Underground Cable Fault Detector Using IOT

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***Abstract*—This paper proposes an error detection system using underground cables microcontroller and Internet of Things (IOT). After detecting the location of the fault in the underground cable the microcontroller alerts the user remotely via IoT. The occurrence of a fault within a predefined distance can be investigated through this proposed system. The display unit is connected to the display system electrical parameters like voltage, current and also the distance at which the error occurs. Defect detector measures the current and voltage of the underground cable and if there is a large difference between the voltages and the current of the two fault detector terminals, then the detector alerts the user from a distance without getting close to the cable.**

Keywords- Internet of things (IOT), microcontroller, fault detector, underground cables.

I.INTRODUCTION

Underground cables are prone to a variety of faults due to underground conditions, wear, rodents, etc.Diagnosing the source of the fault is difficult and the whole cable should be taken out of the ground and inspected and repaired. The paperwork is meant to reveal the fault in the underground cable line from the base station to another substation using a microcontroller. To find a fault in the cable, use the cable must be tested for defects and a defect will be created by a set of switches at every known distance between the two substations. In the event of a fault, the voltage drops and changes according to which is then fed into the programmed Microcontroller IC which further shows IOT error. IoT is used to display information over the Internet using Wi-Fi module ESP8266. The website is created using HTML coding and occurrence information the error will be displayed on the web page.

II.PREVIOUS WORK

Tracer method

The tracer method is an exhaustive way to locate a faultedsegment by ―walking‖ through the cable circuits. A faulted segment can be determined from audible or electromagnetic signals and requires dispatching crew members to the outage area. There have been various techniques largely used in the industries, including the tracing approach through acoustic,electromagnetic or current.

Terminal method

The terminal method is a technique used to determine a fault location of a distribution cable network from one or both ends without tracing exhaustively. A bridge technique is one of the most popular terminal methods that

links with a resistor to determine a fault location .It is a technique used to detect fault location of cable from one or both ends without tracing.

III.LITERATURE SURVEY

The design and implementation ofto identify faults in underground cables using IOT is presented. This project is to determine the distance between the underground cable fault and the base station, in kilometers, and display on the Internet. Underground cable systems are common and are used in large areas of metropolitan cities. While the fault occurred for some reason, the repair process related to this particular cable was difficult due to the unknown location of the fault in the cable. This technique is used to know the exact location of the error and send the data in graph form to our website through the GSM module and display it on the LCD screen at the same time.This project uses the standard theory of Ohm's Law, that when a small DC voltage is applied to the side of a power source through a series resistor (cable line), the current varies in location of the fault in the Cable because the resistance is proportional to the distance. In the case of the, the(line to ground) is shorted and the voltage across theseries resistor varies with the resistance which varies with distance from the ground. This is then passed to a ADC to generate accurate digital data, which is displayed in kilometers by a programmed 8051 series microcontroller.

IV.PROPOSED SYSTEM

The proposed system is an IOT-enabled underground cable fault detection system. The basic principle of the system is Ohm's law. When a cable fault occurs, The voltageused to calculate the distance to the fault changes. The system consists of a Wi-Fi module, a single-chip microcomputer, a sensor unit and a line cutter unit.

V.SYSTEM DESIGN

In this proposed fault detector, a DC voltage is supplied to the power supply through a number of resistors in series. If the is shorted or there is an open circuit in the leads of the , the current flowing through the circuit will change in magnitude and the Cable Fault Detector will detect this current for operation of the installation of microcontrollers and other electronic devices in the proposed system,will work with the help of the ADC converter. The ADC converts the AC voltage to DC voltage for processing by the microcontroller. The detector will detect any type of underground fault within a two kilometer radius and wirelessly alert the user of the same.

MicroController:

A microcontroller is integrated into the system to control a single function of the system in the device. It does this by interpreting data received from I/O devices using the CPU.

Voltage sensor:

A voltage sensor is a device that converts a voltagemeasured between two points in a circuit into a physical signal proportional to the voltage. ImplementingVoltage and Current Sensing, this has become an excellent alternative to traditional current and voltage measurements.

Current sensor:

A current sensor is a device that detects the current (ACor DC) in a wire and generates a signal proportional to it. The signal produced by the can be an analog voltage or current or even a digital output . This can then be used to display the measured current in an ammeter, or the can be stored for further analysis in a data acquisition system, or can be used for control purposes.

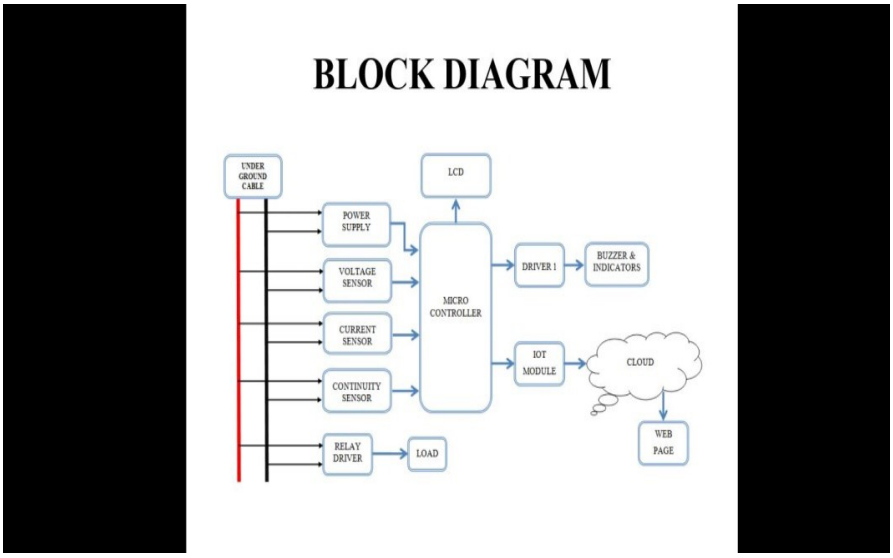

Fig:1:Block Diagram of underground cable fault detection system

VI. TYPES OF FAULTS

Open circuit fault:

When the conductor of the cable is disconnected, it is called a cable open circuit fault. The open circuit fault can be checked with a megohmmeter. To do this, short the three conductors of the 3-conductor cable at the far end to ground. Then measure the resistance between eachlead and ground with a megohmmeter. A megohmmeter will indicate zero resistance in a circuit where the leads are not broken.However, if the lead is a open circuit, the megger will show infinite resistance in its circuit.

Short circuit fault:

When the two conductors of a multi-conductor cable are in electrical contact with each other due to an insulation fault, it is called a short circuit fault. The two terminals of the megohmmeter are connected to any two conductors. If the megohmmeter indicates zero, there is a short circuit fault between these two conductors.

Earth fault:

When the conductor of the cable touches the ground of the earth, it is called a ground fault or an earth fault. To identify this error, connect one megger terminal to theconductor and the other terminal to ground. If themegohmmeter indicates a reading of zero, the conductor is grounded. Repeat the same process for the other conductors of the cable. This project is used to digitally detect the location of faults.Locating Fault Points in Underground Cables helps speed repairs, theincreases system reliability and reduces downtime.

VII. METHODOLOGY

The wire has its own resistance; our previous concern was that the resistance of the wire might change over the length of the wire. As the cable length increases, the resistance value increases accordingly. When the resistance fluctuates, the fault point appears, ouruses the IOT module to identify the point.

Ohm's Law:

$R=V/I$

Length:

$R=\rho l/A$

VIII. CONCLUSION

Use the simple concept of Ohm's Law to locate theunderground cable specified distance short circuit fault and effectively fix the fault. the phase, distance and time of the outage in the web page. The benefits of

accuratefault location are fast recovery to restore power system, improve system performance, reduce operating costs and time required to locate faults on site.

IX. FUTURE DEVELOPMENTS

This project detects the exact location of the fault inunderground cables from the base station only. In the future , by designing robots , it is possible to realize projects which automatically clear errors.

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