Condition Monitoring of Transformer using IOT

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Abstract –Transformer health needs to be continuously monitored in order to preserve grid operation's dependability. We are aware of the significance of transformers in the transmission and distribution of power. They make up the majority of the distribution grid's capital investment and are its primary constituents. Transformers are used to distribute and transmit power, lowering the primary voltage and raising it to the customer's usage voltage. Given how expensive distribution transformers are in the electrical sector. Systems for monitoring the health of transformers in real time assist in replacing equipment before it fails and stops distributing power. A solution for IOT remote transformer monitoring is proposed in this research. A web server will receive this data wirelessly, along with the transformer's output voltage, current, power, and available temperature.

Index Terms – Distribution Transformer, sensors, monitoring, and control.

I. INTRODUCTION

Transformers are expensive and vital components, thus safety measures must be followed. Transformers that come in many shapes, sizes, and connections. As a result, the energy source's authenticity depends heavily on its ability to continue functioning. An influence system is said to be flawed when a grid issue arises; in this case, the undesirable state may be short circuits, overcurrent, overvoltage, etc. Unintentional repairs are very costly and time-consuming, primarily involving the replacement of a malfunctioning transformer. Distribution transformers typically scale down 11 kV of electricity to 440 v. This project's protection system was created in such a straightforward manner that it can be monitored in real-time, and the application showed these parameters. For detecting

II. EXISTING SYSTEM

Distribution transformers serve as the central support structure of any electricity distribution network. In this work, we create an online monitoring system that offers several benefits, including improved management, condition evaluation, information collection, and engineer decision making. A distribution transformer's primary job is to convert high AC voltage to low AC voltage.

Distribution transformer life is influenced by rated circumstances. Transformers have a lengthy lifespan under normal operating circumstances; when they are overloaded, that lifespan decreases. Distribution transformer overload lowers system dependability. Distribution transformers are now manually checked for maintenance and parameter values are recorded. Certain errors in manual testing can be attributed to winding and oil.

The suggested technique enhances longevity and eliminates all the drawbacks of manual testing. An engineer may fully understand how a transformer operates by looking at a graphical depiction of all the parameters.

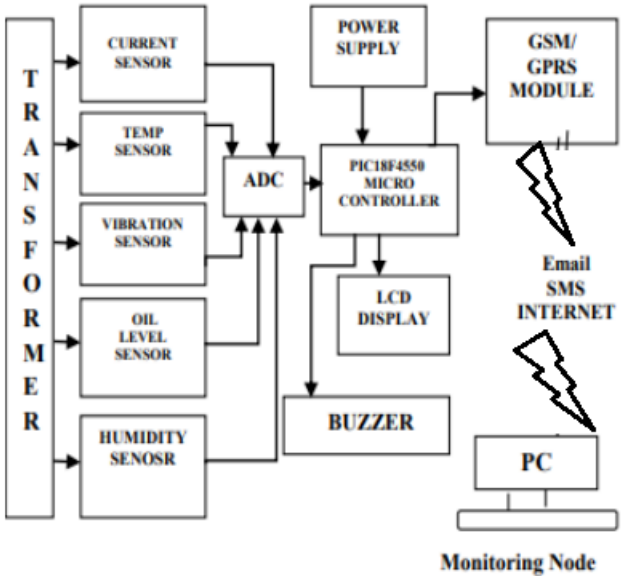

Fig.1 Block Diagram

III. PROPOSED SYSTEM

Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems.We propose an automatic IoT-based transformer monitoring system that can be accessed from anywhere over the internet. We utilise an Arduino-based system to monitor transformer characteristics. Our technology continually monitors and transmits data to the IOT system over the internet.

We utilise an ad IO, an OT platform, to send the voltage and current of the transformer to a server via the internet. It now presents parameter data to the user via an excellent GUI and

warns the user when the transformers reach normal operating conditions.

This enables transformer remote monitoring and ensures prevention of short-circuit situations. It suggests utilizing a microcontroller to automate the transformer. The transformer's oil level, temperature, and current are among the many factors that are tracked. The microprocessor trips the relay in the event of an abnormal condition, and it also indicates the reason for any temperature spikes, protecting the transformer from serious harm.

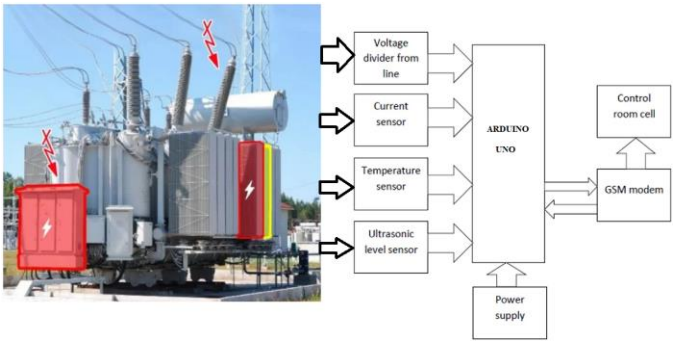

Fig. 2. IOT based condition monitoring of Transformer

IV. REVIEW OF CONTROLLERS

In market at present there are currently various processing units available from small controllers to large processors. In this project used for efficient controllers is demanded and good technical feasibility. According to the industries which needed highly efficient processing unit for their control action and also the production process should fit in there industry standard.

There are various controllers available in the market out of which the two of the controllers which are mostly used for building prototype they are Arduino and Raspberry PI. A detailed comparison has been shown in the following table.

Table 1 Comparision between Arduino and Raspberry PI

Raspberry pi3	Arduino Uno/Node MCU
Stronger and quicker processor multitasking available.	Easier to connect analog sensor motor and other electric component.
Built in Ethernet port, Wi-Fi, Bluetooth capability.	Variety of shield that can add functionality.
OS can be switched easily	Long setup not needed just plugged n and code well run.
Audio output camera port USB output all included.	Price is cheaper and will not need much cables.
Can be more expensive.	Can be cheap.
Long setup will need extra component when first starting.	No internet connectivity right out the box.
Need to connect online and multiple activities going on same time.	Can run one code at time so cant multitask activities lower speed.

From table as seen above the Raspberry Pi has more processing power and it is more efficient in processing information but as far as the budget has been concerned we are going to use Arduino UNO because it is easy to implement.

We can also use Arduino mega but we required only 32kb memory and mega 256kb mega but we memory so we choose UNO. we can use code of UNO in mega and can run the system too. `

V . HARDWARE STRUCTURE

The major parts of hardware are Current sensor, Voltage Sensor and Temperature Sensor.

Current Sensor

The current sensor is based on the Allegro ACS712ELS chip. It's operating with full-scale values of 5A, 20A, and 30A. Linear Hall Circuit with a copper conduction path located near the surface.

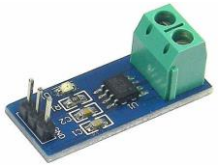

Fig.3. Current Sensor

Voltage Sensor

It is a potential divider to decrease any input voltage by a factor of 5, Based on the principle of resistive voltage strategy. Because voltage sensor operating range is 0 - 25V.which makes input voltage five times smaller.

Temperature Sensor

It is a chip that tells what the ambient temperature of transformer by using solid-state technique and to amplify the voltage precisely, which can be done effortlessly to generate an analog signal that is directly proportional to temperature.

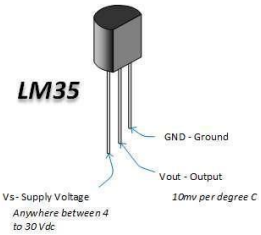

Fig.4. Temperature sensor

VI. EXPECTED RESULT

CT and PT are used for detection of over-current and over-voltage respectively. Hence these will detect any reasonably condition occurs and display it on application API(Application programming interface) and also instructs relay to disconnect load. LM35 is employed as temperature sensor which detects transformer temperature. By means of hydrometer moisture sensor we will determine oil level of the transformer. to work out the status of the transformer we are using ESP8266 serial WI-FI wireless transceiver module is use to transmit the info and it will display the all parameters on the application.

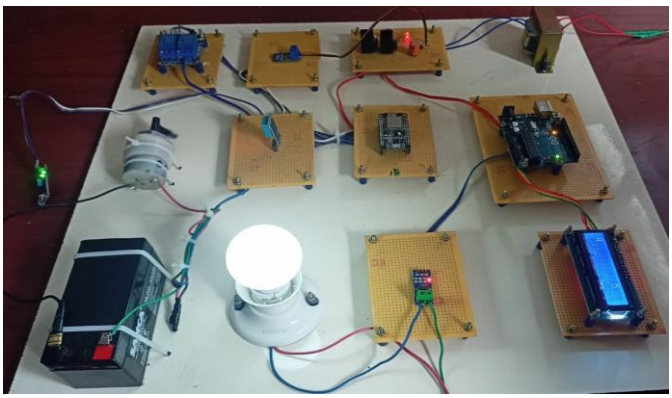
Fig 5. Prototype model

CONCLUSION

In this project, IOT technology is used to monitor the transformer performance on the distribution system. Utilising the internet, create a wireless transformer monitoring system. Multiple people were successfully taught and tested on the system. The suggested system has the advantages of efficient transformer monitoring and management, low power consumption, straightforward hardware and hand gestures, ease of use, and operator friendliness.

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