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Transmission Line Fault Detection Using Arduino

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Abstract: Electric power systems are created to provide the maximum level of stability and dependability in the energy supply. A substation facility is a compact structure that houses transformers, switches, voltage regulators, and metering devices for controlling voltages and keeping an eye on circuits. Since the transmission lines used to transfer the power generated at the main stations hundreds of miles before it reaches the substations. The amount of power received at the substations may decrease due to a significant degree of power loss that may take place during the conveyance of the generated electricity. The main goal is to bypass the power and distribution transformers and ensure protection against damages brought on by overloading and defective situations like short-circuits and surges, among others.

Current sensor is used in this situation to remedy the issue. Accurate fault location cuts down on the amount of time needed to fix damage, restore power, and lower costs. If a problem arises, the substation will be informed via the Internet of Things (IoT). The proposed initiative reduces business losses, damages to equipment, and improves power quality and reliability.

Keywords: Aurdino, GSM module, Relay, LCD, Transmission Line.

1. Introduction

Current is continuously distributed to consumers thanks in large part to the distribution system and transmission lines. According to the review, failures in distribution networks are to blame for 80% of service interruptions for consumers. Due to their exposure to the environment, transmission lines have one of the highest fault incidence rates of all the parts of the power system. Three phase shunt and three phase to ground circuits are the balanced faults in transmission lines that result from lightning, storms, etc. Unbalanced faults include single line-to-ground, single line-to-line, double line-to-line,
overload, overvoltage, and short circuit. When a defect is detected in a transmission system, the protective relaying system is incorporated to separate the malfunctioning portion of the system from the remainder of the system with the least amount of disruption and equipment damage possible. The crucial links that ensure the fundamental continuity of electrical power service to end consumers are power transmission and distribution lines.

The load centres and generating stations are connected by transmission lines. The distance between the generating stations and the load centres is hundreds of kilometres. But there is a very high likelihood that a fault may develop in the transmission lines. To find damaged portions of their transmission lines, several electric power transmission companies have mostly depended on circuit indications.

The precise position of these faults can still be difficult to find. The technical crew and patrol teams still have to physically patrol and inspect the devices for longer hours in order to find problematic sections of their transmission lines, even though fault indicator technology has given a dependable way to locate permanent issues. In order to clear problems quickly and with the least amount of disturbance, fault analysis is a very important issue in the power system. Any information about a fault is promptly sent to the electrical board using this method. To identify problems in load lines, this is employed in remote urban and rural locations. This network made use of IoT technology for communication.

2. Block Diagram

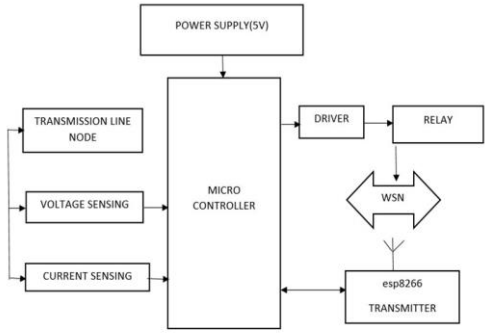

Fig 1: Block diagram of a transmission line fault detector

3. Working and operation

Distribution line multiple faults detection and indication to substation deals with the problem of identifying the fault in the distribution lines and the automatic indication to substation. The electric distribution network the microcontroller interacts with the power lines and sends message what kind of fault held in the line through the Internet of Thins (IOT). In this the man power is decreases from finding the fault where it is. The objective is to monitor the distribution line continuously and hence to safeguard the fault of distribution line due to the limitations such as overvoltage, overload, and short circuit. Here current sensor is used to detect the overload, short circuit and overvoltage. If any of these does occurs then this information will be sent to the substation through Internet of Things (IOT) along with alarm ring. Detecting the area where the fault is occurred is difficult. Using current sensor is reliable to detect and intimate the fault. In the short time we can able know the fault and rectify immediately. The proposed method shows the correct location of the fault occurred through Current sensor.

Regardless of how the DC voltage varies or how the load connected to the output DC voltage changes, the controller circuit removes the wavelet and continues with the DC voltage as before. This voltage regulation is often accomplished using one of the voltage controller IC chips..

A prototype is utilised to identify the transmission line problem that has developed. a CPU, an LCD, and an optocoupler are used. A prototype is constructed using a collection of resistors, kilometres of cabling, and switches intended to introduce faults. Think about the terminals (R, Y, and B) that were supplied with 230 volts of ac power. The supply was sent to the terminals, and each one was equipped with a 470 k ohm resistor and a diode that rectified the voltage signal and generated variable DC as an output. The optocoupler is then given a steady DC supply via a parallel-connected capacitor, which blocks out everything else. The DC supply that lights the LCD is located on the side of the optocoupler. A prototype is utilised to identify the transmission line problem that has developed. a CPU, an LCD, and an optocoupler are used. A set of resistors, kilometres of cable, and are used to assemble a prototype. One LED and transistor are located inside the optocoupler. The transistor is an NPN transistor, and the base terminal senses both the LED's radiation and the current flowing from collector to emitter inside the transistor.

The collector terminal of an IC microcontroller is connected to the emitter terminal, which is connected to ground.

The microcontroller software compares the voltage level and outputs the results to the LCD and Wi-Fi module, which are displayed on the PC and screen..

4. Internet of things (IOT)

The internet of things or IOT, is a system which is connected between the devices, analog, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to sending data over a network without requiring human-to-human or human-to-computer interaction. The Internet of Things is simply defines “A network of Internet connected object able to collect and transfer data”. IOT is the concept of connecting any device with an ON and OFF switch to the internet and then give a appropriate output.

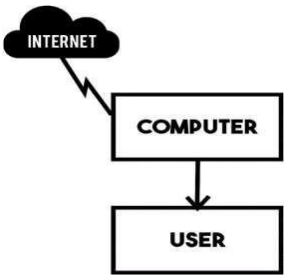

Fig 2: Internet things

5. Objective

This design is trustworthy and efficient. The main objective of this prototype model human efforts decreased. And damage the electrical equipment. To ensure stability and reliability of power system is boost system is stronger and also strong the economic growth.

6. Application

- Used in Industrial Fault detection system
- Used in transmission line fault detection system
- It can be used in mine
- It determines the fault distance
- Used to analyses and classifies the faults.

7. Hardware implementation

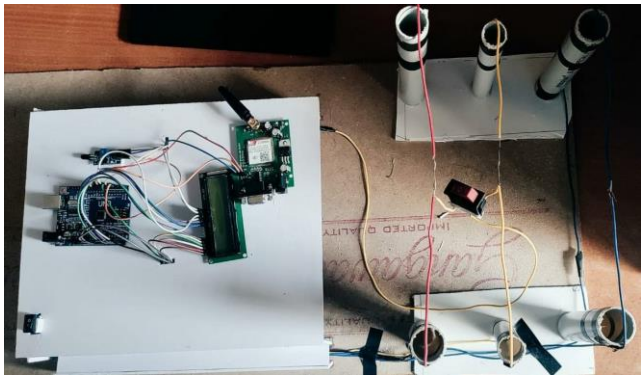

Fig.3 Complete Hardware Setup Of Fault Detection In Transmission Line By Using Arduino.

Our prototype is used to detect the fault, which has occurred in transmission line. By using ATMEGA238 microcontroller, optocoupler, LCD. A prototype is assemble with a set of resistor, cable length in km, by using set of switches made to creation of fault in prototype .A 230v ac supply is fed to the terminal, let us consider the terminals (R,Y,B)we took supply and fed to the Terminal there one resistor connected with diode, resistor rating is 470k ohm and diode IN4007 which rectify the voltage signal and gives variable DC as a output .A capacitor which is connected in parallel which is used to keep out all unwanted signal as well as gives constant DC supply .The DC supply is then gives to optocoupler and input Side of optocoupler the DC supply is present that glows the LCD .The optocoupler one LED and transistor are present. The transistor is NPN transistor, the base terminal is sense the radiation of LED and the current flow inside the transistor from collector to emitter ,The emitter terminal is connected to ground and the collector terminal is connected to IC ATMEGA238.The program is done in IC ATMEGA238 which compare the voltage level and gives the output on LCD and Wi-Fi module result shown on PC and screen.

8. Conclusion

A prototype is utilised to identify the transmission line problem that has developed. a CPU, an LCD, and an optocoupler are used. A set of references is used to construct a prototype. The consumer complaints were addressed in the model's design. Such a technique makes it simple to identify and fix faults. It is very dependable, capable of identifying transmission line faults in three phases, and designed to store data. Since it operates in real-time, we can keep up with all data sheets and prevent transmission line issues in the future.

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