PROTECTION OF UNDERGROUND FIBRE WHILE DIGGING THE ROAD

K.N.Abinaya, A.Amirthavarshini, V.S.Bharathi,
S.Vinoth Kumar, T.Kalaikumaran
Department of computer science and engineering
SNS College of Technology,Coimbatore
(abiguna1998@gmail.com)
Department of computer science and engineering
SNS College of Technology,Coimbatore
(amirthaarjunan007@gmail.com)
Department of computer science and engineering
SNS College of Technology,Coimbatore
(bharathisundararajvs@gmail.com)
Department of computer science and engineering
SNS College of Technology,Coimbatore
(profsvinoth@gmail.com)
Department of computer science and engineering
SNS College of Technology,Coimbatore
(tkalaikumaran@gmail.com)

----------**********----------

Abstract:

The objective of this paper is to determine the location of cable or fault in underground cable lines from the source station to exact location of fault in any units, here in kilometers. Whenever a cable or fault is found 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. 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 is found suitable in principle to develop a fiber 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 — **Underground Cable System, Ohm's Law, Fault Sensing Circuit, IoT Wi-Fi Module, LCD Display.**

----------**********----------

I. INTRODUCTION:

The objective of this paper is to determine the fiber and the distance of cable fault from the base station in unit distance using Arduino board. The underground cable system is a common practice in many urban areas. While a fault occurs for some reason, at that time the repairing process related to that particular cable is difficult due to not knowing the exact location.

Cable fault detector is an advanced method for finding fault location in cables. In the present scenario when a fault occurs, detecting fault source is difficult and entire line has to be dug in order to check entire line and fix faults. The main objective of our paper is to detect the fault location to reduce the time. So, it avoids the difficulty in digging the entire line. Thus, this paper reduces the effort and makes the work easy.

II. 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. And everything done was only manually. Also it takes more time to detect the fiber.

III. PROPOSED SYSTEM:

The circuit consists of a power supply, 4-line display, Arduino and resistance measurement circuit. To induce faults manually in the kit, fault switches are used. About 12 fault switches are used which are arranged in three rows with each row having 4 switches. The 3 rows represent the 3 phases namely R, Y and B. The fault switches: have 2 positions-No fault position(NF) and fault position(F).Main component of the underground cable fault detection circuit is low value resistance measurement. It is constructed using a constant current source of 100mAmps. It can measure very low value resistance as the cables have around 0.01 Ohm/meter resistance. For 10meter cable resistance becomes 0.1 Ohm. This circuit can measure resistance up 50 Ohm, Maximum cable length it can check up to 4 kilometers.

So, starting from the reference point 4 sets of resistances are placed in series. These 4 sets of resistances represent the three phases and the neutral. Short circuit faults, Symmetrical and unsymmetrical faults can be determined by this method. This project uses three set of resistances in series (i.e,) R10-R11-R12-R12, R17-R16-R14R21, R20-R19-R18-R25 one for each phase. Each series resistor represents the resistance of the underground cable for a particular distance and so here four resistances in series represent 1-4kms.Value of each resistance is 10kΩ.

IV. SYSTEM DESCRIPTION:

The project depends on the concept of OHMs law where a low DC voltage is applied at the feeder end through a series resistor. The current would vary depending upon the length of fault of the cable in case there is a short circuit of LL or LG etc. The series resistor voltage drop changes accordingly which is then fed to an ADC to develop precise digital data which the programmed microcontroller would display the same in Kilo meters. The project is assembled with a set of resistors representing cable length in KMs and fault creation is made by a set of switches at every known KM to cross check the accuracy of the same [3].

This is proposed model of underground cable detection and fault distance locator using Arduino. It is classified in four parts –DC power supply part (230v step down transformer, bridge rectifier converter and regulator), cable part, controlling part, display part. When a supply is applied to the step-down transformer, its convert into low voltage. Then this low voltage is applied to bridge rectifier which convert ac signal to the dc signal and we used a regulator which produce constant dc voltage. In the cable part we use a set of resistors along with switches. Current sensing part are used as fault creators to indicate the fault at each location. This part senses the change in current by sensing the voltage drop [4].

After that there is a controlling part which consists of analog to digital converter that receives input signal from the current sensing circuit and converts this input signal into digital signal and send it to the microcontroller. The microcontroller also a part of the controlling units and makes a necessary calculation regarding the distance of the fault[4.. The microcontroller also drives a relay driver which in turn controls the switching of a set of relays for proper connection of the cable at each phase. The display part consists of the LCD display interfaced to the microcontroller which shows the status of the cable of each phase and the distance of the cable at the particular phase, in case of any fault.

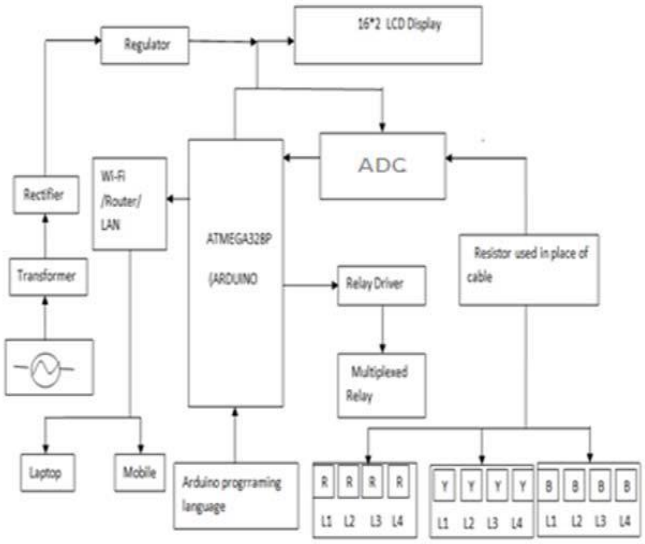

Fig 1. Block diagram

V. POWER SUPPLY:

A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another and as a result, power supplies are sometimes referred to as electric power converters. A DC power supply is one that supplies a constant DC voltage to its load. Depending on its design, a DC power supply may be powered from a dc source or from an ac source such as the power mains[3].

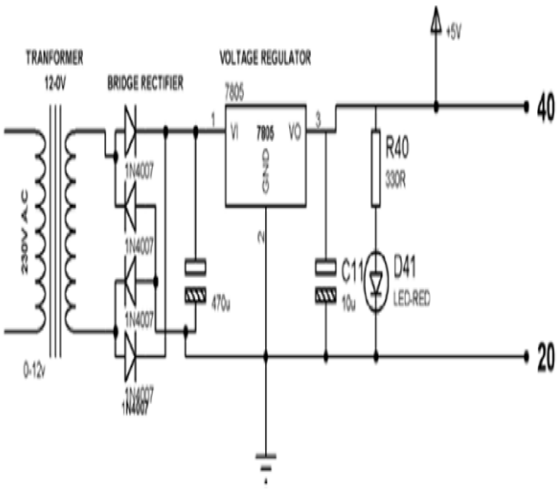

Fig 2. Block diagram of power supply

VI. ABOUT IOT TECHNOLOGY:

The evaluation of IoT in the electrical Power Industry transformed the way things performed in usual manner. IoT increased the use of wireless technology to connect power industry assets and infrastructure in order to lower the power consumption and cost. The applications of IoT are not limited to particular fields, but span a wide range of applications such as energy systems, homes, industries, cities, logistics, heath, agriculture and so on. Government & independent power providers are continuously exploring solutions to ensure good power quality, maximize grid uptime, reduce power consumption, increase the efficiency of grid operations and eradicate outages, power loss & theft. Most importantly, the solution should provide a real-time visibility to customers on every penny paid for their energy. There is an increasing need of a centralized management solution for more reliable, scalable, and manageable operations while also being cost effective, secure, and interoperable. The goal of IoT is not just only connecting things such as machines, devices and appliances, but also allowing the things to communicate, exchanging control data and other necessary information while executing applications. It consists of IoT devices that have unique identities and are capable of performing remote sensing, monitoring and actuating tasks. These devices are capable of interacting with one another directly or indirectly. Data collection is performed locally or remotely via centralized servers or cloud based applications. These devices may be data collection devices to which various sensors are attached such as temperature, humidity, light, etc., or they may be data actuating devices to which actuators are connected, such as relays.

VII. SYSTEM DESIGN:

This system design with following component:

1.Atmega Microcontroller
2.LCD Display
3. Relay Driver
4. WiFi Module
5. Transformer

A.MICROCONTROLLER

Microcontroller is a programmable device. We are using 32 pin microcontroller as for our requirement. In these the 11 pin for LCD, 14 pin for ADC5 pin switches and 2 pin for Wi-Fi. Microcontroller is on chip true microcomputer Intel 8051 family each most popular microcontroller producing is world market. It has 64KB external data memory, 64KB program memory and 256 byte internal data memory. It increases reliability. Hardware is less because of single chip microcontroller it has small time to execution therefore speed is high Microcontroller is a programmable device microcontroller has a CPU in addition to a fixed amount of RAM/ ROM,I/O port. The fixed amount of on chip ROM,RAM and number of IO ports in microcontroller makes them ideal for many applications in which cost and space are critical.

B. LCD DISPLAY

LCD is finding wide spread use replacing LEDs because of the following reasons: The ability to display numbers ,characters and graphics .This is in contrast to LEDs, which are limited to numbers and a

few characters. In contrast, the LED must be refreshed by the CPU to keep displaying the data

C. RELAY DRIVER

Relay are switches that open and close circuit electromechanically or electronically. Relays are control one electrical circuit by using opening and closing contact in another circuit when a relay contact is normally open, (NO) there is open contact (OC) when the relay is not energized.

D. WiFi MODULE

The ESP8266 WIFI module is self contained SOC with integrated tcp/tp protocol stack that can give any microcontroller access to your wifi network. The ESP8266 each capable of either hosting or application or off loading or wifi networking function from another application processor.

E. TRANSFORMER

Transformer is static device is transfer electrical energy from one circuit to other circuit with change voltage and current without in change frequency. in this step-down transformer is use. Usually, DC voltages are required to operate various electronic equipment. And this voltages are 5v,9v and 12v.but this voltage cannot be obtained directly. Thus AC input available at the main supply.i.e. 230v is to be brought down the required voltage level. This done by transformer. Principle of transformer is according to faraday law of electromagnetic induction.

VIII. CONCLUSION:

The short circuit fault at a particular distance in the underground cable is located to rectify the fault efficiently using simple concepts of Ohms law. The work automatically displays the phase, detects the fiber, distance and time of occurrence of fault with the help of microcontroller and ESP8266 Wi - Fi module in a webpage. The benefits of accurate location of fault are fast repair to revive back the power system, it improves the system performance, and it reduces the operating expense and the time to locate the faults in the field.

ACKNOWLEDGMENT

We are profoundly grateful to **Dr.T.Kalaikumaran**, Professor & Head, Department of Computer Science & Engineering for his consistent encouragement and directions to improve Mini project and completing the mini project work in time.

Words are inadequate in offering our thanks to the Mini project Coordinator, **Mrs.G.Renugadevi**, Assistant Professor, Department of Computer Science & Engineering, for her encouragement and cooperation in carrying out the mini project work.

We take immense pleasure in expressing our humble note of gratitude to our mini project guide, **Mrs.K.Maheswari,** Assistant Professor, Department of Computer Science & Engineering, for her remarkable guidance and useful suggestions, which helped us in completing the mini project work in time.

REFERENCES:

[1]. Chao Zhang; Xiaoning Kang; Xiuda Ma; Shuai Jiang; Xiaoyun Qu 2016 IEEE PES Asia-Pacific Power and Energy Engineering Conference (APPEEC)

[2]. Gilbert Cheung, Yuan Tian, Tobias Neier, Technics of Locating Underground Cable Faults inside conduits, International Conference on Condition Monitoring and Diagnosis IEEE (CMD 2016)

[3]. Nikhil Kumar Sain, Rajesh Kajla, and Mr.Vikas Kumar, Underground Cable Fault Distance Conveyed Over GSM, International Organization of Scientific Research Journal of Electrical and Electronics Engineering, Volume 11, Issue 2, MarApril 2016.

[4]. C.Bharatiraja, S.Jeevananthan, J.L. Munda, A Timing Correction Algorihm based extended SVM for three level Neutral point clamped MLI in Over Modulation Zone IEEE Journal of Emerging and Selected topics in Power Electronics.

[5]. Manar Jaradat, Moath Jarrah, Abdel Kader Bousselham, Yaser Jararweh, Mahmoud AlAyyoub

the Internet of Energy: Smart Sensor Networks and Big Data Management for Smart Grid, Procedia Computer Science Elsevier, and July 2015