Fault Detection of Under Ground Cable using IOT

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Abstract

The objective of this paper is to determine the location of fault in underground cable lines from the source station to exact location of fault in any units, here in kilometres. Whenever a fault occurs in the underground cable line for some reason, the repairing process relating to that faulted cable becomes difficult owing to lack of proper system for tracking the exact fault location and the type of fault occurred in the cable. For this, a system has to be developed to find the exact location of the fault in the distribution line system for all the three phases R, Y & B for different type of situations of faults. Here in this paper single line to ground, double line to ground & three phase faults have been considered. Therefore, the basic concept of Ohm's law[2]is found suitable in principle to develop a fault location tracking system. Based on the Ohm's Law, it is found that the resistance of the cable is proportional to its length under constant conditions of temperature and the cross section area and therefore if a low DC voltage is applied at the feeder end through a series of resistor in cable lines, the current would vary depending upon the location of fault in the cable. Here a system is developed which consists of a microcontroller, LCD display, Fault Sensing Circuit Module, IOT Wi-Fi Module and proper power supply arrangement with regulated power output.

Keywords: ATmega 328P micro controller, Fault Sensing Circuit, IOT Wi-Fi Module, LCD Display.

I. INTRODUCTION

Use of underground power cable is expanding due to safety considerations and enhanced reliability in the distribution systems in recent times. Due to safety reasons and high power requirements in densely populated areas, use of underground cable has seen a sharp hike. The underground cable systems have the advantages of not getting affected by any adverse weather condition such as storm, snow, heavy rainfall as well as pollution. But it has its own drawback for immediate

tracking of fault in the underground cable lines.

Study of cable failures and development of accurate fault detection and location methods has been interesting research topics in the past and present. Fault tracking entails determination of the presence of a fault, while fault location detection includes the determination of the physical location of the fault. However, this fault detection and fault location detection technology for underground power distribution systems is still in developing stages.

Before fixing any fault in cables, the fault has to be identified first. There are many ways to find the cable fault location. This paper deals with the method to locate faults and identify the phase line in damaged cables. A basic idea of fault location and phase identification in the pictorial view is undernoted.

II. LITERATURE SURVEY

Frequent fault in underground cables due to the breakdown of paper plastic insulation due to chemical reaction or poor workmanship during installation and the difficulties in locating the approximate fault area have been a serious problem. Most Underground Faults are located by unearthing the entire length of cable to enable visual inspection to be carried out. In case where visual inspection is not helpful then the entire length of cable is replaced. This manual method is not only expensive but also results in heavy loss of revenue to the power distribution company. This research is aimed at designing an underground cable fault location distance detection to solve this problem. The research work will help in identification and location of underground cable fault without unearthing the entire length of the cable before repair or replacing entire cable due to difficulty in locating the fault.

III.EXISTING SYSTEM

When electrical energy is generated in the generations' stations, it is distributed to the different loads, i.e. cities, towns and villages for consumption then. The process involves stepping up the voltage to minimize the loss of energy in the form of heat. The stepped up voltage is distributed to grid stations where it is stepped down for distribution to the local transformers where it is finally stepped down and distributed to the consumers. The basic method of locating a cable fault depends on physically cutting and splicing the cable. Dividing the cable into successively smaller sections will enable you to narrow down the search for a fault. For example, on a 500-ft length, you would cut the cable into two 250-ft sections and measure both ways with an ohmmeter or high-voltage insulation resistance (IR) tester. The defective section shows a lower IR than the good section. You would repeat this "divide and conquer" procedure until reaching a short enough section of cable to allow repair of the fault. This laborious procedure normally involves repeated cable excavation

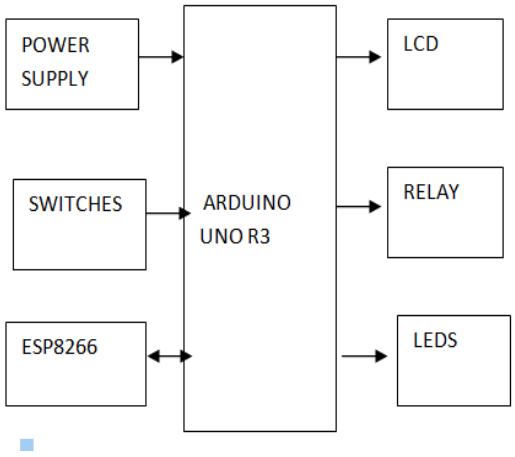
IV.PROPOSED SYSTEM

Our paper aims in finding the exact location of the fault. The paper uses the standard concept of Ohms law i.e., when a low DC voltage is applied at the feeder end through a

series resistor (Cable lines), then current would vary depending upon the location of fault in the cable. In case there is a

short circuit (Line to Ground), the voltage across series resistors changes accordingly, which is then fed to inbuilt ADC of Arduino board to develop precise digital data for display in unit distance. Cable fault detector deals with finding the exact fault location from the base station. It also notifies about the fault when it occurs. It can be also used for underground transmission. Cables have some resistance. We are mainly focusing that resistance. Resistance can vary with respect to the length of the cable. If the length of the cable is increased, the value of the resistance will also increase. If any deviation occurs in the resistance value, we will call that point as fault point and find that place with the help of arduino technology. That fault point is represented in unit distance from the base station and the value is displayed.

BLOCK DIAGRAM



ARDUINO UNO R3

The ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. This empowers system designed to optimize the device for power consumption versus processing speed. It has 32KBytes of In-System Self-Programmable Flash program Memory, 1KBytes EEPROM, 2KBytes Internal SRAM and Write/Erase Cycles of 10,000 Flash/100,000 capable EEPROM. It can be programmed using Arduino IDE.

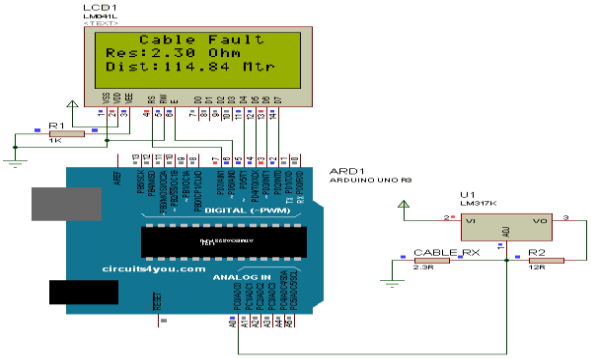
WIFI MODULE

The ESP8266 wifi module is a self contained SOC with incorporated TCP/IP protocol stack that can offer any controller access to wifi network. It uses 802.11 b/g/n protocols. Standby power consumption is less than 0.1mW.

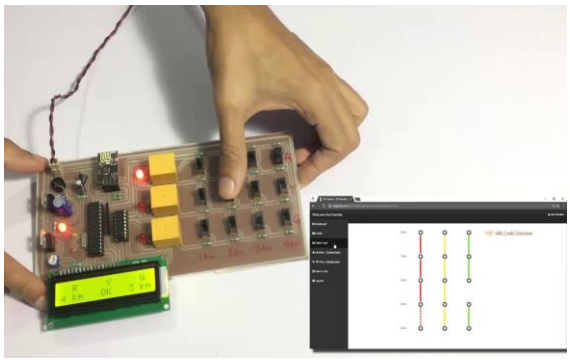
RELAY

Relays are used in a wide variety of applications. The advantage of relays is that it takes a relatively small amount of power to operate. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet. it also contain a set of contacts. The switching mechanism is based on electromagnet. Most of the devices have the application of relays.

V. EXPERIMENTAL RESULTS



(a)Fault detection



(b) fault send to mobile

The fault distance detection system is being run and tested which shows the different outcomes of faults in LCD display of the system and followed by mobile webpage through IOT Wi-Fi Module as per case chosen. This system consists of fault sensing circuit having set of four series resistors in each phase of the line equally divided into 4 parts at a distance of 1 Kilometre each where a slider switch is connected to the supply. When the switch is closed the current flows through the resistor and voltage drop occurs which indicates that a fault to ground has occurred. There are various case studies conducted with all the three phases (R, Y, and B) of cable line individually in each phase. There are 4 nos. of slider switches in each phase totalling to 12 nos. of such switches in all the three phases.

VI. CONCLUSION

This paper described the IOT Technology Based Underground Cable Fault Distance Detection System Using ATmega328P Microcontroller in software and hardware simulation form and results were successful. A full-fledged prototype model had been implemented as a proof of concept to realize and understand the real time scenarios in underground cable system. Through this prototype simulation model the proposed architecture had been demonstrated that can effectively satisfy the requirement of exact fault location detection in the underground cable system and it is believed that this model can be a promising technology to solve future fault location detection problem.

VII.FUTURE SCOPE

We use an Ethernet shield to establish connection to the web page. If we use a Wi-

Fi module instead of an Ethernet shied then we can make it wireless. With the help of an SD card we can develop a better user interface. In the future it can be used to find the error in open circuit faults.

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