International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 06 | Jun 2022 www.irjet.net p-ISSN: 2395-0072

IOT based Three Phase Power fault monitoring with SMS alerts

Pratyush Kumar[1], Nishant Raj[2], Rahul Purbia[3], Rajdeep Purbia[4], Rachana M Hullamani [5]

[12345]*Dept. of EEE, Dayananda Sagar College of Engineering, Bangalore, Karnataka, India*

Abstract - *There are many sections to the Electric Power System. Power is transmitted from generating stations and substations to consumers via transmission lines, one of which is the transmission system. It is possible for both methods to encounter various types of malfunctions, also known as faults. When the insulation of a power system fails at any point, a number of undesirable but unavoidable incidents are able to temporarily disrupt the stable operation of the power system. A smart GSM-based fault detection system accurately and appropriately detected and located the fault. As a result, technical crews will respond more quickly to rectify these faults, reducing the chances of transformer damage and disasters. A current transformer, a voltage transformer and a GSM modem are used in the system. This system will automatically detect faults, analyses and classifies these faults, and then calculates the fault distance from the control room. The fault information is then transmitted to the control room. In conclusion, the time required to locate a fault is greatly reduced, since the system automatically and accurately provides fault location information. With this project, it is possible to detect the faults of three phase transmission lines, as well as monitor voltage current and frequency error by using a GSM modem.*

Key Words: ***Automatically, Fault, Frequency, GSM, Sensors***

1. INTRODUCTION

Energy leakage is one of the major problems that the corporation faces in recent times. Because of this, there has been an increasing awareness of the difficulties involved. They can be caused by natural disasters, technical problems, or mechanical problems. The distribution of electricity to the final consumers could be disrupted by interruptions in power supply. These interruptions are most often caused by problems with the electric power provider or problems with the building's electrification. In addition, power failures can be a major cause of low production rates in industries and power cut-offs in the transportation sector, such as metros and trains. Bringing this leakage under control is next to impossible with the electrical transmission lines running millions of miles across the country. Only way to solve this problem is to come up with a mechanism that can detect the fault in electricity transmission line automatically and intimate the authorities with a specific location. Through this project you will develop a device that uses sensors to sense the incoming & outgoing values and detect anomalies. And, the system will be integrated with the Bluetooth mechanism, to intimate the responsible people real time with the location information and scale of leakage in an LCD. There are many courses of faults in power transmission leading to power outages, if not properly managed.

2. Literature Survey

[1] In this paper, Arduino UNO Microcontroller is used to identify transmission line faults by identifying the unwanted fluctuation of electrical quantity and protect the load from damage. Voltage Regulator (LM 317) is used in a circuit that provides variable output voltage for the connected load. The power supply has three Rotating potentiometer for adjusting the output voltage and for setting the current limit. A variable voltage detection circuit identifies the abnormal change in voltage every second. Lcd display is used to display voltage change, current consumption, pre-set current limit and power consuming by load. High voltage back EMF received from the relay coil switching the relay ON and OFF and hence circuit protects the load by disconnecting from the voltage supply.

In [3] survey, the fault detection system in transmission line has been studied. The status of all phases can be monitored individually. And for unbalanced phase fault, the system can detect the faults, can update the same at the power house via a SMS alert and if the microcontroller timer times out, it can reset and restart the normal operating conditions. Thus, with the recorded nominal current and voltage values, the system can identify the fault type and theft current. This survey also explains about the types of faults for example line to line fault, line to ground fault, double line to ground fault etc.

In [4] this paper GSM system was still utilized as a part of numerous nations the same number of nations of the world had reported to shutdown GSM administrations toward the finish of 2016. GSM system or 2G organize has worked for past 20 years. At the time, simply making a mobile approach the move was curiosity and everyone grasped the versatile marvel. Be that as it may, time changes, as innovation developed and cell phones have turned out to be quicker witted, clients have actually moved to 3G and 4G systems that offer quicker speeds and a client experience that we could have envisioned around 20 years back. With newly advance like LTE Advancement, the systems administration is keep going on developing much further.

3. Block Diagram and Working Principle

To attain our concept, we have to use Arduino mega, voltage sensor, current transformer, a stable multivibrator, relays, buzzer, LCDs, and GSM module. The project detects these types of faults –

1. **Line to line and ground fault detection** using low voltage cable. The secondary transformer will be connected in star connection so that it will have a set of three phase lines. To analyze this type of fault, here we have used a small circuitry called post unit which is mounted on various points in the circuit line. When short circuit takes place between R-Y, Y-B phases then ADC get more than zero analog value at channel AD6 & AD7 where relay is in NO condition and load is stop running. The main unit consists of set of sensors that give the status of line at that point and it accepts the information received from the post unit. Then it sends information to the power station provider about the type of fault and location if it finds the line faulty and cutoffs the loads automatically from the lines and a notification will sent to a mobile phone using GSM module.

2. **Over load detection** using current transformer. This circuit is designed to detect over current. In this section a special type of CT is used to detect very low current. The CT output is an AC voltage proportional to the Load current. The CT voltage varies according with load current. That output is connected to the analog points of Arduino A98, A 9 and 10 and protects the load from maximum current.

3. **Over and under voltage detection** using potentiometer. That output is connected to the analog points of Arduino and protects the load from maximum or minimum voltage. For the satisfactory working of all electrical and electronic devices, it is recommended to allow prescribed voltage limit. Voltage fluctuations in electric power supply certainly have very adverse effects on connected loads. These fluctuations can be of over voltage and under voltages which are caused by several reasons like voltage surges, overload, lightning, etc. Over voltages are the voltages that exceed the nominal or rated values which cause insulation damage to electrical appliances which leads to short circuits.

4. **Frequency error detection –** We have designed an oscillator having frequency 40 to 60 Hz using 555 timer and its output is given to the Arduino pin - 8. Arduino measures the time between HIGH and LOW level of the signal and it returns the value in microseconds. After duration of both the times between HIGH to LOW and LOW to HIGH are added, inverse of this value will give signal frequency. If frequency changes from 50hz to 60Hz or to 40Hz then it will trip the loads using relays and send a notification to mobile phone.

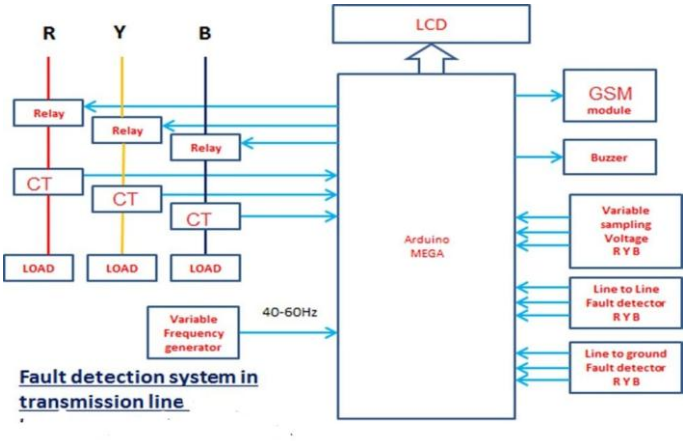

Fig -1: Block diagram of Three phase Fault monitoring

5. Smart Plant Pot Architecture

The architecture can be divided into two parts i.e., hardware and software.

In the hardware section, the following tools were used:

- Power Supply(+5V)
- Arduino mega – 1
- Current sensor – 3
- Potentiometer – 4
- 555 timer -1
- Micro switches -3
- RYB cable – 1meter each
- Bulb holders – 6
- Led bulb – 3watt – 3
- 100watt bulb – 1
- Buzzer – 1
- 100 uf capacitor – 6
- 10k resistor- 13
- 10k preset – 3
- Bc547 – 4
- Relay 12v/7amp – 3
- Diode in 4007 – 6
- GSM module – 1
- LCD 16/2 – 1
- Led – 2

In the software section, the following tools were used:

- Proteus software
- Arduino IDE
- Library: Arduino GSM Shield

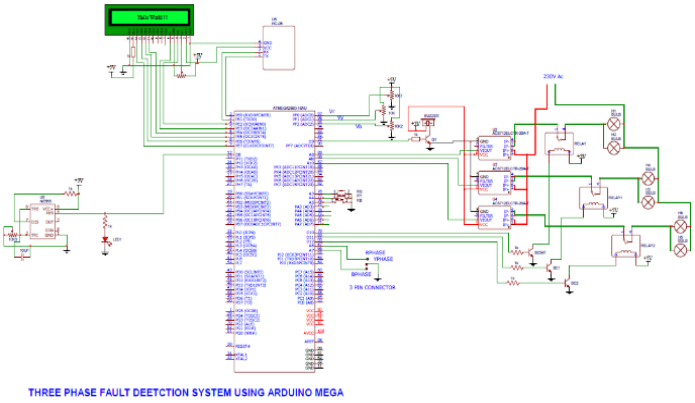

Fig -2: Pin Diagram of Hardware System

6. Results and Discussions

The 4 faults, we are monitoring in IOT based three phase faults monitoring system which includes Line to line and ground fault detection, over load detection, Over and under voltage detection, Frequency error detection. The IOT based system was able to remove the limitations of the traditional system and thus was able to automate various activities which can simplify the lives of the people and Plants technician as it provides faults location and types of faults directly by message to the control room. The following images illustrated the working module of system.

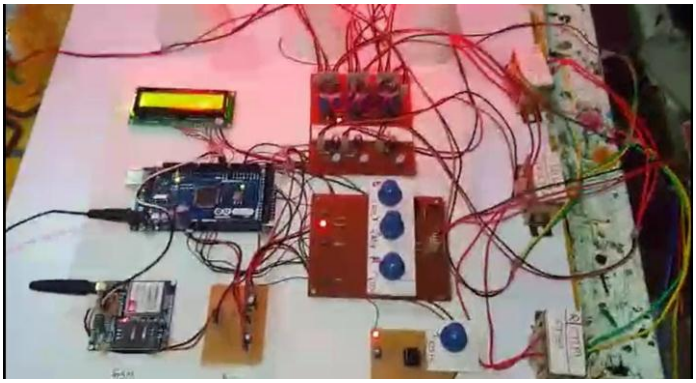

Fig -3: Working model of IOT based fault monitoring system of three-phase

7. CONCLUSION

The model design in such a way to solve the problems faced by consumers. By using such method, we can easily detect the fault and resolve it quickly. It is highly reliable and locate the three-phase transmission line fault and also supposed to store the data. It works on real time so we can easily maintain all sheets of data and avoid the future problem in transmission line. This paper concludes that the GSM technology used for the fault detection of three phase line through calls and messages is provided to the In-charge Technicians of particular faulty location. The messages of fault location will be sent information about the fault to the all In-charge technicians at the same time by the internal programming of microcontroller connected to GSM Module. The Lamp or Buzzer can be provided if any of the area In-charge technicians doesn't respond by clearing the fault or can easily locate the fault. To get the exact faulty phase under faulty area the RYB Indicators are also used for faulty phase indication purpose. Implementation will result in high yield and growth of the power plant. In future this project can be used by people bearing antique or expensive plants and want to take extensive care of them, so our model can achieve this by completely automating the process of finding fault.

REFERENCES

[1] Akash Chatterjee, Avijit Maitra, Biswarup Saha, Debopam Chakraborty, Mouli Karmakar, Sandipan, JIS College of Engineering, West Bengal, India,"Fault Detection System Of Transmission Line Using IOT", Year of Publication- 2021 Publication- International Journal of Creative Research Thoughts.

[2] Mrs. Kripa, Ms. Madhushree M, Mr. Manish Puthran Assistant Professor, Dept. of EEE, Yenepoya Institute of Technology, Moodbidri,India, "Fault identification: Three phase fault detection using IOT", Year of Publication- 2021, Publication- International Journal of Research in Engineering and Science.

[3] Ankita Gupta, Ravindra Manohar Potdar (Bhilai Institute of Technology) -Fault Detection System in Transmission Line Network -ET and T Department, BIT, Durg, India.

[4] Zia Ur Rahman, BACHA KHAN UNIVERSITY," GSM Technology: Architecture, Security and Future Challenges", Year of Publication- 2017, Publication- Research Gate.

[5] Prof. Vikramsingh R. Parihar, Shivani Jijankar, Anand Dhore, Arti Sanganwar, Kapil Chalkhure Automatic Fault Detection in Transmission Lines using GSM Technology-International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering.