

# A Novel Implementation of Substation Monitoring System Using IoT

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**Abstract** - This project Substation monitoring system using IoT is aimed to monitor and control the substation without the interference of the human. The hypothesis Internet of Things (IoT) lets the objects to transmit the data through wired or wireless connections for the intent of communication. The communication interface is provided by the IoT module and this module also helps us to update data on to the web server. Industrial Internet of Things (IIoT) is a prolonged approach of IoT which involved in the development of smart grids in several applications. Here we are considering the substation parameters like current, voltage, frequency and temperature. The sensors of these parameters are interfaced to a controller. The controller compares all the required parameters and differences that are further sent to the web server. If the obtained values of the parameters exceed the rated values of the parameters the relay gets tripped. In this way we can continuously monitor and control the substation.

**Keywords**- Current, Control, Frequency, IoT, Monitor, Substation, Temperature, Voltage.

## I. INTRODUCTION

Substation plays a crucial functionality in the generation, transmission and distribution of the electrical power. Technology in substations is developing day by day to encounter the challenges presented by highly digitalizing and decentralizing power distribution systems. To overcome these problems and also deregulation in the power industry automation of the substation has given importance for the coming Smart Grid Environment.

With the help of smart devices, powerful substation computer systems, component knowledge modules and local storage have proved to be the important factors for the development of the digitalized i.e., smart substation. The new aids should match the high-tech requisites of the substation and also should be free from danger, adaptable, design and easily potable for the changes in the future. The substation apparatus should minimize the unscheduled downtime and should also increase the

constancy of the system. Condition monitoring of the different apparatus in a substation depicts the state of the various equipments in the substation. If the substation is monitored manually then there may be scope for the human to make errors. To overcome these limitations online measuring instruments can be used on condition basis.

## II. METHODOLOGY

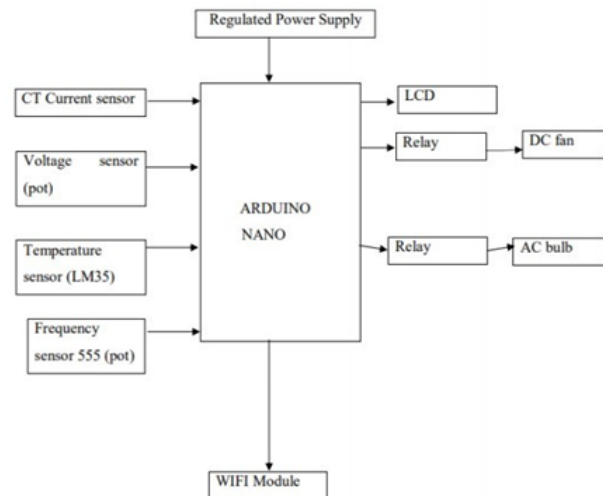


Fig. 1. Block diagram of Substation monitoring system using IoT

Here the microcontroller used is ARDUINO NANO. To monitor the substation parameters like current, voltage, temperature and frequency we take the help of sensors. To measure the value of current we make use of a current transformer and similarly for voltage potentiometer is used, for temperature LM35 sensor is used and for frequency 555 timer is used. A Wi-Fi module is used for transferring data to the web server. All the parametric values are displayed on the LCD. All these are supplied with Regulated Power Supply (RPS). The values measured by the sensors are sent to the microcontroller. This microcontroller compares the values with their respective rated values and if the obtained values exceed or get below the rated values the relay gets tripped and these values are sent to the web server with the help of Wi-Fi module and are also displayed on the LCD.

### Hardware components

- Arduino Nano
- Current transformer
- Potentiometer
- LM35 Temperature sensor
- 555 timer
- Regulated Power Supply (RPS)
  - Transformer
  - Rectifier
  - Filter
  - Regulator
- Wi-Fi module
- Liquid Crystal Display (LCD)

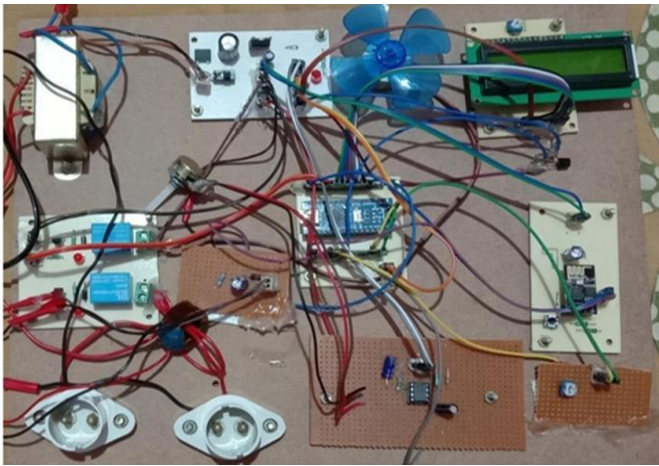


Fig. 2. Representation of the circuit

### Software requirement

- Embedded C
- Arduino software (IDE)

### ADVANTAGES

- Highly sensitive.
- Response is faster.
- Long life and also the performance is stable.
- Scope of errors are less.
- Operation is easier.
- Power consumption is reduced.
- Fault identification is easy.
- Parameters can be continuously modified and analyzed.

### DISADVANTAGES

- Design of the system is expensive.

System is complex.

### III. RESULT

This project Substation Monitoring System Using IoT is developed to overcome the problems that are faced during the manual operation. The system provides web storage through a Wi-Fi module which receives data from the microcontroller. During the comparison of the obtained values and the rated values if there are any differences then the relay gets tripped by which the equipment is protected.

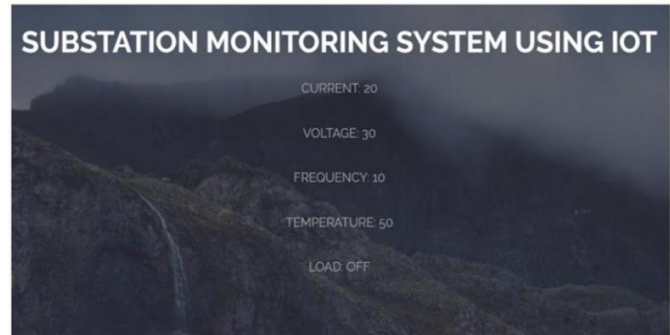


Fig. 3. Web page result

### IV. CONCLUSION

With the introduction of the Internet of Things (IoT) concept human efforts are reduced as the monitoring and controlling of the substation is automated. Accurate and reliable operations are undertaken. As a result, efficiency is increased. Power can be supplied without any interruptions. Quality of the power transfer can be improved. Therefore, system performance is enhanced.

### V. FUTURESCOPE

We can also add GSM modem to operate fans, lights etc. through a GSM based mobile phone. The microcontroller is programmed in such a way that the obtained values are sent as SMS to the GSM modem from mobile phone. A feedback SMS will be sent to the mobile from GSM modem.

### REFERENCES

- [1] Timo T. Vekara, "REMOTE MONITORING SYSTEM FOR TRANSFORMER SUBSTATION" member,IEEE,Seppo Pettissalo and N.Rajkumar,member,IEEE.
- [2] An efficient monitoring of substation using microcontroller based monitoring system, IEEE paper by M.V.Thiyagrajan on July 2010.
- [3] S. A. H. Z. Abidin, S. N. Ibrahim, "Web-based monitoring of an automated fertigation system: an IoT application", *Proc. IEEE MICC*, pp. 1-5, 2015.
- [4] Design of an Industrial IoT-Based Monitoring System for Power Substations Long Zhao ; Igor Matsuo ; Yuhao Zhou ; Wei-Jen Lee 2019 IEEE/IAS 55th Industrial and Commercial Power Systems Technical Conference (I&CPS).
- [5] Argonne National Laboratory, "Assessment of the Potential Costs and Energy Impacts of Spill Prevention,

- Control, and Countermeasure requirements for Electric Utility Substations," Draft Energy Impact Issue Paper, 2006.
- [6] B.A. Carreras, V. E. Lynch, D. E. Newman and I. Dobson, "Blackout Mitigation Assessment in Power Transmission Systems," Hawaii International Conference on System Science, January 2003.
- [7] S. Matsuda, Y. Watabe, I. I. Asrizal, S. Katayama, K. Okuno, and K. Kasuga, "Issues overcome in the design and application of iec 61850– compliant substation automation systems," in Advanced Power System Automation and Protection (APAP), 2011 International Conference on, Oct. 2011, pp. 198–202.
- [8] S. E. Collier, "The emerging enernet: convergence of the smart grid with the internet of things", *IEEE Mag. Industry Application*, vol. 23, no. 2, pp. 12-16, Dec. 2016.