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Micro Controller Based Power Transformer Monitoring and Protection in 210mw Thermal Unit

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ABTRACTS
This report presents a microcontroller based power transformer monitoring and protection in 210 MW thermal unit. The system is designed with a microcontroller that monitors and controls the power transformer of the power plant. The microcontroller is programmed to detect any abnormality in the power transformer and take appropriate steps to protect the transformer from any damage. The system is designed to monitor the voltage, current and temperature of the transformer. The system is also designed to detect any fault or over-current in the transformer and take appropriate action to protect the transformer from any damage. Additionally, the system is also designed to detect any leakage in the transformer and take appropriate action to prevent any further damage to the transformer. The system is designed to provide a safe and reliable operation of the transformer and ensure its efficient operation. The system is also designed to provide a cost-effective solution for the monitoring and protection of the power transformer in the power plant.

I. INTRODUCTION

Reliability and safety issues of power system have been more important with progress and development of national economy and power system. If we look back towards our daily routine we can conclude that electricity is the inseparable part of our life and transformers plays a role of electricity carrier to us from generation stations. Transformer is the key component in electricity distribution system. Hence protection of transformer is very important. Transformers get overloaded due to illegal use of electricity. Overload affects the efficiency of transformer and electricity distribution system. So, the designed system involves automatic isolation of load to avoid damage to the transformer due to overloading. Therefore, a proposed method is chosen to design microcontroller-based transformer for overload protection. The microcontroller-based relay provides more adjustable characteristics, high accuracy, more flexibility, and reduced size, minimum cost with many functions such as selfmonitoring and checking by IOT technology.

II. OBJECTIVES OF THE PROJECT

- To measure the real time parameters of transformers such as voltage, current, temperature and oil level.
- To check whether if the air break (AB) switch is properly opened or not, if the AB switch is opened without permission is informed to the officer through IoT.

III. PROBLEM STATEMENT

Modern power system requires accurate, reliable technique for detection of faults, real time data monitoring and fast response speed. The reliable operation of the power system depends upon the effective functioning of the distribution transformer. Microcontroller based system has real time data monitoring, detection of abnormal

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condition, fast processing speed, reduced installation cost low maintenance cost and more flexibility

IV. BLOCK DIAGRAM OFPROPOESD SYSTEM

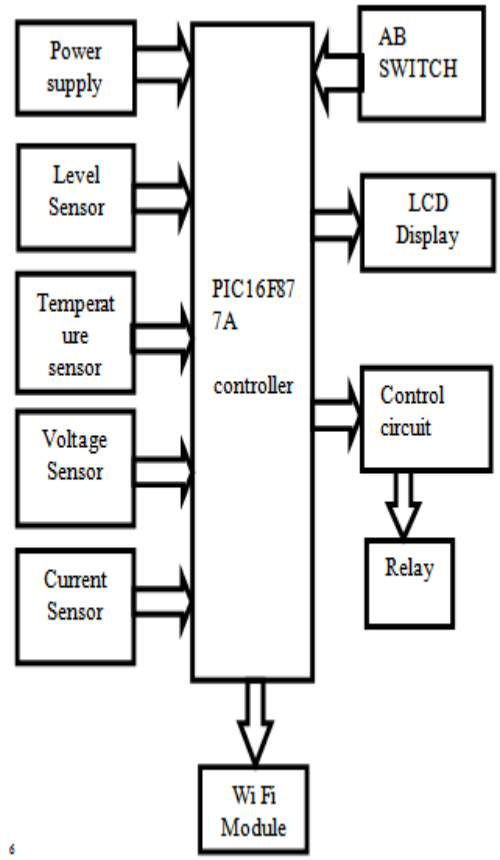

Fig.1: Block diagram of the proposed system

This system is designed for online monitoring of distribution transformers parameter can provide useful Information about the transformers health which will help the utilities to optimally use their transformers and keep the asset in operation for a long time. In this system, we used three sensors for monitoring that is voltage sensor, a current sensor, and temperature sensor. Then the values of all the sensors are sent sequentially as per the frequency of multiplexing of the ADC by Microcontroller PIC16F877A and IOT Module. The power system any unbalance cortication informed IOT. AB switches open without permission informed officer using IOT. The design of a monitoring system that consists of a GSM modem that is integrated with standalone single chip embedded system to monitor and record key operation indictors of a distribution transformer like load currents, transformer oil and ambient temperatures. The paper is organized as follows; section two discusses the proposed hardware architecture. The power system any unbalance cortication informed IOT. And same time if AB switch is open without permission is informed to the officer using IOT.

V. COMPONENTS DESCRIPTION

1.MICROCONTROLLER

Fig.2: PIC16F877A

PIC16F877A is the brain of this protection circuit. This microcontroller has on chip ADC which converts analog values to digital values. This sampled value compared with pre-set values and decision is taken according to programming, hence microcontroller is decision making device. As compared to microprocessor microcontroller have simple structure and fast responding capacity. Power consumption is less for PIC16F877A microcontroller. It has wide range of temperature so it can be used in most of the systems.

2. LEVEL SENSOR

Level sensors detect the level of liquids and other fluids including slurries, granular materials, and powders that exhibit an upper free surface. Substances that flow become essentially horizontal in their containers (or other physical boundaries) because of gravity whereas most bulk solids pile at an angle of repose to a peak. The substance to be measured can be inside a container or can be in its natural form (e.g., a river or a lake). The level measurement can be either continuous or point values.

3. CURRENT SENSOR

A **current sensor** is a device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal could be analog voltage or current or even a digital output. The generated signal can be then used to display the measured current in an ammeter, or can be stored for further analysis in a data acquisition system, or can be used for the purpose of control.

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4. TEMPERATURE SENSOR

Fig.3: LM35 Temperature Sensor

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in oC).The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 oC temperature rise in still air.The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every oC rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ oC..

5.LCD DISPLAY

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

These modules are preferred over seven segments and other multi segment LEDs. The reasons being:

- LCDs are economical
- Easily programmable
- Have no limitation of displaying special characters

Fig 4: LCD display

The liquid crystal display(LCD) is shown in the figure 3.10. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data register.

6. RELAY

Fig.5: Relay

It is an electrically operated switch. When current exceed their limits, coil actuates which operate either to close open contacts or to open close contacts. It gives high reliability, safe disconnection from the main supply. It has longer life.

Specifications of Relay are:

- Supply Voltage: 3.75 to 6 V
- Supply Current with Relay De-Energized: 2 mA
- Supply Current with Relay Energized: 70 to 72 mA
- Input Control Signal: Active Low
- Input Control Signal Current: 1.5 to 1.9 mA
- Relay Max Contact Voltage: 250 VAC or 30 VDC
- Relay Max Contact Current: 10 A

Relay is used just like a switch to isolate load from transformer and it get operated by the microcontroller.

7.NODE MCU (Wi-Fi Module)

Fig.6: ESP8266 NodeMCU

The ESP8266 Wi-Fi module is one of the leading platforms in internet of things.It is connected to micro control board to access the web. The Wi-Fi 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 pic16c877a configuration is employed to attach with Wi-Fi module. It requires 3.3v only. The main exciting feature of ESP8266 module that can be programmed using the pic16c877a IDE which makes it a lot more user friendly.

VI. CONCLUSION

This system provides transformer protection using microcontroller-based relay. For transformer current sensing circuit were designed and result have been verified with proteus simulation. Proposed method is economical and compact in size.

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