International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

IOT BASED TRANSFORMER HEALTH MONITORING SYSTEM

N. JASWITHA[1], N. LAVANYA [2], M. CHAYA PRASANNA[3], MRS.K.SUMALATHA[4]

[1,2,3] UG Students, Department of ECE, ***Malla Reddy Engineering College for Women (UGC-Autonomous) Maisammaguda, Hyderabad***, Telangana, India.

[4] Associate Professor, Department of ECE, ***Malla Reddy Engineering College for Women (UGC-Autonomous) Maisammaguda, Hyderabad***, India.

ABSTRACT:

Transformers are the main building block in a power system. Any damages in transformers adversely affects the balance of a power system. The damages are mainly occurring due to overloading and inefficient cooling. The main objective of the is real time monitoring of the health conditions of the distribution transformer using IOT technology. The parameters such as temperature, voltage and current of a transformer are monitored, processed and recorded in servers. For this purpose, we use three sensors interfaced with Arduino. The recorded data can be send using Wi-Fi module and accessed from anywhere around the world using IOT technology using HTTP protocol. This helps in identifying without human dependency. This helps in identifying and solving a problem before a failure without human dependency.

Keywords: IOT, Transformer, oil level, parameters, wifi module.

1. INTRODUCTION

Transformers are important equipment in power system network. A healthy power supply at the customer end mainly depends on the performance of the distribution transformer. The monitoring and control of distribution transformer is an important procedure for diagnosing the rapid alerts of the electrical network and also for the proper functioning of the electrical network. The monitoring of distribution transformer is done by an electronic system with the capacity of sampling, storage, prosecution and mailing of information. If there is a real time monitoring or inspection of the system, so that we can prevent the sudden breakdown of the transformer that may lead to stop serving the electric power to several charges and produces serious affectations to the functioning of the electrical network. The monitoring of distribution transformer includes the measurement of transformer parameters like voltage, current, power and frequency. The important factor that necessary to consider is the inspected information regarding the distribution transformer should be transmitted properly by considering the coverage to the electrical network. So it's necessary to select an energy efficient, reliable, low-

cost technology for the advanced monitoring of distribution transformer. The compiled information is very useful for studies of the electrical network and the planning of future enlargement in fact the common procedure is to substitute the transformer due to the aging of the transformer, which is a huge loss for the government. If we consider the solutions like smart inspection system of the distribution transformer frequently, may lead to increase in the life span of the distribution transformer. At present there are several methods for the monitoring of distribution transformer due to the advancement in the electronics and communication technology. By suitable implementation of varying technologies with the electrical service results in the vast development of power system and its proper management.

Literature survey:

The transformer plays a significant role in the electricity domain. Observing the condition of the transformer is a very critical task. Any small problems in the transformer also lead to major issues. Regular monitoring transformer health condition is important. Preventive devices are used to identify the fault and it will be helpful at the fault time. The main goal of the authors Amutha elakkiya et al., 2019 is to collect real time data from the transformer with the help of the IoT (Internet of Things). This system can be used to monitor the important transformer features like temperature and the current level. The collected data sent through the TCP/IP internet protocol. using this system, the user will receive an alert signal when a power failure occurs. The LED display is used to display the phase defect message. The importantparameter of the transformer is regularly sent to the android system. With the help of these parameters, the concerned people take necessary action and maintain the transformer in a better manner. This proposed embedded system is used to measure the current level, oil level, and temperature level of the transformer. The major goal of this system is to predict and prevent the fault of the transformerfor the development of the Indian economy power system safety is very important. To provide the safety and reliability of the transformer monitoring system is used. A transformer is an important asset of the electrical network and it needs extra care and concentration. Sajidur Rahman ET AL., 2017 proposes THMS (Transformer Health Monitoring System) for monitoring the condition of the transformer in real-time. Huge numbers of transformers are available throughout the world; it is a very difficult task to observe the condition in a manual way of every transformer. So, an automatic monitoring system is needed to observe the condition of the transformer. This proposed system is embedded with the mobile to observe the load of the current, voltage level, oil temperature, and level of the oil. This system is integrated with the GSM (Global Service Mobile), microcontroller, and various sensors. The

International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

sensor data are collected and stored on the memory. The system checks the condition of the transformer using inbuilt instructions. If any abnormal conditions are occurring on the transformer the GSM component sent the message to the receivers' mobile phones contains the data about the abnormal condition. It is a wireless system to offer better monitor the condition of the transformer. The developed system is embedded with the transformer and it sends the abnormal parameters to the cell phone using the GSM technique

OBJECTIVE OF WORK

- The main objective of this system is real time monitoring of the health conditions of the transformer using IOT technology.
- To design a protective circuit for transformer, based on programmable a Arduino to monitor transformer, voltage and current using sensors
- The parameters such as temperature, voltage and current of a transformer are monitored, processed and recorded in servers

PROBLEM SOLVING

Modern power system requires accurate, reliable technique for detection of faults, real time data monitoring and fast response speed. The reliable operation of the power system depends upon the effective functioning of the distribution transformer. Microcontroller based system has real time data monitoring, detection of abnormal condition, fast processing speed, reduced installation cost low maintenance cost and more flexibility Current sensor senses the amount of load current at the secondary of the distribution transformer. Output of the current sensor gets processed by the controller to find out the load current value. If the load current exceeds the pre-set value inside the controller relay gets operated immediately. This results into isolation of load from transformer which brings down the load current to zero. So, the transformer gets protected from damage due to overloading. The load current values continuously get transferred to the LCD and android application for monitoring. The GPRS enabled module sends current values to android application.

2. AN OVERVIEW OF PROPOSED SYSTEM

Distribution transformers have a long service life if they are operated under rated condition. However, their life is significantly reduced if they are overload, resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability. Over loading and ineffective cooling of transformer are the major causes of failures in distribution transformer. Most power companies use supervisory control and data acquisition (SCADA) system for online monitoring of power transformer but extending the SCADA system for online monitoring of distribution transformer is an expensive proposition.

Distribution transformer are currently monitored manually where a person periodically visits a transformer site for maintenance and records parameter of

International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

importance. This type of monitoring cannot provide information about occasional overloads and overheating of transformer oil and windings. All these factors can significantly reduce transformer life.

Online monitoring of key operational parameters of distribution transformer can provided useful information about the health of transformer which will help the utilities to optionally use their transformer and keep the asset in operation for a longer period.

PROPOSED SYSTEM:

The proposed project is about acquiring real time status of transformer health parameters. Temperature, voltage and current of transformers are monitored and send over internet The live tracking of these parameters can be done using IOT technology from anywhere around the world. This is cost effective in nature. Thus, the responsible authority can access information on any power failure or maintenance. The concept proposed here is an introduction of the continuous transformer health monitoring system utilizing IOT. Cost viability and remote area will be offered need to this extends. If there should be an occurrence of programming driven system add up to system requires part of association and mechanical assembly and in fact gifted work force. The entire data will be accessible on the site page. Then again, the composed arrangement has less unpredictability to introduce and doesn't require manpower.

Understand the Proposed System

The Proposed monitoring system based on IoT consists of three main systems:

- Parameter measurement subsystem.
- Protection Subsystem.
- Data reception subsystem.

Firstly, transformer electrical and physical parameters are measured by using the Parameter measurement subsystem. Electrical parameters consist of internal flux, voltage, current, KVA, Frequency and power factor and in physical parameter we included temperature, oil level, oil quality and humidity.

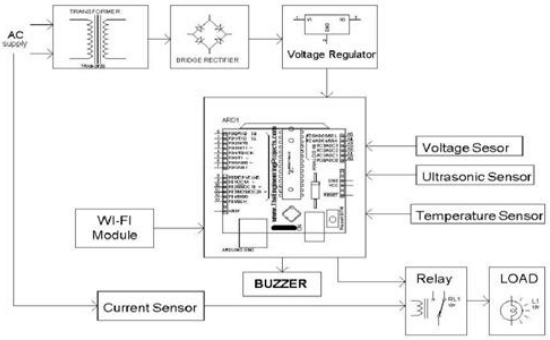
To measure the above parameter, we need different sensors and modules to interface with the Arduino microcontroller. A list of the component is provided in the next section.

In the protection subsystem, Arduino controls the operation of a fan and protection relay to protect the transformer in a fault condition.

The current state and measured parameters are sent to the remote IOT server by using the data reception subsystem. We have two IOT platforms are available to use for testing first is things peak and Biodot stem. The integration of Bluetooth, Bluetooth LE and Wi-Fi ensures that a wide range of applications can be targeted, and that the module is future proof: using Wi-Fi allows a large physical range and direct connection to the internet through a Wi-Fi router, while using Bluetooth allows the user to conveniently connect to the phone or broadcast low energy beacons for its detection. The sleep current of the ESP32 chip is less than 5 μA, making it suitable for battery powered and wearable electronics applications. ESP32 supports a data rate of up to 150 Mbps, and 20.5 dBm output power at the antenna to ensure the widest physical range. As such the chip does offer industry-leading specifications and the best performance for electronic integration, range, power consumption, and connectivity. The operating system chosen for ESP32 is

International Journal For Recent Developments in Science & Technology
Crossref
A Peer Reviewed Research Journal
2581-4575

freeRTOS with LwIP; TLS 1.2 with hardware acceleration is built in as well



Entire block is divided into four parts. These are data collection, data processing, communications the control part with required power supply unit.Fig.2.1 shows the transformer placed near Component. The components of the block diagram measure various real time parameters associated with the distribution transformer. The information definitely assures the proper health monitoring of commercial transformers that lead the utilities to better usage of their transformers and keep the asset in operation for a long time. Four sensors such as level sensor, gas sensor, temperature sensor, and current sensor were involved. A power supply is used to operate

Microcontroller PIC16F877A.Once the data are sensed that can be read from the LCD display and at the same time these values are Transmitted to the IOT module through the UART cable and the IOT module sends the data to the user on given IP address as per program.

The Internet of things (IoT) describes physical objects (or groups of such objects) with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks. Internet of things has been considered a misnomer because devices do not need to be connected to the public internet, they only need to be connected to a network and be individually addressable.

The field has evolved due to the convergence of multiple technologies, including ubiquitous computing, commodity sensors, increasingly powerful embedded systems, and machine learning. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), independently and collectively enable the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems, cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smart phones and smart speakers. IoT is also used in healthcare systems.

There are a number of concerns about the risks in the growth of IoT technologies and products, especially in the areas of privacy and security, and consequently, industry and governmental moves to address these concerns have begun, including the development of international and local standards, guidelines

International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

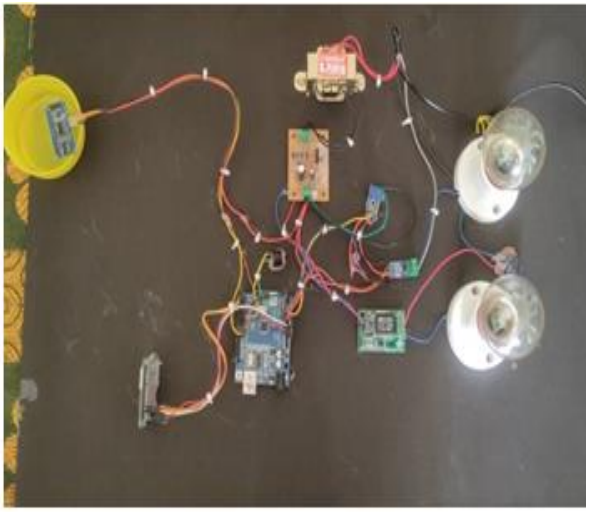


Fig.1. OFF CONDITION.

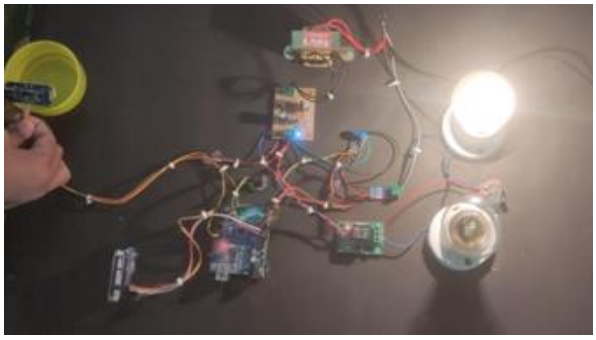


Fig.2. ON condition.

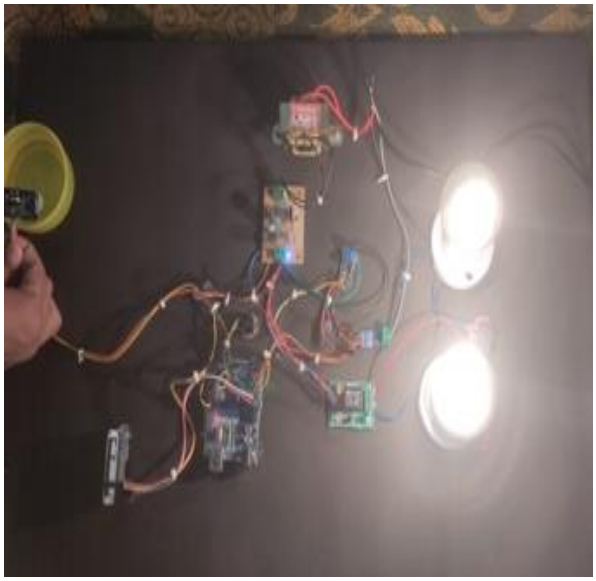


Fig.3. Over load condition.

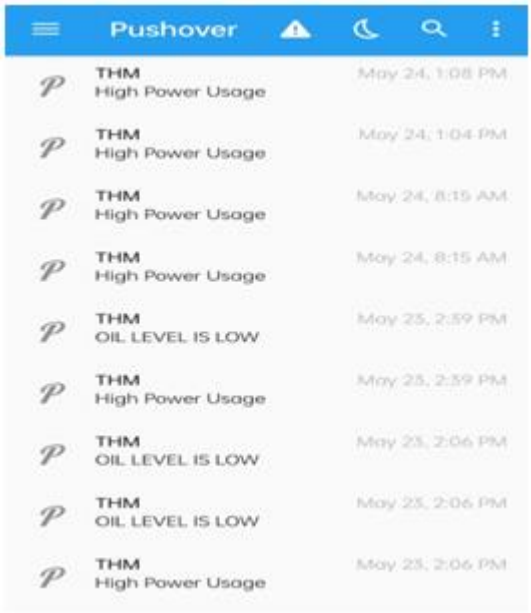


Fig.4. PUSH-OVER MESSAGES.

Fig.5. Thing speak output.

4. CONCLUSION

This system provides transformer protection using microcontroller-based relay. For transformer current sensing circuit were designed and result have been verified with proteus simulation. Proposed method is economical and compact in size.

6.2 FUTURE SCOPE:

The system has following future scopes which makes system more reliable and effective:

- System will be capable of communicating in both directions.

- System will be able to measure more transformer parameters.
- Data at monitoring station will get updated whenever requested by monitoring person

REFERENCES

1. Abdul-Rahman AI-Ali, Abdul Khaliq & Muhammad Arshad "GSMBased Distribution Transformer Monitoring System," IEEE MELECON 2004, May 12-15,2004, Dubrovnik, Croatia.

2. K. Sridhar, M. Assarudeen, J.Ranjith Kumar, E.Sarathbabu "Transformer Health Monitoring And Control Through Arduino,"IJAERD – International Journel of Advanced Engineering and Research, vol. 5, Issue 04, 2018.

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

[4] Sajidur Rahman, Shimanta Kumar Dey, Bikash Kumar Bhawmick and Nipu Kumar Das, "Design and Implementation of Real Time Transformer Health Monitoring System Using GSM Technology", International Conference on Electrical, Computer and Communication Engineering (ECCE), February 16-18, 2017, Cox's Bazar, Bangladesh.

[5] J. Jayakumar, J. Hephzibah Jose Queen, Thanu James, G. Hemalatha, Neethu Lonappan "Distribution Transformer Monitoring Using GPRS", International Journal of Scientific & Engineering Research, Volume 4, Issue 6, June-2013.

[6] Pathak A. K Kolhe A. N Gagare J.T Khemnar S.M "GSM Based Distribution Transformer Monitoring and Controlling System", IJARIIE, Vol-2 Issue-2, 2016.

[7] Aravind I., Harikrishnan Dhananjayan G., Deepak A., Aravind S. "GSM Based Transformer Monitoring and Control Systems", SSRG International Journal of Electrical and Electronics Engineering (ICRTECITA-2017) -March 2017.

[8] V. A. Patil, Ms. Namrata S. Kumbhar, Ms. Shital S. Patil "Transformer Monitoring and Controlling with GSM Based System", International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 03, Mar -2017.