IOT Based Distribution Transformer Health Monitoring System

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Abstract— Distribution transformers are one of the most important devices in an electrical network. With the large number of transformers distributed over vast areas of the power system, data collection and condition monitoring are important issues. The main purpose of this system is to monitor and control distribution transformers via IOT. It also sends SMS to the central database via GSM modem for further processing. The idea of an online monitoring system is to combine a global service mobile modem (GSM) with a microcontroller chip and various sensors. Here the transformer is damaged by oil damage. Oil damage depends on various parameters and environmental conditions. Now in this system we focus on the temperature of the transformer and the viscosity of the oil. In this system, the control and regulation of temperature and viscosity is performed based on the AVR microcontroller. After pairing the required components, the user has to develop one application in Embedded-c. Here, the controller continuously reads the temperature, voltage and current and displays it on the LCD.

I. INTRODUCTION

Transformers play an important role in power generation, transmission and distribution. Records show that 40% of transformers fail due to mechanical problems. In this system, IoT-based monitoring and control can be suitable for manual operating systems. In the power system, the distribution transformer is the main equipment that distributes power directly to low voltage consumers, and its condition is an important part of the operation of the distribution network. Operation of transformer distribution in nominal conditions of their long-term life insurance. However, if their lives are overloaded, they are greatly reduced when the loss of proposals for a large number of customers affecting sudden failures and the reliability of the system. The winding of overload and increased oil and transformer is the main cause of the failure of the distribution transformer. Our system has been developed based on online monitoring of major operating parameters of distribution transformers and can provide useful information on the health of transformers that will help you optimize the transformer and maintain assets for a longer period of time There is. This system will help you identify the problem before the unwanted failure, leading to the long-term service of the transformer.

II. PROPOSED SYSTEM

Smart grid, next generation power is the actual method of digital transmission of electricity. This is a digital technology that allows quantum to communicate between utilities and clients. The project developed based on online monitoring of the main operating parameters of the transformer can provide useful information about the health of the transformer that helps uses the transformers optimally and to maintain assets for a longer period of time. This system will help you identify the problem before the unwanted failure, leading to the long-term service of the transformer. In a transformer monitoring system, we have used four sensors for monitoring voltage sensors, current sensors, temperature sensors, and oil level sensors. The power supply was used to operate the AT Mega 16 microcontroller and the GSM module. Figure shows the communication between the microcontroller and all other devices. The sensor receives the data and displays it on the LCD, while the GSM module sends a message (data) to the user with a programmatically designated number. Having unsafe data on the transformer can prevent errors and protect the system.

III. BASIC BLOCK DIAGRAM OF SYSTEM

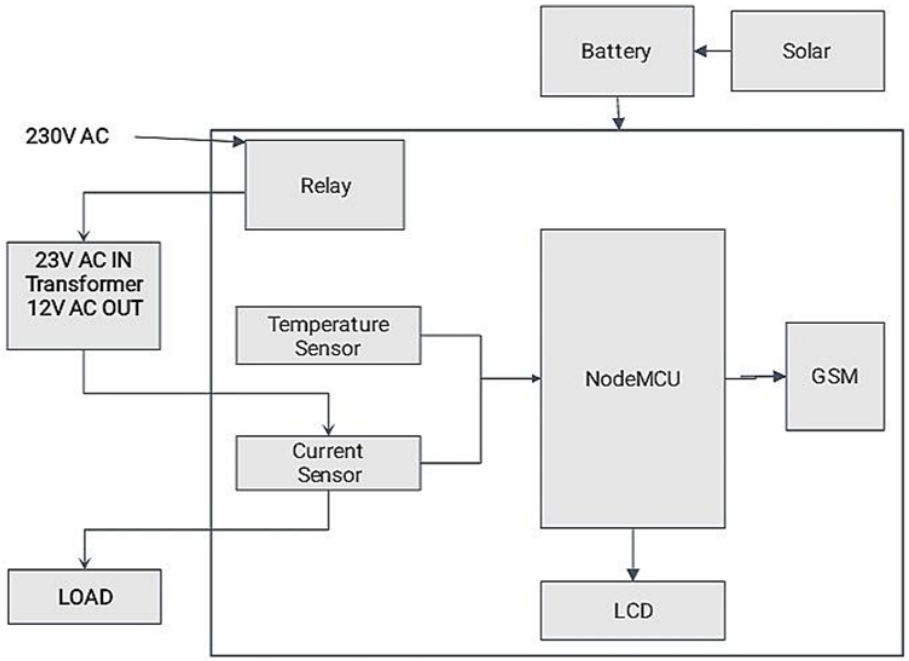

Figure: Transformer Monitoring System Block Diagram

IV. COMPONENTS

Voltage Sensor

A voltage sensor is a device that senses the voltage (AC or DC) in a wire and generates a signal proportional to it. The signal generated can be an Analog voltage or current. It can be used to display the measured voltage on a voltmeter, stored for further analysis in a data acquisition system, or used for control purposes.

Current Sensor

The current sensor is a device that detects the current flowing in the wire and generates a signal proportional to it. The signal generated can be an Analog voltage or current. It can then be used to display the measured current on an ammeter, or stored for further analysis in a data acquisition system, and also used for control purposes.

Oil level sensor

The oil level sensor is the device used to determine the oil level of the transformer. Oil-level reduction can be dangerous for transformers because oils begin to evaporate due to overheating and reducing oil levels. Therefore, this sensor represents the level and understands the level.

Temperature sensor

Temperature sensor is the simplicity of the on / off to control the internal heating system of the hot water in a simple thermostat of on / off. There are a variety of devices. Monitors complex installations for process control. While rejecting our school scientific class, we remember that the molecule and atomic movements cause heat and greater movements. The temperature sensor measures the amount of thermal energy or chill generated by the object or system to measure the physical change of this temperature generated by Analog or digital output, and "means" or detects.

LCD module

Recently, LCD is widely used to replace LED (7-segment LED or other multi-stage LED). Ability to display numbers, symbols and graphics. This is different from LEDs, which are limited to numbers and a few letters.

Transformer
AC 230-12V transformer, 1A output current, soft iron core

NODE MCU
1. ESP12 based microcontroller 4K memory 2.4GHz 8-bit Wi-Fi controller 1 Analog pins 9 digital pins Program via Arduino IDE

Relay
1. 5V DC SPDT Relay
2. Support 250VAC.
3. Support 110VDC. Max charge current 1000mA

Battery
1. Nominal Capacity: 10000 mAh.
2. Nominal Voltage: 3.7V
3. Charging Voltage: 4.2V

Solar panel
1. DC output voltage
2. Max output power 0.5W

V. ADVANTAGES

1. Low cost
2. Real-time monitoring
3. High efficiency
4. High Accuracy
5. System Stability Improvement

CONCLUSION

Monitoring of the distribution transformer is very useful than manual monitoring. It is not possible to increase the ambient temperature or load current because the oil level can always be monitored manually. After receiving a message for above, you can take action immediately to prevent unwanted supply transformers. The distribution network has many distribution transformers and each transformer can easily find 40 converters that cause errors from messages sent to mobile by connecting them to these systems. We can restore the system to a short time because we do not need to check all transformers and their phase current and voltage. Message reception times may vary depending on traffic on public GSM networks, but are still more efficient than manual monitoring.

RESULT

This system requires no manpower, ensuring efficiency and accuracy. This article provides precise details about energy theft. This will help manage parameter readings and log details of power thefts. This document will also help ensure safety and reduce theft rate without harming the environment and the environment.

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