IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

MONITORING AND CONTROLING OF SUBSTATION USING IOT IN DISTRIBUTION POWER GRID

[1]P.Shalini,[2]S.Harshith, [3]K.Sree Ram,[4]P.Thirupathi, [5]M.Naveen,A.Surya Prakash
[1]Associate Professor, Dept of ECE , PBR VITS, Kavali, Andhra Pradesh, India.
[2-6]UG Students, Dept of ECE, PBR VITS, Kavali, Andhra Pradesh, India.

***Abstract*— The distance between the generators and load may be in terms of hundreds of miles hence the amount of huge power exchange over long distances has turned out as a result of the lack of quality of the electric power. During the earlier development stages the issues on quality of power were not frequently reported. Demanding the quality of power being delivered at the user side has raised the alarm due to the increase in demand of electricity in the customer side. A huge amount of power is lost during the transportation of the general power which leads to the reduction in the quality of power received at substation. The purpose of this project is to acquire the remote electrical parameters like voltage, current and frequency and send these real time values over IOT network using IOT modem/phone along with temperature at power station. This project is also designed to protect the electrical circuitry by operating an spdt relay.**

Keywords: Generator, IOT Modem, Buzzer, LED's, Sensors, Relay.

I.INTRODUCTION

The project named "Substation Monitoring System proposes an innovative design to develop a system based on microcontroller. It is used for monitoring the voltage, current and temperature of a distribution transformer in a substation and to protect the system from the rise in mentioned parameters. Monitoring and controlling of substations is an important task for supplying healthy power to the consumers in this automated era.

Also the substations in the rural areas are even more difficult to monitor manually and hence requires more time to take respective actions. The solution to all these problems is automation of the substations.

The aim of project is to acquire electrical readin gs like current, voltage. to send and receive real time readings everywhere around the world through Wi-Fi modem or GSM module along with the temperature w ith it. another motive of this project is to provide safet y for the circuit by operating an electromagnetic relay . The relay will be releases when there is a misreading in the above-mentioned parameters. the system is des igned in a way to send an alert message to users when ever the circuit breaks. the components used are curre nt sensor, voltage sensor, temperature sensor for stori ng the reading MySQL server is used and the controll ers are coded using embedded.

II.EXSTING SYSTEM :

In Previous system is not able to avoid or to detecting the over voltage. Hence, the life span of transformer is limited. The high Transformer temperature may causing huge fault like it can be put transformer on fire. It may cause a loss of human life.

In systems, distribution substation is electrical equipment which distributes power to the low-voltage users directly, and its operation condition is an important component of the entire distribution

network operation. Operation of distribution substation under rated condition (as per specification in their nameplate) guarantees their long life. However, their life is significantly reduced if they are subjected to overloading, resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability.

Overloading and ineffective cooling of substations are the major causes of failure in distribution substations. The monitoring devices or systems which are presently used for monitoring distribution substation exist some problems and deficiencies. Monitoring and controlling substations in the power grid have relied on manual inspections and periodic maintenance schedules. This approach involves sending personnel to the substations to visually inspect equipment, take measurements, and perform maintenance tasks based on predetermined intervals or in response to reported issues.

- **PROBLEMS WITH EXISTING SYSTEM:**

Manual inspections provide only periodic snapshots of substation conditions, potentially missing critical issues between inspections. Sending personnel to substations for inspections and maintenance can be time-consuming and costly, especially for substations located in remote or difficult-to-access areas. Maintenance tasks are often performed reactively in response to reported problems or during scheduled downtime, which can lead to unexpected failures and disruptions to the power supply. Manual inspections are prone to human error, and critical issues may be overlooked or misinterpreted.

III.PROPOSED SYSTEM

Monitoring and controlling substations using IoT in the power grid involves deploying sensors to collect data on various parameters such as voltage, current, temperature, and humidity. This data is then transmitted through the Internet to a central control system, where it is analyzed in real-time to detect abnormalities or potential failures. Through IoT, operators can remotely monitor and manage substations, improving efficiency, reducing downtime, and enhancing overall grid reliability. Additionally, IoT enables predictive maintenance, allowing for proactive repairs before major issues occur.

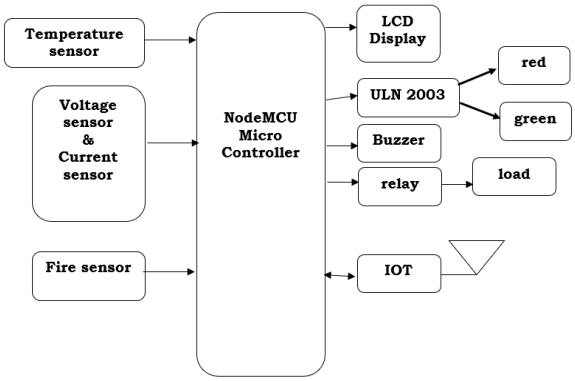

Figure: Block diagram proposed system

The NodeMCU Development Board can be easily programmed with Arduino IDE since it is easy to use. Programming NodeMCU with the Arduino IDE will hardly take 5-10 minutes. All you need is the Arduino IDE, a USB cable and the NodeMCU board itself. You can check this Getting Started Tutorial for NodeMCU to prepare your Arduino IDE for NodeMCU.Current structure screens the single-phase electrical structure using the platform as a microcontroller to use the voltage and current and temprature and fire from the sensor.

Three voltage and three current sensors. It then sends this information, after estimation, to the end IOT module.

The limitations checked on the diffusion transformer are contradictory.When fire detected or any sensor detected that's information pass trough iot and Monitoring and controlling the substation using the IoT system relies on various sensors to determine the specific electrical limits.

The sensors include a current sensor, an AC voltage sensor and a temperature sensor. Each sensor is interfaced with an Arduino microcontroller. The output of several sensors is sent from the microcontroller, which sends the current upside of

several related boundaries to show on the interface LCD on the microcontroller.

ADVANTAGES

- Easy to monitoring and controlling.at any place and any where.
- Cost Savings.
- Efficient Energy Management.
- Data Analytics and predictive Maintenance.
- Remote Accessibility.
- Real time Monitoring

IV.RESULTS AND DISCUSSIONS

1.Temperature sensor detects temperature changes and sends signals to the microcontroller (NodeMCU).

2.Microcontroller processes temperature data and sends it to the LCD display and laptop (via WiFi).

3.If temperature thresholds are exceeded, the buzzer sounds an alert.

4.The voltage shifter adjusts voltage levels as needed to ensure proper system operation.

5.The LCD display shows real-time temperature readings.

6.The laptop and Blink app display temperature data on a web page, allowing for remote monitoring.

Implementing IOT for monitoring and controlling substations in a power grid embedded system project can yield several benefits, including real-time data collection, remote monitoring, and efficient management of power distribution.

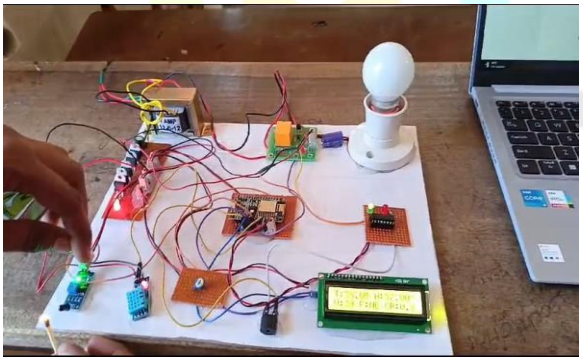

Figure: Fire Detecting

For the construction of the model, the components such as Arduino Uno, ESP8266 WiFi Module, LCD Screen, and different types of sensors are used

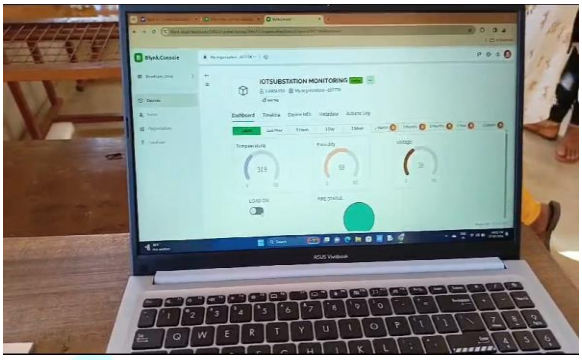

Figure:Laptop Interface

V. CONCLUSION AND FUTURESCOPE

The proposed Topological Smart Voltage and Current Monitoring System (SVCMS) Concludes our venture "Substation Monitoring and Control Use Microcontroller and IoT," Deep Belief Network can improve the quality of Force Move and provide continuous force. Likewise, constant checking of various boundaries can ensure the well-being of the substation and its hardware. Except for many migratory Integrated Circuits (ICs) to help make progress, the effort has been adequately executed.

In this way, the effort is adequately made, and the effort of the planned structure gives easy control of checking the substation. The substation can talk to the help association to show what shortcoming is connected and empowers the two-way business.

The exact area of the substation can be determined in the same way by sending the field directions of the Substation. Finally, the yield of the exploration was checked. Moved can improve the nature of the force being moved and provide constant force.

In Addition, ongoing checking of various boundaries is carried out, guaranteeing the Substation's safety and hardware.

The relevance of this project is underscored by the prevalence of train accidents in India,despite having the third-largest railway system globally.

The proposed system not only addresses the immediate safety concerns but aligns with the Indian government's suggestion of raising platform heights to mitigate accidents caused by the platform gap.

FUTURE SCOPE

Monitoring and controlling substations in a distribution power grid using IoT can enhance the efficiency, reliability, and safety of the electrical distribution system.

Here's a proposed design along with its future scope.Monitor voltage levels and current flow to detect abnormalities and potential overloads.Measure temperature at critical points to identify overheating and prevent equipment failures.

Monitor humidity levels to prevent moisture-related damage to electrical components.Detect leaks of harmful gases such as sulfur hexafluoride (SF6) used in high-voltage equipment.

VI. REFERENCES

[1] Mohannad Jabbar Mnati, Alex Van den Bossche and Raad Farhood Chisab "A Smart Voltage and Current Monitoring System for Three Phase Inverters Using an Android Smartphone Application", Sensors

2017, 17, 872

[2] Haoyang Lu, Lingwei Zhan, Yilu Liu and Wei Gao "Power Grid Frequency Monitoring over Mobile Platforms" 2014 IEEE International Conference on Smart Grid Communications

[3] Dipali Namdev Shelke, Azmina Gayasuddin Maniyar, Poonam Kisan Pawar, Prof. M. P. Satone "Android App Based Car Controller Using Bluetooth Communication" Volume 7, Issue 5, May 2017 International Journal of Advanced Research in Computer Science and Software Engineering

[4] Fatih Işık, Mustafa Reşit Haboğlu, and Büşra Yartaşı "Smart Phone Based Energy Monitoring System for 3 Phase Induction Motors" International Journal of Electronics and Electrical Engineering Vol. 5, No. 1, February 2017

[5] Aniket V. Kulkarni, "Automatic Power Factor Correction to reduce the power requirement", International Journal on Advanced Computer Theory and Engineering (IJACTE) Volume-2, Issue-6, 20138

[6] Ismail Harnekar Aadam, B. Patel Gaurang Kumar, "Automatic Power Factor Correction by Fine Tuning of Graded Capacitors", International Journal of Advance Research, Ideas and Innovations in Technology. (Volume 3, Issue 6) 2017

[7] Aparna Sarkar, Umesh Hiwase, "Automatic Power Factor Correction by Continuous Monitoring", International Journal of Engineering and Innovative Technology (IJEIT) Volume 4, Issue 10, April 2015

[8] Gaurav S. Chingale1 , Priya R. Patil2 and Arvind R. Singh "Power Factor Correction of Three Phase Induction Motor Using Switched Capacitor Banks with PLC", International Journal of Research in Electrical & Electronics Engineering Volume 2, Issue 2, April-June, 2014, pp. 45-58

[9] Bhavin Seta1 ,Prof. Deepa Karvat, "Automatic Power Factor Correction in EHV System", International Journal of Advance Engineering and Research Development Volume 2,Issue 5, May -

2015 762 Scientific Journal of Impact Factor(SJIF): 3.

[10] Karthik Subramanian, Shantam Tandon, "Power factor correction using capacitors & filters", International Journal of Engineering &

Technology, 7 (2.12) (2018) 234-23.