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IoT Based Transformer Health Monitoring System

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Abstract -Transformers are basic design of device which give power transmission by transforming induced current from one circuit to other circuit. The induced current are often converted step up &step down of current or voltage. This application mainly concentrates on the three phase transformer which are utilized in between electric poles & power transformers. The real time controlling is completed on the fundamental feature like current, voltage, temperature maintained. These features are essential for effective power transmission &long life of industrial transformer. The monitoring & control of the transformer is finished by using Arduino Controller, Sensor which check the current, voltage & maintain temperature by regular observation. There are various transformer maintenance techniques, but this project gives real time monitoring &controlling of transformer by using arduinouno Controller which replace the bulky computers making it as embedded system. The design is to sense features of transformer & send the data regularly to the processor, so this design makes possible to achieve real time control &monitoring of current voltage exceeded & temperature range in the transformer.All data are going to be updated over web server using IOT module on things speak.

***Key Words*:**Transformer, Embedded System and Arduino.

1.INTRODUCTION

Electricity is a very handy and useful kind of energy. It plays an ever growing role in our modern industrialized society. The electric power systems are highly non-linear, extremely huge and complicated networks. Such electrical power systems are unified for economic benefits, increased reliability and operational advantages.

Distribution transformers have an extendedservice life if they're operated under good and rated conditions. However, their life is significantly reduced if they're overloaded, leading to unexpected failures and loss of supply to a large number of consumers thus effecting system reliability. Overloading and ineffective cooling of transformers are the main causes of failure in distribution transformers. Most power companies use Supervisory Control and Data Acquisition (SCADA) system for online monitoring of power transformers but extending the SCADA system for online monitoring of distribution transformers is an upscale proposition. Distribution transformers are currently monitored manually where an individual periodically visits a transformer site for maintenance and records parameter of importance. This kind of monitoring cannot provide information about occasional overloads and overheating of transformer oil and windings. These factors can significantly reduce transformer life. Our system is intended based upon online monitoring of key Operational parameters of distribution transformers can provide useful

Information about the health of transformers which is able to help the utilities to optimally use their transformers and keep the asset in operational for an extended Period. This technique will help us to spot problems before any catastrophic Failure, thus leading to an extended life service for transformers. This technique relies on embedded system as we are using microcontroller as discussed before. Embedded systems are self-contained programs that are embedded within a piece of hardware. Embedded systems are usually set to a particular taskin a different way to think about an embedded system is as a computing system that's created with optimal efficiency, thereby allowing it to finish specific functions as quickly as possible. It also has the benefits of great cost savings, power consumption and greater reliability.

2. METHODOLOGY

Over Voltage Protection: Over voltage is generated using pot, which input is monitored by microcontroller and regarding operation is taken.

Over Current: Whenever the overcurrent condition is observed the relay goes off, overcurrent is detected using current transformer.

Temperature rise fault are often detected using lm35 same are often sent to the microcontroller. Thus can be determined using the microcontroller and it'll updated over iot.

IoTmodule: It's used to update data through wifi module within which we are able to represent graphically in thinkspeak online web server.

Buzzer:If any sensor detect then buzzer will beep.

Lcddisplay:All information are going to be displayed on LCD.

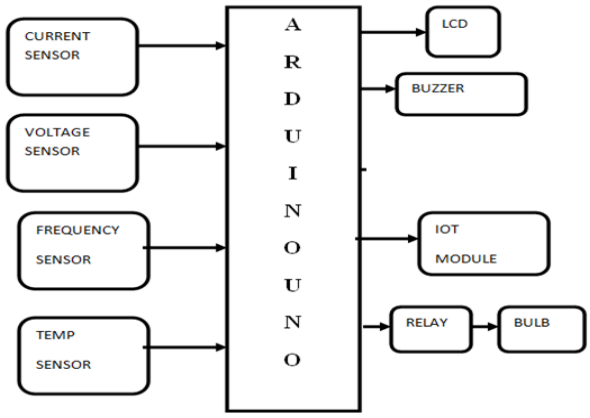

Fig-1: Block Diagram of Proposed Model

3. HARDWARE COMPONENTS

Arduino:

Arduino circuit board with Arduino IDE is capable of reading analog or digital input signals from different sensors, activating the motor, turning LED on/off and do many other such activities. All functionalities are performed by sending a set of instructions to the ATtmega328 main microcontroller, on the board via Arduino IDE. The Arduino board also includes Power USB, Power (Barrel Jack), voltage regulator, crystal oscillator, voltage pins (3.3v, 5v, gnd, vin), A0 to A5 analog pins, icsp pin, power led indicator, tx and rxleds, 14 digital input/output pins, Aref, and Arduino reset.

Temperature Sensor:

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors.

Frequency Sensor:

Frequency domain (FD) sensor is an instrument developed for measuring soil moisture content. The instrument has an oscillating circuit, the sensing part of the sensor is embedded in the soil, and the operating frequency will depend on the value of soil's dielectric constant.

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 a digital output.

Voltage Sensor:

Voltage Sensor is a preciselow-costsensor for measuringvoltage. It is based on the principle of resistive voltage divider design. It can make the red terminal connector input voltage to 5 times smaller.

Buzzer:

The vibrating disk in a magnetic **buzzer** is attracted to the pole by the magnetic field. When an oscillating signal is moved through the coil, it produces a fluctuating magnetic field which vibrates the disk at a frequency equal to that of the drive signal.

LCD:

LCD (Liquid Crystal Display) screen is an electronic display module and finds a wide range of applications. A 16x2 LCD display is a very basic module that has 2 controllers with 16 Pins which is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi-segment LEDs as they are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations. The status of the system is displayed using LCD.

IoT Module:

An IoT module is a small electronic device embedded in objects, machines and things that connect to wireless networks and sends and receives data. Another key differentiator of IoT modules is that they provide always-on connectivity.

4. CIRCUIT DIGRAM

The security system consists of Arduino, Temp Sensor, Frequency Sensor, Current Sensor, Voltage Sensor,Buzzer, LCD Display and IoT Module. The power supply is provided to all the units. The circuit diagram is represented in Figure 2
.

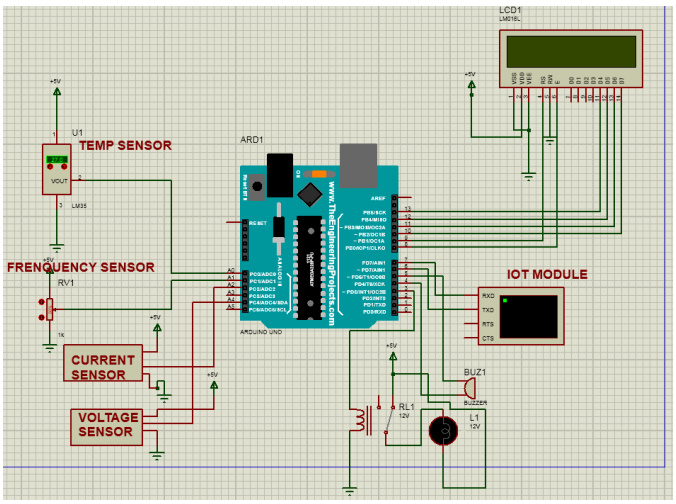

Fig-2: Circuit Diagram

5. CONCLUSIONS

This system would be eliminating the necessity of human power and thus providing efficiency and accuracy. The IOT based monitoring of distribution transformer is kind of useful as compared to manual monitoring and also it's reliable because it's not possible to always monitor the ambient temperature rise,load current manually. After receiving of message of any abnormality, we will be able to take action immediately to stop any catastrophic failures of distribution transformers.

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REFERENCES

1. Performance Monitoring of Transformer Parameters in (IJIREEICE) Vol. 3, Issue 8, August 2015.

2. Chan, W. L, So, A.T.P. and Lai, L., L.; "Interment Based Transmission Substation Monitoring", IEEE Transaction on Power Systems, Vol. 14, No. 1, February 2014, pp. 293-298.

3. J. H. Estrada, S. Valencia Ramı´rez, C. L. Cortés, E. A. Cano Plata, "Magnetic Flux Entropy as a Tool to Predict Transformer's Failures", Magnetics IEEE Transactions on, vol. 49, pp. 4729-4732, 2013, ISSN 0018-9464.

4. Hongyan Mao, "Research of Wireless Monitoring System in Power Distribution Transformer Station Based on GPRS", Volume 5, C 2010 IEEE,978-1-4244-5586-7/10/$26.00.

5. Zhang Xin, Huang Ronghui, Huang Weizhao, Yao Shenjing,Hou Dan &ZhengMin,"Real-time Temperature Monitoring System Using FBG Sensors on immersed PowerTransformer",DOI:10.13336/j.10036520.hve.2014.S2.048, Vol.40, Supplement 2: 253-259v, August 31, 2014.

6. GSM based Transformer Condition Monitoring System Ms.SwatiR.Wandhare, Ms.BhagyashreeShikkewal Special Issue-2 ISSN : 24541311 International Conference on Science and Engineering for Sustainable Development (ICSESD-2017)(www.jit.org.in)International Journal of Advanced Engineering, Management and Science (IJAEMS).

7. Monika Agarwal and Akshaypandya, "GSM Based Condition Monitoring of Transformer", IJSRD - International Journal for Scientific Research&Development| Vol. 1, Issue 12, 2014 | ISSN (online): 2321-0613.

8. Leibfried, T, "Online monitors keep transformers in service", Computer Applications in Power, IEEE, Volume: 11 Issue: 3, July, 2017. International Journal of Pure and Applied Mathematics Special Issue 963.