International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 07 | July 2020 www.irjet.net p-ISSN: 2395-0072

ONLINE MONITORING OF DISTRIBUTION TRANSFORMER USING IOT

Dr. N. Balamurugan[1], S. Rishya Dora[2], A. Karthick[3], M. Sathish Kumar[4], R. Dhamodharan[5]

[1]Assistant Professor, [2-5]Final Year Student
[1-5]Department of Electrical and Electronics Engineering, SSM Institute of Engineering and Technology, Dindigul, Tamil Nadu, India

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Abstract - *In power system network, distribution transformer is electrical equipment which distributes power to the low-voltage users directly and its operating condition is a vital part of the operation of distribution network. Operation of distribution transformer under rated condition assurances their long life. However, their life is significantly reduced if they are subjected to overloading condition, resulting in sudden failures and loss of supply to a large number of customers thus affecting system reliability. Overloading and rise in oil & winding temperature of transformer are the major causes of failure in distribution transformers. Our system is designed based upon online monitoring of key Operational parameters of distribution transformers can provide useful Information about the health of transformers which will help the utilities to Optimally use their transformers and keep the asset in operation for a longer Period.*

Key Words: Distribution transformer, online monitoring, power system, IOT, reliability

1. INTRODUCTION

In Indian perspective, power system network is visible and controlled only up to this extent. Transformers have an average life of 20- 25 years. Most of the transformers installed are in the verge of their operational life. The current monitoring methods are only associated with electrical parameters which gives no clue about the internal condition of the distribution transformer. Periodical maintenance is not enough for such a major asset in power system. Condition based maintenance will be effective only when an online monitoring system is present so that equipment condition will be known remotely and maintenance scheduling as well as control. Most power companies use Supervisory Control and Data Acquisition (SCADA) system for web-based monitoring of power transformers yet amplifying the SCADA system for online monitoring of distribution transformers is an a costly suggestion.

2. Literature Survey

As a large number of transformers are distributed over a wide area in present electric systems, it's difficult to monitor the condition manually of every single transformer. So automatic data acquisition and transformer condition monitoring has been an important issue. With the progress and development of national economy as well as power system, reliability and safety issues of power system have been more important. Development of distribution Transformer Health Monitoring System (THMS) has been done in that reason. Distribution transformer is the most vital asset in any electrical distribution network and therefore it needs special care and attention. This THMS can monitor the health status of the distribution transformer in real time aspect.

3. PROPOSED SYSTEM

Our system is designed based upon online monitoring of key Operational parameters of distribution transformers can provide useful Information about the health of transformers which will help the utilities to Optimally use their transformers and keep the asset in operation for a longer Period.

1) Distribution transformers are as of now observed physically where a man intermittently visits a transformer site for support and records parameter of significance. This type of monitoring can't give data about incidental over-load and overheating of transformer oil and windings. Every one of these variables can essentially decrease transformer life.

2) A monitoring system can only monitor the operation state or guard against steal the power, and is not able to monitor all useful data of distribution transformers to reduce costs.

3) Auspicious detection data will not be sent to observing centers in time, which cannot judge distribution transformers three phase equilibrium.

According to the above requirements, we need a distribution transformer real-time monitoring system to detect all operating parameters operation, and send to the monitoring centre in time. It leads to Online monitoring of key operational parameters of distribution transformers can provide useful information about the health of transformers which will help the utilities to optimally use their transformers and keep the asset in operation for a longer period. This will also help identify problems before any catastrophic failure which can result in a significant cost savings and greater reliability.

4. BLOCK DIAGRAM

The block diagram consists of sensors, distribution transformers, IOT module and relay circuit respectively

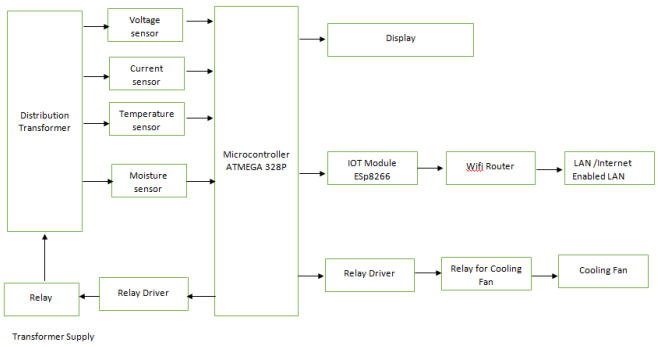

Fig -1: Block diagram

5. HARDWARE

5.1. Microcontroller

Keeping in mind the economic constraints and the simplicity of the system, Arduino Uno has been used which abates the programming complexity. Atmega sense the current and voltage value through Analog pins. With the help of these values, microcontroller programing calculates the power and energy.

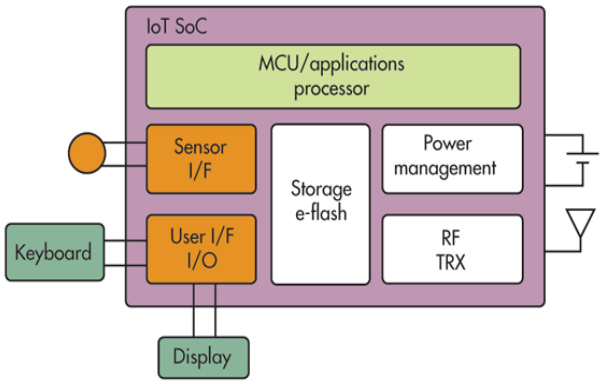

Fig -2: Microcontroller of IOT

5.2. ESP 8266 IOT

ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. When ESP8266 hosts the application, and when it is the only application processor in the device, it is able to boot up directly from an external flash.

5.3. Voltage Sensor

The voltage sensor is used to sense the voltage produce by solar panel. This sensor works in basis of voltage sensor. The output of the sensor is connected to the microcontroller. This voltage sensor works in Voltage division rule which has two resistor in series . The total voltage is applied across these resistors .The output is taken from the centre of these resistor

5.4. Current Sensor

This current sensor is used to sense the current flow in the load by linear Hall effect method. Applied current flowing through this copper conduction path generates a magnetic field which the Hall IC converts into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer.

5.5. IOT module

The Internet of things (IoT) is the network of everyday objects — physical things embedded with electronics, software, sensors, and connectivity enabling data exchange. ESP8266 is a system-on-chip (SoC) with capabilities for 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2), general-purpose input/output (16 GPIO), Inter-Integrated Circuit (I^2C), Serial Peripheral Interface (SPI).

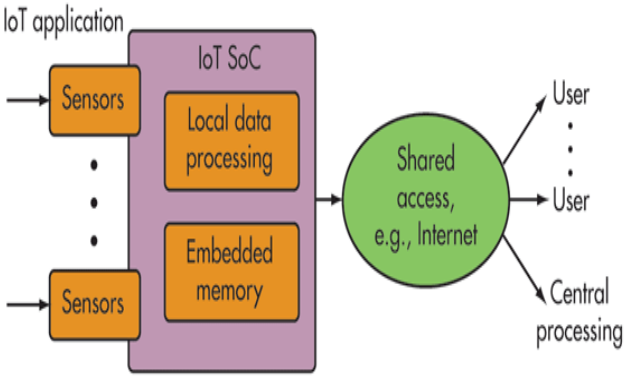

Fig -3: IOT sensor interface

6. CONCLUSION

The proposed technique with results has shown that the protection scheme works properly with accuracy, sensitivity of this scheme very high for the abnormal and faulty conditions. Transformer Health Monitoring will help to identify or recognize unexpected situations before any serious failure which leads to greater reliability and significant cost savings. If transformer is in abnormal condition we can know from anywhere. No human power need to monitor the transformer. Details about the transformer are automatically updated in webpage when the transformer is in abnormal condition.

REFERENCES

[1] 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

[2] 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

[3] Pathak A.K, Kolhe A.N, Gagare J.T and Khemnar SM, "GSM Based Distribution Transformer Monitoring And Controlling System", Vol-2 Issue2 2016, IJARIIE-ISSN (O)-2395-4396.

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

[5] 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.

[6] Zhang Xin, Huang Ronghui, Huang Weizhao, Yao Shenjing,Hou Dan & Zheng Min,"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.