fig.4) Interfacing of ARDUINO with WIFI module

VI. Test And Result

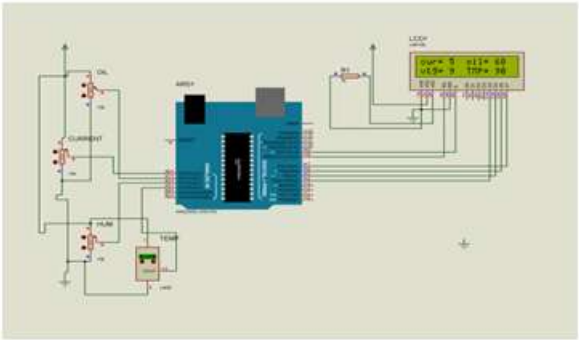

Fig. 5) Result of four parameter of transformer

In this part, WIFI module and ARDUINO circuit which is built with PROTEUS software are connected together using monitoring software. The information about parameter available at web page and GSM send to mobile. All component are tested one by one and work well.

VII. Conclusion

We have design a circuit for transformer monitoring. If transformer is in abnormal condition we can know from anywhere. No human power need to monitor the transformer. Details about the transformer are automatically updated in webpage and text message when the transformer is in abnormal condition. [2]

VIII. Future Work

We can get all information by placing the proposed system modules at every transformer. We can send the data through WIFI module. A WIFI module connects to nearby network and sends information to monitoring node. Multiple Transformers can be monitored and controlled. GSM system can be used to send SMS to authorized personal.

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