

UNDERGROUND CABLE FAULT DETECTION

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Abstract: In urban areas, electrical cables run underground instead of running over, because it does not affected by any adverse effect of weather such as heavy rainfall, snow, thunder storm. Whenever a fault occurs within the underground cable, it is difficult to detect the exact location of the fault for the repair process of particular cable. The proposed system found the point of the exact location of fault. The paper uses the standard concept of Ohm's law i.e. when a low dc voltage is applied at the end of feeder through series resistor (cable lines) then the current will vary depending on the location of the fault. Short in the cable.

This system uses an Arduino microcontroller and a rectified power supply. In this case, the current detection circuit in combination with the resistor is connected to the microcontroller with the aid of an ADC device to represent the length of wire in Km. Error creation is performed by a set of switches. The relays are controlled by a relay exciter IC, which is used to check cable line. A 16x2 LCD is used to display information. Also one more feature is that using GSM the message of fault detection, location of fault and distance of fault from base station in kilometers this all information is send to base station. As soon as a fault occurs in a cable the buzzer produce the alarm to alert and to take an immediate action by field workers

Key Words - Arduino microcontroller, Ohm's law, LCD, GSM, ADC, cable fault.

INTRODUCTION

Even the last cables of the decades were made to put the overhead and is currently put to the underground cable that is superior to the previous method. Because the underground cable are not affected by adverse weather conditions, such as storm, snow, heavy rain as well as pollution. But when any fault occurs in the cable, then it is difficult to locate fault. When it is easy to detect and correct the faults in overhead line by mere observation, it is not possible to do so in an underground cable. As they are buried deep in the soil it is not easy to detect the abnormalities in them. Even when a fault is found to be present it is very difficult to detect the exact location of the fault. Due to which digging of entire area has to do, for detecting and correcting the fault which in turn causes wastage of money and manpower. So it is necessary to know the exact location of faults in the underground cables [1]. So we will move to find the exact location of fault. Now world has been digitalized so the paper is intended to detect the location of fault in digital form. The underground cable system is the most common practiced followed in many urban areas. While the fault occurs for some reason at that time the repair process related to that particular cable is difficult due to not knowing the exact location of fault [2].

In the event of short circuit (Line to Earth) fault, the voltage accordingly. It is then fed to an ADC to develop precise digital data that is directed to the programmed Arduino to display the same in kilometers. Hence this paper is very helpful for determining exact location of short circuit fault. How to send this message to the base station, how the system works and alerts the field workers.

METHODOLOGY

Fault location methods can be classified as follows:

1) Online method

To determine the fault points this method utilizes & processes the sampled voltages & current. Online method for underground cable is less than overhead lines.

2) Offline method

This method uses special instrument to test out Service of cable in the field. The offline Methods are as follows,

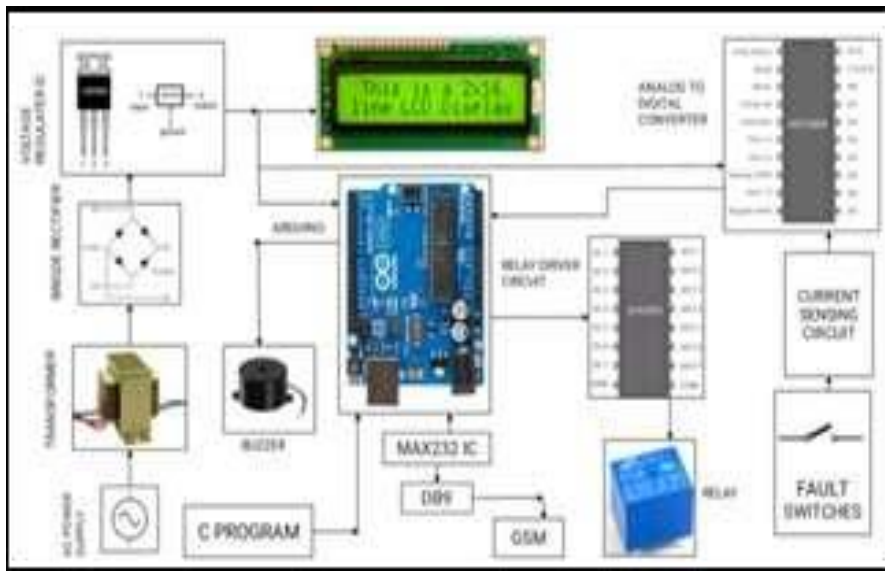
a) Tracer method

In this method fault point in the cable lines is detected by walking on ground. The fault point is indicated from audible signal or electromagnetic signal. It is used to point out fault location very accurately.

Example:

- 1) Tracing current method
- 2) Sheath coil method
- b) Terminal method

This technique is used to detect fault location of cable from one or both ends without tracing. The general area of fault is located by the use of this method, to expedite tracing on buried cable.



Block diagram of Electrical Circuit

WORKING

Working of this project is divided into four parts –

DC power supply Part, cable part, controlling part, display part.

DC power supply part consist supply of 230v AC then it is step down using transformer, bridge rectifier converts ac signal to dc & voltage regulator 7805 is used to produce constant dc voltage.

The set of resistors denote the cable part along with switches. The set of resistors & switches are used as fault creators to indicate the fault at each location this shown by the current sensing part of cable. The change in current is sensed by this part by sensing the voltage drop.

Controlling part uses the analog to digital (ADC) to converter the input current sensing signal from the current generating circuit to the voltage drop into digital signal and supply the Microcontroller. The microcontroller makes necessary calculations regarding the distance of the fault. The driver is ran by the microcontroller and controls the switching of the relays for proper connection of the cable at each phase.

Display part consists of the LCD display interfaced to the microcontroller and it shows the status of the cable of each phase and the fault distance of the cable at the particular phase, in case of any fault and GSM used to send message to the base station. Buzzer is used to alerts the field workers.

ADVANTAGES

Provides precise accuracy in determining the location of fault.

1. Consumes low power in Nano watts.
2. 3.Compact size, Easy to handle.
3. 4.Serial on board programming.
4. 5.No external programming voltage needed.
5. 6.Less maintenance cost.
6. 7.It has higher efficiency.
7. Useful for all type of underground cable.
8. Public safety is improved

LIMITATIONS

- 1.The Arduino and other component require 5V DC Supply.
2. Relay requires 12V dc.
3. Sometimes network Problems for rural areas may happen.
4. Angular value required time to read so some delay occur.

CONCLUSION

It's a difficult task to find the faults in underground cables. This paper is intended to study how to detect the exact location of circuit fault in the underground cables from the feeder end in km by using an Arduino microcontroller. The Arduino microcontroller work is based on the output of the cable resistance. As soon as fault occurs in the cable, the display unit displays the exact fault location and also displays which phase is affected in the cable and how long it's affected and buzzer system is used to create an alerting signal which is helpful to humans. Also using GSM the message of fault detection send to the base station.

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