International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 8, Issue 3, pp 251-254, March-2024

https://doi.org/10.47001/IRJIET/2024.803037

Transformer Health Monitoring and Data Analysis Using IOT

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***Abstract* - Transformers are a fundamental type of device that transmits power by converting induced current from one circuit to another. Step-up and step-down conversions of the induced current to voltage or current are common. The three phase transformers that are used between power transformers and electric poles are the primary focus of this application. The essential features, such as maintained temperature, voltage, and current, are fully controlled in real time. These characteristics are necessary for an industrial transformer's long lifespan and efficient power transmission. The Arduino Controller and Sensor, which check the current, voltage, and maintain temperature by regular observation, complete the transformer monitoring and control process. While there are many ways to maintain transformers, this project uses an Arduino controller to monitor and operate the transformer in real time. This eliminates the need for large, cumbersome computers and turns the transformer into an embedded system. Real-time control and monitoring of the transformer's temperature range and overvoltage are made possible by the design, which senses the transformer's properties and periodically sends the data to the processor. Using an IOT module, all data will be updated via a web server on Things Speak.**

Keywords: Transformer, Embedded System and Arduino.

I. INTRODUCTION

Energy in the form of electricity is incredibly convenient and helpful. In our contemporary, industrialized society, its significance is constantly expanding. The networks that comprise the electric power systems are incredibly large, intricate, and nonlinear. For improved operational efficiency, enhanced dependability, and financial gain, these electrical power systems are integrated.

If distribution transformers are operated under optimal and rated circumstances, their service life can be prolonged. However, overloading them shortens their lifespan considerably, resulting in unanticipated malfunctions and supply disruptions for a large number of users, which impacts system dependability. The two main reasons distribution transformers fail are overloading and inadequate cooling. The majority of power companies monitor their power transformers online using Supervisory Control and Data Acquisition (SCADA) systems; however, expanding the SCADA system to monitor distribution transformers online is a more expensive option. Currently, distribution transformers are manually monitored, meaning a person visits the transformer site on a regular basis to perform maintenance and logs important parameters. Information regarding sporadic overloads and transformer oil and winding overheating cannot be obtained by this type of monitoring. Transformer life may be considerably lowered by these elements. The foundation of our technology is the online monitoring of critical distribution transformer operational parameters, which can yield valuable.

Information about the health of transformers which is able to allow the utilities to optimally use their transformers and maintain the asset in operational for an extended Period. This method will enable us to identify issues before they become catastrophic, extending the transformers' useful life. This method uses an embedded system since, as we previously explained, it makes use of microcontrollers. Self-contained software embedded in hardware is known as an embedded system. An alternative way to think of an embedded system is as a computing system that is designed with optimal efficiency, allowing it to complete certain functions as rapidly as feasible. Embedded systems are typically set to a particular task. It also has the benefits of great cost savings, power consumption and greater reliability.

II. METHODOLOGY

Over Voltage Protection: A microcontroller monitors the pot's input, which is used to generate over voltage, and appropriate action is performed.

Over Current: A current transformer is used to detect overcurrent, which causes the relay to trip whenever it is encountered.

Temperature Sensor: Lm35s are frequently used to detect temperature rise faults, and the same are frequently communicated to the microcontroller. The microcontroller

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may therefore be used to determine this, and it will be updated via IoT.

IoT module: It is utilized to update data via a wifi module, which allows us to visually depict information on a thinkspeak online web server.

Buzzer: The buzzer will beep if a sensor detects anything.

LCD display: An LCD will be used to show all of the information.

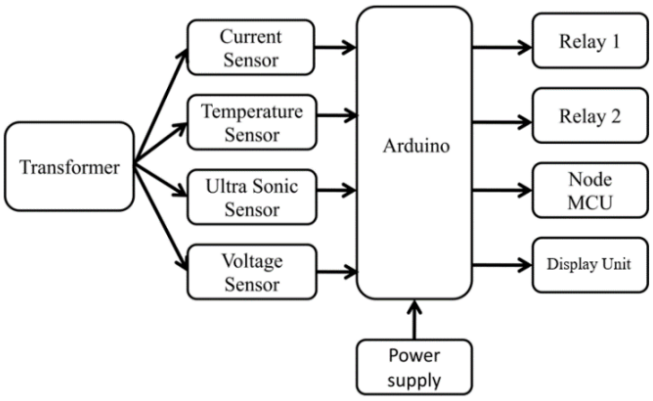

Figure 1: Block Diagram of Proposed Model

III. HARDWARE COMPONENTS

Arduino:

The Arduino circuit board and Arduino IDE can receive analog or digital input data from various sensors, turn on and off LEDs, activate motors, and do a host of other similar tasks. Every function is carried out by using the Arduino IDE to send a set of instructions to the ATtmega328 primary microcontroller on the board. Power (Barrel Jack), Power USB, voltage regulator, crystal oscillator, voltage pins (3.3v, 5v, gnd, vin), analog pins A0 to A5, icsp pin, power led indicator, tx and rx leds, 14 digital input/output pins, Aref, and Arduino reset are all included on the Arduino board.

Temperature Sensor:

A temperature sensor is an electronic device that records, tracks, or signals changes in temperature by measuring the ambient temperature and converting the input data into electronic data. Temperature sensors come in a variety of varieties.

Current Sensor:

A current sensor is a gadget that measures the electric current flowing through a wire and outputs a signal that is proportionate to the current. A digital output or analog voltage or current could be the created signal.

Voltage Sensor:

A precise, reasonably priced voltage sensor is the voltage sensor. The design of resistive voltage dividers serves as its foundation. It can reduce the input voltage of the red terminal connector by five times.

Buzzer:

The magnetic field of a magnetic buzzer attracts the vibrating disk to the pole. The disk vibrates at a frequency equal to the drive signal when an oscillating signal passes through the coil and creates a fluctuating magnetic field.

LCD:

An electronic display module known as an LCD (Liquid Crystal Display) screen has several uses. A basic module with two controllers and sixteen pins, a 16x2 LCD display is widely utilized in a variety of circuits and devices. These modules are favored over other multi-segment LEDs and seven segments because they are more affordable, simple to control, and allow for the display of unusual and customized characters as well as animations—something that seven segments cannot do. LCD is used to show the status of the system.

IoT Module:

An Internet of Things (IoT) module is a tiny electronic device that is incorporated into machines, items, and other things and connects to wireless networks to send and receive data. The constant connectivity that IoT modules offer is another important factor.

IV. CIRCUIT DIGRAM

The Arduino, Temperature Sensor, Current Sensor, Voltage Sensor, Buzzer, LCD Display, and IoT Module are the components of the security system. Every unit has access to the power supply. Figure 2 shows the circuit diagram.

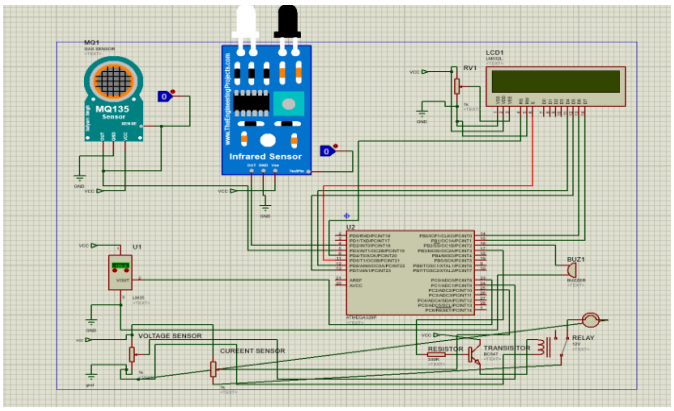

Figure 2: Circuit Diagram

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V. CONCLUSIONS

This technology would provide efficiency and accuracy by doing away with the need for human labor. Since it's not always possible to manually monitor load current and ambient temperature rise, IOT-based distribution transformer monitoring is dependable and somewhat helpful in comparison to manual monitoring. As soon as we receive notification of any anomaly, we will be able to take prompt action to prevent any disastrous distribution transformer breakdowns.

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Citation of this Article:

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