



INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

A REVIEW ON REAL TIME BASED MONITORING OF DISTRIBUTION TRANSFORMER USING IOT

Shubham A. Shindole¹, Pranoti R. Raghorte², Mahesh K. Sukalkar³, Pradnya R. Kale⁴

¹Student, Department of Electrical Engineering, JDIET, Yavatmal, Maharashtra, India, sashindole12@gmail.com
²Student, Department of Electrical Engineering, JDIET, Yavatmal, Maharashtra, India, raghortepnanoti7@gmail.com
³Student, Department of Electrical Engineering, JDIET, Yavatmal, Maharashtra, India, maheshsukalkar@gmail.com
⁴Student, Department of Electrical Engineering, JDIET, Yavatmal, Maharashtra, India, kalepradnya35@gmail.com

Abstract

Transformers are one of the important elements in the process of transmission and distribution of electricity. As, Distribution Transformer is a major component of power system and its correct functioning is vital to system operations. This review paper presents, design & implementation of a mobile embedded system, to monitor and record parameters of a distribution transformer like Current, Voltage, Temperature and Frequency. We are introducing the system, because if any abnormality occurs, the system sends alert messages to the mobile phones as well as monitoring units which containing information about abnormality to some predefined instructions programmed in the microprocessor. Also, these all proposed parameters are displayed on LCD display. Actually, the main objective is, to develop mobile embedded system to monitor and record various parameters of transformer. This system will help the distribution transformers, to operate smoothly and to identify the problems before any catastrophic failure.

Key Words: Internet of Things (IOT), Raspberry-Pi, LCD display, Microprocessor, Transformer.

1. INTRODUCTION

Electricity plays an important role in our day to day life. Every moment of our life depends upon electricity. Electricity has the several components and equipment helping the human to transfer the distribution according to usage. The most important equipment of transmission and distribution of electric power is transformer. In power systems, an electrical equipment distribution transformer directly distributes the power to the low voltage users and its correct operation condition is an important criteria of the entire network operation. Transformers have a very long life, if they are operating under good conditions. In case they are overloaded then their life is significantly reduced. Overloading and ineffective cooling of transformers, are the main causes of failure in the transformer. All such type of

factors can reduce the life of transformer. The main concern with transformers protections is protecting the transformers, against internal faults & external faults. As we know, transformer is a most important part of power system and its correct functioning is vital to system operations. To reduce the risk of unexpected failures and the ensuring unscheduled outage, online monitoring has become the common practice to assess the condition of the transformer. Transformer is the main equipment in power system, to ensure its stable operation is important. The main aim behind these systems is to monitoring the real status of the distribution transformer, and also to reduce cost, improve services to customers and protect the transformer and identify problems before any catastrophic failure.

2. LITERATURE SURVEY

Abdul-Rahman AI-Ali, Abdul Khaliq & Muhammad Arshad [1] This paper presents design and implementation of a mobile embedded system to monitor and record key operation indicators of a distribution transformer like load currents, transformer oil and ambient temperature. The system is connected to a distribution transformer and is able to record and send abnormal operating parameters information of transformer to a mobile device using a GSM network.

Xiao-hui Cheng, Yang Wang [2] This paper uses a single bus multi point temperature measurement method and GSM network remote control and data processing combined, so that speed of the temperature and its analysis becomes improved also accuracy of system is also improved, reducing the cost of temperature monitoring system and using the remote control module to avoid the failure of transformer.

D S Suresh, Prathibha T, KouserTaj [3] have discussed about insulating oil in a transformer which can explain about the actual state of transformer and its longevity. This proposed work mainly forces on condition monitoring transformer oil by using PLC, SCADA with sensors for sensing parameters of oil like moisture and temperature can be found. Also, to monitoring of transformer is done using PLC system and GSM module.

Monika Agarwal, Akshay Pandya [4] This paper represents that they are designing a system where there exists communication between system and operator. For this system we are using Transformer, microcontroller, logic level converter and GSM module.

Ravishankar Tularam Zanzad, Prof. Nikita Umare Prof Gajanan Patle [5] This paper monitor and record operations of a distribution transformer like over voltage, over current, temperature, rise or fall of oil level. This system is implemented at the distribution transformer site and measuring above parameters it will help to optimize transformers and identify problems before its failures.

Dr. T. Anil Kumar, Ajitha [6] This paper presents a method of implementing LoRa (Long-range) technology for monitoring and diagnosing the condition of distribution

transformers using specified sensors/devices. This facilitates recording key operation indicators like voltage, load current, winding temperatures, oil temperatures of each distribution transformer in the range of 10km using LoRa modules. This data is sent to IoT platform using LoRa gateway.

Rohit R. Pawar, Priyanka A. Wagh, Dr. S.B.Deosarka [7] In this paper we are developing online monitoring system by using GSM Modem which has many advantages. This proposed system overcomes all disadvantages of manual testing and improves life of transformer.

D.Sarathkumar, Uvaraj.M, Kabilesh Kumar C V, Kalaiselvi A [8] The main aim of the paper is that to acquire real-time data of transformer remotely using IOT. For the real-time aspect, we use one temperature sensor, one potential transformer and one current transformer for monitoring temperature, voltage, current data of the transformer and then send them to a remote location. These three analog values are taken in multiplexing mode and connected to a programmable microcontroller of 8051 families through an ADC 0808. They are then sent directly to a Wi-Fi module under TCP IP protocol.

Priyanka R, Chaithrashree N, Sangeetha S, Bhagyalakshmi, Divyashree A [9] This paper presents the design and implementation of a mobile embedded system to monitor and record load currents, over voltage and temperature. The implementation of online monitoring system integrates internet of things (IOT) Modem, by using single chip Raspberry-pi and sensors.

Table-1: Analysis of IOT Based Monitoring of Distribution Transformer

Ref No	OBJECTIVE	AUTHORS	YEAR	MAJOR CONTRIBUTION
1	GSM-Based Distribution Transformer Monitoring System.	Abdul-Rahman AI-Ali, Abdul Khaliq & Muhammad Arshad	2004	Sending of abnormal parameters value using GSM module to the mobile.
2	The remote	Xiao-hui	2011	Discussion of

	monitoring system of transformer fault based on The internet of Things.	Cheng, Yan g Wang		temperature measurement method and GSM network.
3	Oil Based Transformer Health Monitoring System.	D S Suresh, Prathibha T, Kouser Taj	2012	Discussion about condition monitoring of transformer OIL by using PLC, SCADA and sensors.
4	GSM Based Condition Monitoring of Transformer	Monika Agarwal, Akshay Pandya	2014	Discussion about design and implementation of a mobile embedded system.
5	ZIGBEE Wireless Transformer Monitoring, Protection and Control System	Ravishankar Tularam Zanzad, Prof. Nikita Umare, Prof Gajanan Patle	2016	Uses SCADA system & to monitor over voltage, current, temp. fall of oil level.
6	Development of IOT Based Solution for Monitoring and Controlling of Distribution Transformers	Dr. T. Anil Kumar, Ajitha	2017	This paper uses LoRa technology for monitoring condition of distribution transformers using sensors/devices.
7	Distribution Transformer	Rohit R. Pawar,	2017	Transformer parameters

	Monitoring System Using Internet of Things (IoT)	Priyanka A. Wagh, Dr. S.B.Deosarka		are Monitored with The Help of Pic 18f4550 And Gsm/ Gprs Module.
8	Real Time Transformer Health Monitoring System using IOT	D.Sarathkumar, Uvaraj.M, Kabillesh Kumar C V, Kalaiselvi A	2018	Here the parameters of the transformer are monitored with Wi-Fi Module.
9	Design and Implementation of Real-Time Transformer Health Monitoring System using Raspberry-Pi	Priyanka R, Chaitrashree N, Sangeetha S, Bhagya Lakshmi, Divyashree A	2018	Here the Transformer parameters are monitored and recorded using Raspberry-Pi Module.

3. PROPOSED SYSTEM

Normally the transformer failures occur due to the over voltage fluctuations and over current fluctuations etc. So that purpose we can develop these type of system to reduce the faults respectively. This paper is a presentation of the design and implementation of Real Time Transformer Health Monitoring System through Raspberry-Pi module. Cost of transformer and remote location will be given priority to this project. In case of software system total system requires lot of connection and apparatus and technically skilled personnel. On the other hand, the designed system has less difficulties to install and doesn't require any sort of skilled personnel and can be notified remotely. The parameters of the generator like voltage fluctuations, current fluctuations, temperature, frequency are monitored remotely by using IOT Module.

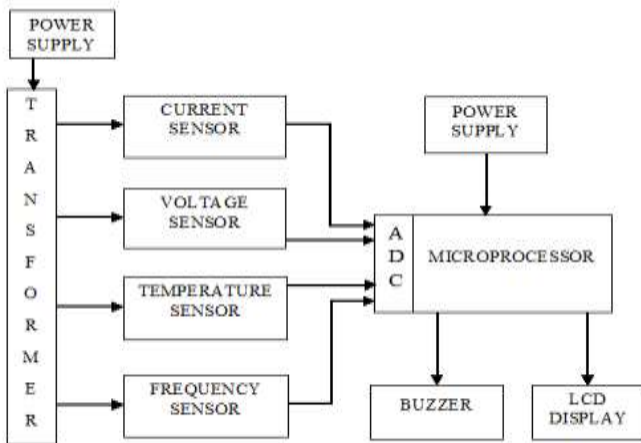


Fig.1: Proposed Block Diagram

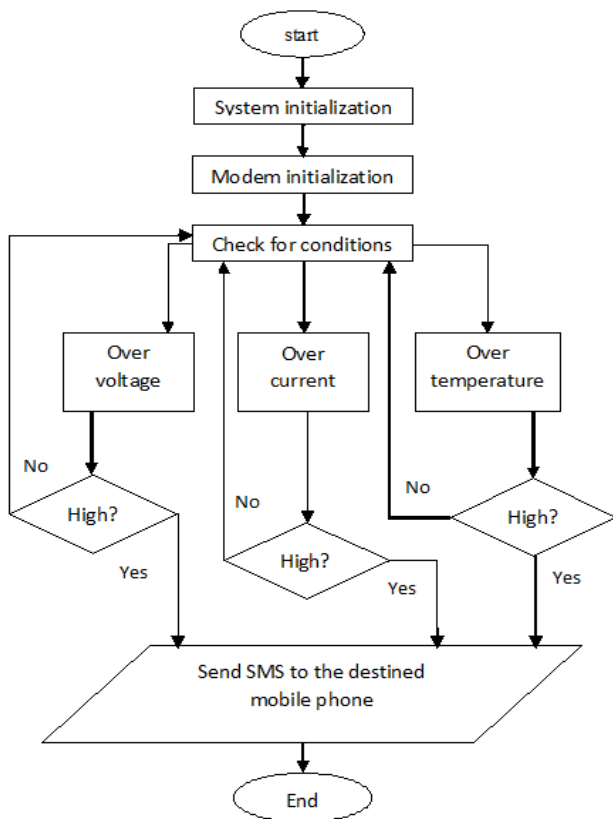


Fig 2: Flowchart for proposed system

At first all the sensors and Raspberry-Pi modem initialization occurs. After the initialization process all the required data are measured from sensors. Then the Raspberry-Pi starts to compare the incoming values with the saved values in the memory. When there is at least one parameter's value is higher than the saved value, then the modem takes action to send this message to the monitoring centre. If there are no over rated values of current and voltage, temperature or frequency is in the predefined value range, then the system jumps back to the testing procedure.

This process continues until the decision making logic's output negative. When the decision making logic's output is affirmative, then instantly system will take action for further execution.

Here we have designed a system that is called the real-time monitoring of transformer health monitoring system over internet with the help of Raspberry-Pi chip, temperature sensor, current sensor, voltage sensor, and analogue to digital converter. By using this system, or supply company can easily check the instant status of their transformer at their workplace through the internet.

- **Current Sensor:** In the system, the current sensor is used for sensing the current of transformer. It senses the current in amps and give output in milli amps. The current sensor used here for current sensing is ACS712 .

- **Temperature Sensor:** In this system, the temperature sensor is used for sensing the temperature of cross ponding transformer or generator. For this purpose, the DHT11 temperature sensor have been using here.

- **Voltage Sensor:** In this remote monitoring of transformer health over internet system, the voltage sensor is used for sensing the voltage of cross ponding components such as transformer or generator.

ADVANTAGES

- This system could be used for real time data monitoring of industrial loads and domestic load.
- By using this system, the supply company can easily check the instant temperature, current or voltage of transformer.
- This system is reliable, more cheap and compact as compared to the other systems.
- It is an ARM based system.
- Simpler than GSM, No need of external model. □ Cloud messaging is achieved.
- It can be used for long time without the fear of model damage.
- No limitation for sending SMS (Unlimited messages). It consumes less human involvement and thus reduces the human involvement time.

4. CONCLUSION

The paper proposes the system of electricity distribution is the delivery of electricity from generating power plants to end users. Thus, it is very important to have high efficiency, high reliability and high service quality in a distribution system network. This study gives remedies from the difficulties of finding faults occurring causes in distribution transformer and it overcomes the drawbacks of previous working methods. The focus of this project mainly on the efficiency of monitoring process of the transformer by using wireless communication that eliminates the use of large cables which are of very high cost, low reliability and maintenance. The cloud networking helps in better way of communication which enhances the improvement steps in this process. So, use of Raspberry-pi makes the system real time embedded system and aids very much in industry needs. The designed system is connected to a distribution transformer and is able to send abnormal operating parameters information to a mobile device using a Twilio account. From the available components the system hardware was constructed. The experimental results came out as expected.

REFERENCES

- [1] Abdul-Rahman AI-Ali, Abdul Khaliq & Muhammad Arshad "GSM-Based Distribution Transformer Monitoring System," IEEE MELECON 2004, May 12-15,2004, Dubrovnik, Croatia
- [2] Xiao-hui Cheng, Yang Wang, "The remote monitoring system of transformer fault based on The internet of Things," 2011 International Conference on Computer Science and Network Technology
- [3] D S Suresh, Prathibha T, KouserTaj," Oil Based Transformer Health Monitoring System" International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Impact Factor (2012): 3.358 Volume
- [4] Monika Agarwal, Akshay Pandya," GSM Based Condition Monitoring of Transformer," IJSRD -International Journal for Scientific Research & Development| Vol. 1, Issue 12, 2014 | ISSN (online): 2321-0613
- [5] Ravishankar Tularam Zanzad, Prof. Nikita Umare, Prof Gajanan Patle , "ZIGBEE Wireless Transformer Monitoring, Protection and Control System", International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization), Vol. 4, Issue 2, February 2016.
- [6] Dr. T. Anil Kumar, Ajitha "Development of IOT Based Solution for Monitoring and Controlling of Distribution Transformers," International Conference on Intelligent Computing, Instrumentation and Control Technologies (ICICT) IEEE-2017
- [7] Rohit R. Pawar, Priyanka A. Wagh, Dr. S.B.Deosarka , "Distribution Transformer Monitoring System Using Internet of Things (IoT)", International Conference on Computing Methodologies and Communication (ICCMC) IEEE-2017
- [8] D.Sarathkumar, Uvaraj.M, Kabilesh Kumar C V, Kalaiselvi A, "Real Time Transformer Health Monitoring System using IOT", International Journal of Advanced Research in Science, Engineering and Technology (IJARSET) Vol. 5, Issue 11, November 2018
- [9] Priyanka R, Chaitrathree N, Sangeetha S, Bhagya Lakshmi , Divyashree A," Design and Implementation of Real-Time Transformer Health Monitoring System using Raspberry-Pi" International Journal of Engineering Research & Technology (IJERT) Volume 6, Issue 13