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TRANSFORMER FAULT DETECTION USING IOT

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ABSTRACT—

In the process of distributing electric power, the transformers is known as the "heart of "Transmission and Distribution" Distribution is important because it fulfils a vitalfunction, especially for many applications. However, now there are a lot of restrictions due to lack of any routine maintenance and, in the situation of an overload, the problemisn't discovered until it has already happened at the transformers on a different day. Usually, this happens when afuse is installed incorrectly. The load results in the transformer's capacity being exceeded. This study recommends a procedure for avoiding protection failure by frequently evaluating select circuit for low voltage in order toreduce transformer failure. The IoT-based findings were reported online using the New application. The shift in electrical data is one indicator of the status of the transformerunder examination. If there is a deviation from the transformer's typical characteristics, the state of the transformer may be known beforehand by transmitting data from microcontroller and then passing it to a later application,which further shows the measured data for the transformer location. Any deviations from the transformer's usualcharacteristics will be quickly identified by this monitoring system.

Keywords— Distribution transformer; PIC microcontroller; GSM module; current; temperature; oil level; vibration; humidity; Remote terminal Unit (RTU); Monitoring Unit. Overload, IoT, Arduino, and microcontroller are all terms used to describe distribution transformers.

NTRODUCTION

An essential part of the electricity generation and distribution system is the transformer. If the transformer hasan unforeseen fault while it is in service, the economy and public safety will suffer greatly. More thorough monitoringand diagnostics of transformers are therefore essential. The"internet of things" use in the electrical system may improvenot only security but also the central network for information exchange and power transfer, as well as the reliability of that transmission. In this industry, technology advances swiftly. However, uneven maintenance causes a lot of current limits, and usually, as in the case of an overload, the problem is not discovered until after the transformer has already experienced it. Overloading occurswhen the transformer is used beyond its intended capacity. A voice call is used by an online IoT to report the outcome.One sign of the state of the transformer under investigationis the difference in temperature from the norm. A microcontroller signal may be used to rapidly determine thestate of the transformer if it performs differently from how it typically does.

LITERATURE SURVEY

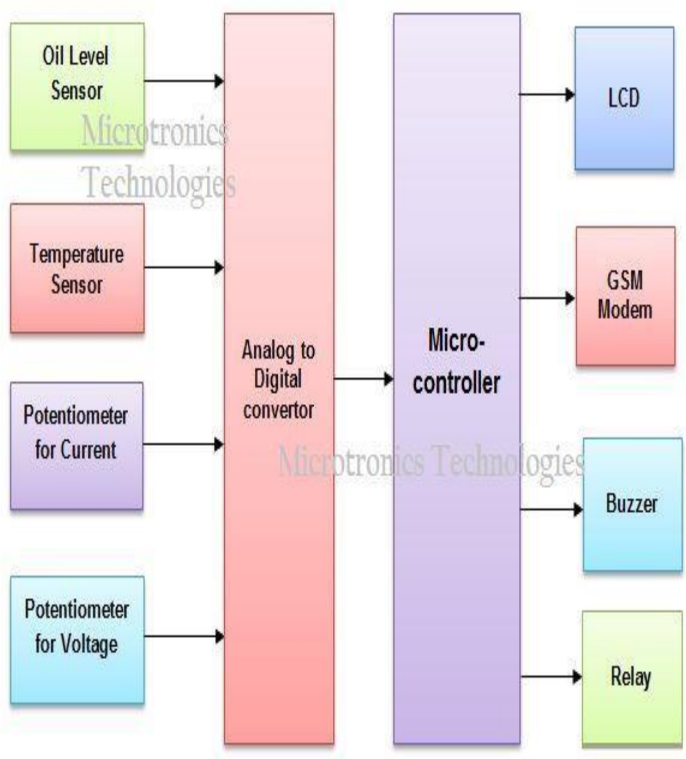
Distribution transformers serve as the foundation of everyelectricity distribution network. In this study, we create an online monitoring system that has several benefits for engineers, including data collection, improved management,condition evaluation, and decision-making. Distribution transformers' primary purpose is to change high AC power into low AC voltage. The rated circumstances determine thelifespan of the distribution transformer. Transformers have along lifespan while operating under normal conditions, and their lifespan decreases if they are overworked. System dependability is decreased by distribution transformer overload. Distribution transformers are now manually maintained and parameter values are recorded. In manual testing, there are several flaws that are brought on by oil andwindings. The life of the transformer is increased and all manual testing's drawbacks are eliminated by the suggested approach. The parameters are graphically represented tooffer engineers a thorough understanding of how the transformer operates.

Modern technology is evolving at a breakneck pace. The transformer is the key component of transmission and distribution in the world of electric power distribution. That isstate, a transformer should perform at its best. Power transformers that are in a voltage state where a mistake cannotbe recognised in advance are a general example of constraints.It is now very difficult to determine the status of the transformer suffering interference if interference occurs outside of the maintenance schedule. The only does routine maintenance in accordance with the schedule at a specific time.

The Fuse placed, which is inappropriate or greater than what should be installed, is an example of an occurrence thatoccurred on the field. The load transformer is above 100% as a result. An online transformer condition monitoring system is necessary as a result of this circumstance. It givesthis instrument the idea of the Internet of Things. Using thesensor, we can keep an eye on the current. which the programme will use to show information based on thelocation of the transformer after being read by the microcontroller. A current sensor for parameters to determine the condition of the secondary transformer is included in the tool.

Although this would increase prices, the advantage is that it will be simpler for staff to look into disturbances andexpedite handling. When there is an interruption, it typicallytakes the employee 45 to 60 minutes to locate the source ofthe problem. Also, this makes it simpler for workers to effectively manage their time by instantly locating any interruptions. With this idea, Such a monitoring is crucial for ensuring reliable and sustainable delivery of electrical energy.

SYSTEMARCHITECTURE



A common transformer condition monitoring system iscapable of tracking a number of variables, including oil temperature, gas content, moisture content, oil level, voltage, and current. This paper's major goal is to build andexecute an embedded mobile and Internet of Things (IoT)- based system. To meet this goal, we have developed a project-IoT-based transformer failure detection method. Through the use of a buzzer and voice calls from engineers,this aids in the early detection of municipal problems.

SYSTEM IMPLEMENTATION

A typical transformer condition monitoring system can monitor a variety of components such as oil level, voltage, current, and so on.

The primary objective of this article is to design and implement an embedded mobile and IoT-based system that uses sensors to determine the oil level, voltage, current, andso on.

A predefined programme uploaded to the Arduino calibratesthe given input values and provides the required output.

This work entails monitoring the level range of transformeroil. The Arduino receives the measured values.

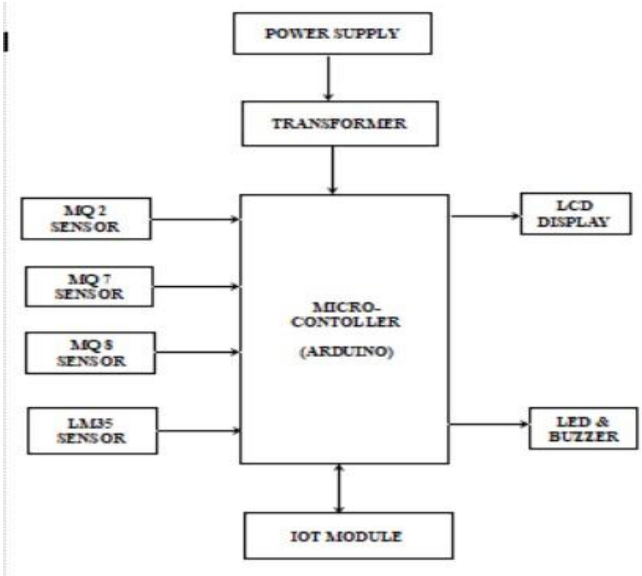
In the comparators, the values provided by the sensors are measured and compared to the nominal value predeterminedin the programme. If the measured value changes, the system will send an alert to the concerned person using the GSM module, and the buzzer will beep and place a call as aphysical indication.

We will also set a threshold frequency level so that if the voltage crosses that level, GSM will place a call, and if it blasts, we will produce a buzzer.

A local display LCD screen displays the programmed output. The same output is also sent via the GSM module tothe internet server and then to the mobile application programmed in the Arduino.

Data will be saved and can be used for further research. TheGSM modem serves as a short message server, sending parameters as SMS.

The information on the state of health of the transformer andalarms raised when measured values exceed appropriate limits. can be provided to the operator by using software to store and perform the dissolved analysis of the measureddata.

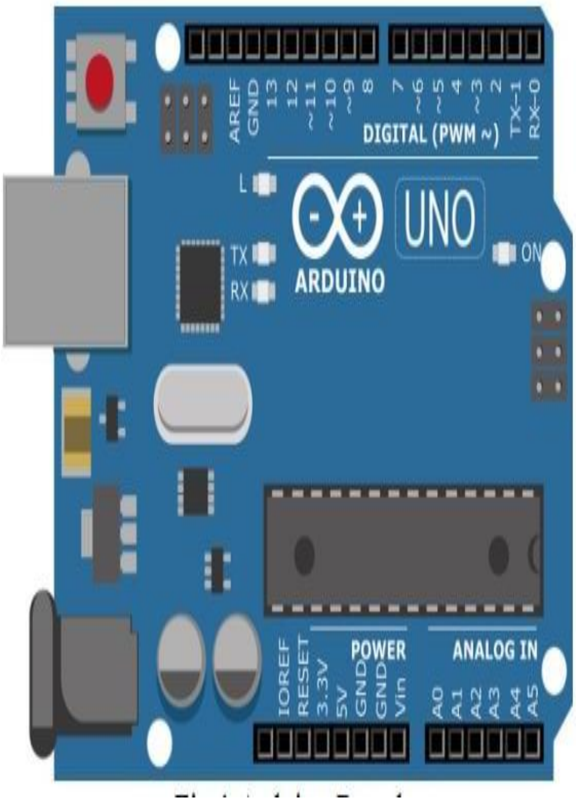


BLOCK DIAGRAM

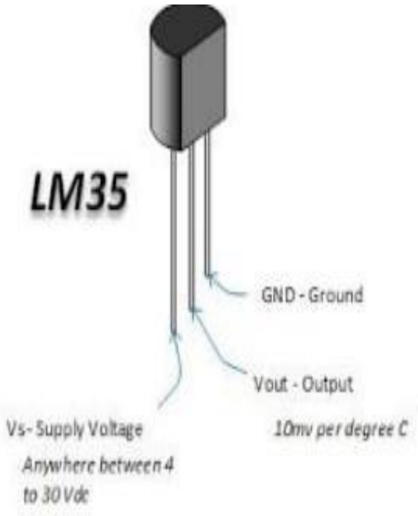
CURRENTSYSTEM	**PROPOSEDSYSTEM**
In the current system, the employee must manually locate the problem. **Cons: -** **The current system include the lengthy identification process for faults the error must be manually located by theemployee.**	**The primary idea behind a sensor-basedintelligent faultdetection technique is that the time it takes to discover a fault is reduced.** **Advantages: -** **Benefits of the suggestedapproach include a shorter time frame for fault detection. The** **microcontroller will use IOT technology to reportthe detected fault to the WEB SERVER.**

COMPONETS DESCRIPTION

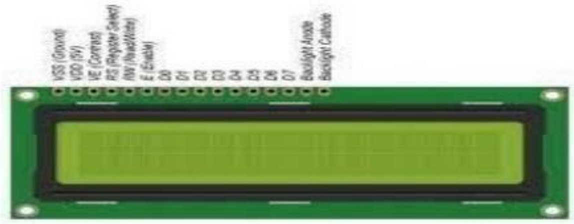
Arduino: - In order to develop digital equipment andinteractive objects that really can read and operate both physically and digitally, users of Arduino's open - sourced hardware and software design and produce single board microcontrollers as well as kits of microcontrollers. The boot loader that comes pre-programmed on Arduino microcontrollers makes it easier to upload programmes to the chip's flash memory. Any programming language with a compiler that produces binary bytecode for the target machine can be used to create programs for Arduino hardware.



GSM MODULE: - The Hall Effect theory serves as the foundation for the allergo ACS712 used as. A voltage is produced across the edges of a current-carrying conductorwhen it is put in a magnetic field that is perpendicular to the directions of the current and the magnetic field. It's utilized to gauge high-frequency alternating current. In order for a microcontroller to read alternating current withease, it lowers it to a lower value.



LCD DISPLAY: - An LCD is built using either an active matrixor a passive matrix display grid. An alternative term for an active-matrix LCD is a coating transistor (TFT) display. A grids of conductors having pixels at each junction makes upa passive matrix LCD. A current is transferred between twogrid conductors in order to control light for every given pixel. As each pixel intersection in an actively matrix has a transistor, controlling the brightness of a pixel with less current is possible. Because of this, the current inside an active-matrix display might be Off and On more frequently,lengthening the time it takes for the screen to refresh.



Temperature sensor: - Precision integrated-circuit thermistors of the LM35 series have voltage waveform thatare linear proportional to the temperature in Celsius. The operating temperature range for the LM35 is -550 to +1200

C. The LM35's temperature can be adhered to or fixed to asurface, and it will remain between 0.010 C of a temperature rise. A comparator circuit can be used todetect overheating by feeding the LM35's temperatureoutput into it.

Current sensor: - The ESP8266 Wi-Fi module is a self- contained SOC with an integrated TCP/IP protocol stack that can provide access to your Wi-Fi network to any microcontroller. The ESP8266 can host an application or offload all Wi-Fi networking functions from another application processor. Each ESP8266 module comes preprogrammed with an AT command set firmware, meaning, you can simply hook this up to your arduino device and get \sabout as much WiFi ability as Wi-Fi offers.The ESP8266 module is a low-cost board with a large and rapidly growing community.

Supply Circuit: - The circuits' required power is supplied bythe supply circuit. 230V single phase AC is changed to 12V using a step down transformer. The power supply circuit receives the voltage of the step-down alternating current. Sent by the circuit that supplies power are +5, -5, +12, and -12 volts. The driving circuit requires both 5V and 12V, andthe Uno and LCD display both require 5V.

PROPOSED WORK

The design and construction of an embedded mobile Internet

- of - things system to check voltage fluctuation, oil level, and oil temperature is the main objective of this project.

METHODOLOGY

As part of our job, we monitor the operation of the transformer by measuring the over voltage, over current, oillevel, oil current, and winding temperature and comparing them to the nominal value in a comparator. The system willnotify the concerned individual of an error if the calculationthat determines changes. Install sensors on the transformersand its surroundings, such as temperature, vibration, and current/voltage sensors. The sensors will be coupled with IoT hardware so that the sensor data may be sent to a centralised system for analysis.

CONCLUSION

The design, implementation, and testing of a mobile distribution transformer monitoring system. The system is configured to capture and transmit information about abnormal operating parameters to a mobile device througha GSM network while being attached to a distribution transformer. Given the general GSM network load, the SMSmessage delivery time ranged from 2 to 10 seconds. The system hardware was built using components that were readily available. The experimental outcomes confirmed what was predicted. This system may be enhanced with a server module that will regularly collect and store data aboutthe transformer parameters for each distribution transformerbelonging to a certain service in a data model. The utility may monitor the operating behaviour of its transformerusing the recorded data and discover defects before any catastrophic breakdowns, which would result in considerable cost savings and improved system dependability.

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