Design and Implementation of Transformer Health Monitoring System

[1]Dr. J. Narendra Babu, [2]M. Madhu Priya, [3]B. Kalpana, [4]M. Vamsi and [5]G. Bhargavi
[1] Professor, CREC, Tirupati, AP, India, [2,3,4,5] Student, ECE Dept, CREC, Tirupati, AP, India

----

ABSTRACT: This Project aims at monitoring the oil & temperature of multiple transformers continuously and protects them from overheating. So, this project is helpful to monitor every transformer easily. This project presents design and implementation of a mobile embedded system to Monitor. By using microcontroller and wireless communication module, we simply monitor oil level and temperature of the transformer. Here we must place Oil level Sensor and temperature sensor to find oil level and temperature respectively. This is implemented by using on-line measuring system using Internet of Things (IOT), with microcontroller and sensors. The output values of sensors are processed and recorded in the system memory. System programmed with some predefined instructions to check abnormal conditions. If there is any abnormality on the system, details are automatically updated in the internet and the system sends messages to the mobile phones. This Internet of Things (IoT) will help the utilities to optimally utilize transformers and identify problems before any catastrophic failure occurs.

*KEY WORDS***:** Node MCU, Ultrasonic sensor, Voltage sensor, Temperature sensor

---

1. INTRODUCTION

Electricity plays an important role in our life. Every moment of our life depends upon electricity. Electricity has several components and equipment helping humans to transfer and regulate the distribution according to usage. The most crucial equipment for transmission and distribution of electric power is the transformer. In power systems, an electrical equipment distribution transformer directly distributes power to the low- voltage users and its operation condition is an important criterion of the entire network operation. Overloading, oil temperature, load current and ineffective cooling of transformersare the major causes of failure in distribution transformer. When a transformer fails, an adverse effect occurs in the continuity of transmission and distribution systems resultingin an increase of power system cost and decrease of reliability in electric delivery. As transformer is a combination of many parts, this all parts must be checked regularly to maintain the transformer in perfect operating conditions. The monitoring devices orsystems which are presently used for monitoring distribution transformers have some problems and deficiencies. If there is any abnormality on the system, details are automatically updated in the internet and the system sends messages to the mobile phones.

2. EXSITING METHOD

Figure 1: Hardware setup

The device has a micro processor and global System for Communication and more potentiometers. The device is more complicated to maintain. The device cost is high. It sent a message only to the registered mobile when any abnormalities present in the transformer.

3. PROPOSED SYSTEM

In this system, oil level and temperature of the transformers are observed continuously using ultrasonic sensor for oil level monitoring and temperature sensor for monitoring transformer temperature. If there is any abnormality on the system, details are automatically updated in the internet and the system sends messages to the mobile phones. In this potentiometer is for voltage variation. The advanced Transformer Health Monitoring System (THMS) includes Microcontroller, voltage sensor, ultrasonic device, temperature sensor. The
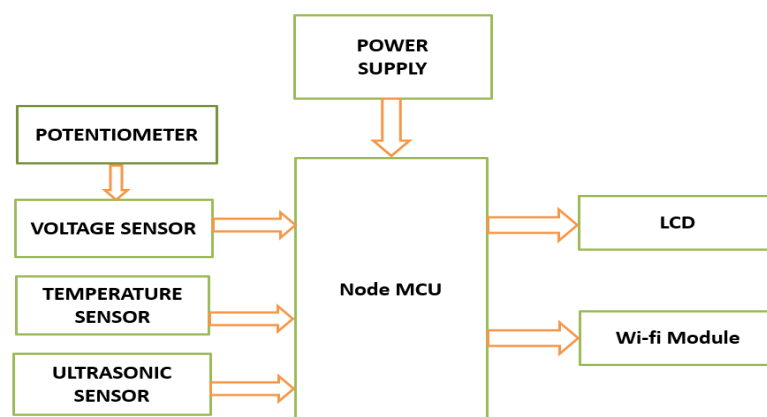
THMS continuously measures the line voltage, oil level and temperature serially. System reads corresponding values for further calculation for monitoring purpose and does the functions according to the program loaded in it.

Figure 2: Block Diagram of Proposed System

System Design

The main purpose of our project is to monitor the real time transformer. We checking the parameters like oil level, voltage value, and temperature level. In this system we continuously monitor the condition of the transformer performance using sensors with IoT.
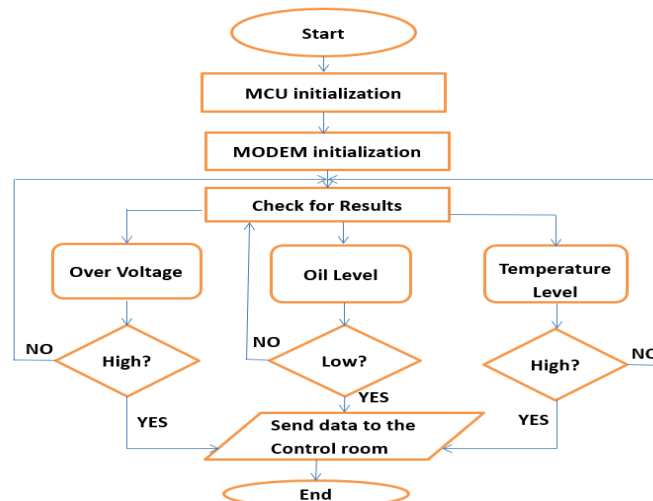

Figure 3: Flow Chart of Proposed System

4. RESULTS

The Hardware components of the transformer health monitor system are connected and the power supply is given and it shows as figure 4.
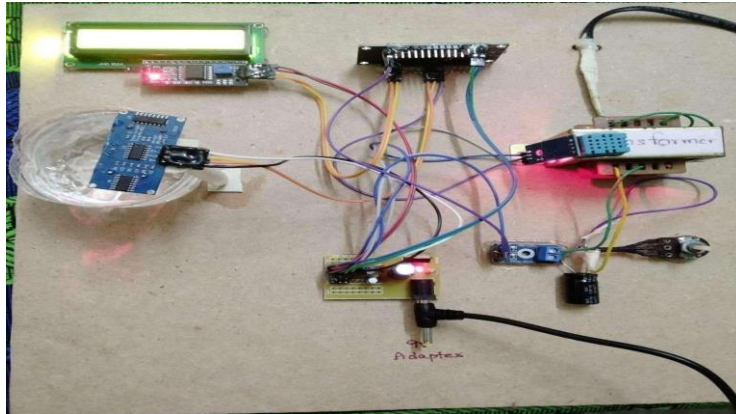

Figure 4: Hardware setup

Step 1: When the power supply is given, it shows Sending data IoT as shown in the figure 5.

Figure 5: Displaying that Sending Data IoT

Step 2: When humidity value is detected it displays the value of the humidity as shown in the figure 6.

Figure 6: Displaying Humidity Value in LCD

Step 3: When temperature value is detected it displays the value of the temperature as shown in the figure 7.

Figure 7: Displaying Temperature Value in LCD

Step 4: It displays the temperature value is safe for the transformer or not in LCD display as shown in the figure 8.

Figure 8: Displaying that Temperature is Safe in LCD

Step 5: It displays the oil level and the level is safe for the transformer in LCD display as shown in the figure 9.

Figure 9: Displaying that Oil Level and Condition of Oil Level in LCD

Step 6: It displays the oil level and the level is safe for the transformer in LCD display as shown in the figure 10.

Figure 10: Displaying that Voltage Level and Condition of Voltage Level in LCD

Step 7: We can see the alert messages for oil level and temperature value to the registered emails from the system as shown in the figure 11.
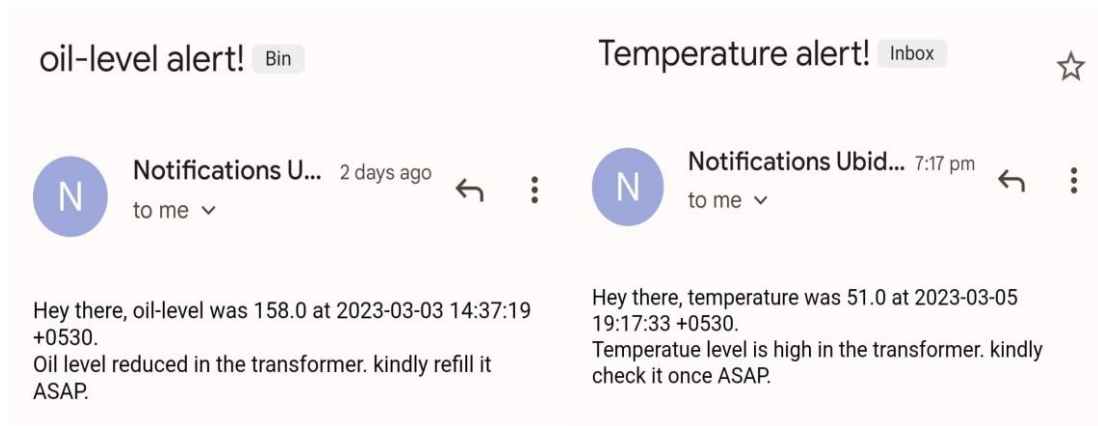
Figure 11: Alert Message of Oil Level and Temperature Level

Step 8: It displays the temperature level and the humidity value of the transformer in LCD display as shown in the figure 12.

Figure 12: Dashboard of the Input Sensor Data 1

Step 9: It displays the oil level and the voltage level of the transformer in LCD display as shown in the figure 13.
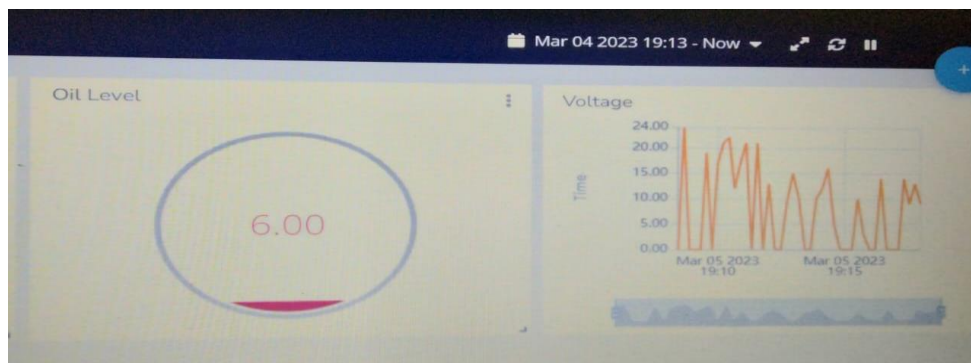

Figure 13: Dashboard of the Input Sensor Data 2

5. CONCLUSION

This project is proposed for the purpose of Transformer health monitoring system will help to identify the voltage level, temperature level, oil level by using IoT was designed in this project.

The conclusion of the proposed system is that it is intelligent in detecting the faults in transformer and we can take some preventive action. This IOT based monitoring of transformer health is quite efficient than manual monitoring. The details about the transformer are been updated automatically in UBIDOTS webpage, when the transformer is in abnormal condition.

REFERENCES

[1]   Amol A. Sonune, Mayur S. Talole, Sumit V. Sonkusale, Ankit A. Akotkar, Piyush S. Jaiswal, and Vivek N. Gayki, "Condition Monitoring of Distribution Transformerusing IOT", International Journal of Engineering Research & Technology, Volume No. 9, Issue No. 06, 335-338, 2020.

[2]   Abrar Shaikh, Payal Nannewar, Diksha Mangate, Rupali Gajapure, Swinal Tirpude, and Avinash Ikhar, "IOT Based Transformer Monitoring System", International Journal of Scientific Research in Science, Engineering and Technology, Volume No. 7, Issue No. 3, 115-119, 2020.

[3]   Biju Rajan. B, Amanraj. S, Akhil. S, and Nayana. S, "IOT based Distribution Transformer Health Monitoring System Using Arduino, Nodemcu and Thingspeak", Volume No. 8, Issue No. 4, 673-676, 2019.

[4]   M. Sudalaimani, P. Lakshmi priya, J. Pooja, and M. Vigneshwari, "Real Time Transformer Health Monitoring System Using GSM and IOT", International Research Journal of Engineering and Technology, Volume No. 6, Issue No. 3, 3515-3518, 2019.

[5]   Priyanka. R, Chaithrashree. N, Sangeetha. S, Bhagya Lakshmi, and Divyashree. A, "Design and Implementation of Real-time Transformer Health Monitoring System using Raspberry-pi", International Journal of Engineering Research &Technology, Volume No. 6, Issue No. 13, 1-5, 2018.

[6]   N. Nagaraju, and M. S. Kiruthika, "Fault Sensing in a Remote Transformer Using GSM & Automatic ON/OFF of Street Lamps", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Volume No. 2, Issue No. 10, 4620-4626, 2013.

[7]   S. Dharanya, M. Priyanka, R. Rubini, and A. Umamakeswari, "Real Time Monitoring and Controlling of Transformers", Journal of Artificial Intelligence, Volume No. 33, Issue No. 42, 33-42, 2013.

[8]   Vivek Landage, Ashish Kharche, Vadirajacharya. K, and Harish Kulkarni, "Transformer Health Condition Monitoring through GSM Technology", International Journal of Scientific &Engineering Research, Volume No. 3, Issue No. 12, 1-5, 2012.

[9]   M. S. Sujatha and Dr. M. Vijay Kumar, "On-Line Monitoring and Analysis of Faults in Transmission and Distribution Lines Using GSM Technique", Journal of Theoretical and Applied Information Technology, Volume No. 33, Issue No. 2, 258-265, 2011.

[10] Abdul Rahman, Ai Ali, Abdul Khaliq and Muhammad Arshad, "GSM- Based Distribution Transformer Monitoring System", IEEE MELECON 2004, 999-1002, 2004.