

Precise Kilometer Calculation by Underground Cable Fault Detector

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ABSTRACT: the objective of this project is to determine the distance of underground cable fault from base station in kilometres. The underground cable system is a common practice followed 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 of the cable fault. The proposed system is to find the exact location of the fault. The project uses the standard concept of Ohm's 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 an ADC to develop precise digital data which the programmed microcontroller of 8051 family would display in kilometres.

KEYWORDS: Microcontroller, Relay, ADC, LCD, Ohm's law.

I. INTRODUCTION

The electrical energy is generated in the generating station and then it is distributed to the different loads at different areas for consumption through step up and step down transformers. Distribution of the electrical energy is done via electric cables. Study of cable failures and development of accurate fault detection and location methods has been interesting research topics in the past and present. Fault detection 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. There are many ways to find the cable fault location. This paper deals with the method to locate faults in a damaged cable. Before fixing any fault in cables, the fault has to be identified first.

II. PROBLEM STATEMENT

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. OBJECTIVES

- To design a Fault Locator.
- To model the design into a measuring device which can give precise of distance at which conductor is break.

IV. EXISTING METHOD

Some of the methods adopted earlier for cable fault detection is explained.

A) Online Method:

In this technique, the sampled current and voltages are utilized to figure out the faulty points.

B) Offline Method:

Here a special instrument is used to figure out service of Cable among the sphere.

Offline techniques are:

1. Tracer technique
2. Terminal technique.

C) Tracer Method:

The fault of the cable is detected by walking on the cable in this technique. Magnetism or perceptible signal is applied on the cable to identify the fault. This system helps in location of fault accurately.

D) Terminal Method:

This system is utilized to chase general areas of the fault on buried cable. The above methods gives solution for Dealing with the problems only to alert the personnel.

V.BLOCK DIAGRAM DESCRIPTION

The proposed system detects underground cable fault distance from base station using ohms law, microcontroller and relay switches concept. It is classified in four parts as shown in Fig.1.

A.DC power supply: This part consist of AC supply of 230Vis step-down using step down transformer, full wave bridge rectifier converts AC signal to DC& regulator is used to produce constant DC voltage.

B.Cable fault detection: This part is denoted by set of resistors and three phase cable along with switches. Current sensing part of cable represented as set of resistors & switches are used as fault creators to indicate the fault at each location. This part senses the change in current by sensing the voltage drop due change in length of the resistor.

C.Controlling: Next is controlling part which consists of ADC which receives input from the current sensing circuit as AC input, converts this voltage into digital signal and then it feeds the microcontroller with that signal. The microcontroller also a part of the controlling unit and makes necessary calculations regarding the distance of the fault according to our program.

D.Display part: This part consists of the LCD display which is interfaced to the microcontroller which shows the status of the cable and the distance of the cable from the base station, in case of any fault.

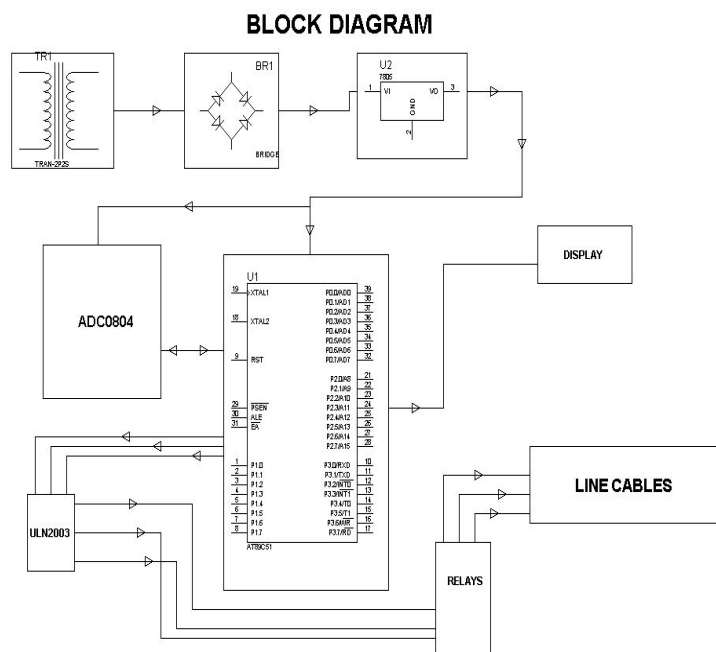


Fig.1 BLOCK DIAGRAM

VI. ADVANTAGES OF UNDERGROUND SYSTEM

- Have less maintenance fetch.
- Can soak up the emergency power loads.
- Release a less magnetic field than the overhead line.
- To install it requires a small band of land.
- Low susceptible to the contact of the severe weather.
- They have decreased the EMFs (Electric and Magnetic Fields) and therefore removes the potential health issues.
- It is very hard to steal, and also very hard to make sabotage or the illegal connections.
- There are very less chances to developing the faults and the maintenance costs is very low as well.

VII. DISADVANTAGES OF UNDERGROUND SYSTEM

- The Cost of underground cables are very high. We can say that underground cables cost is three times more compare as to the overhead lines (i.e. 400 KV).
- In case of the failure of system it is hard to discover and fix the wire breaks. Besides it takes a lot days or weeks to just overcome with the problem. The maintenance of the underground cables is very difficult as compare to the overhead because of the underground cabling.
- Underground cable lines cannot be standard to expand the capacity but overhead lines can easily be up rated to expand more power. Underground cables are main of the subjected to destruction because of the ground movement required to an earthquake.

VIII. WORKING

This project uses a standard concept of Ohms law, i.e., when a low DC voltage is applied at the feeder end through series resistor (assuming them as cable lines), then the current would vary depending upon the location of the fault in the cable. In case of a short circuit (line to ground), the voltage across the series resistors changes which is then fed to an ADC, to develop a precise digital data that gets displayed on the LCD. The project is assembled with a set of resistors representing cable length in km and fault creation is made by a set of switches at every known km to cross check the accuracy of the same.

The fault that occurs at a particular distance of a particular phase is displayed on the LCD interfaced to the microcontroller. Furthermore, this project can be enhanced by using a capacitor in an AC circuit to measure the impedance which can even locate an open-circuited cable, unlike short-circuited fault only using resistors in DC circuit as followed in the above proposed project.

IX. APPLICATIONS

- Is applicable for both Open circuit fault and Short circuit fault
- Both Government and Private Sectors Can operate for this technology to rectify the Faults, Internet Service Providers, Telecom Companies, LPG providers, etc.

X. FUTURE SCOPE

The underground cables are convenient for distributing power in urban and other areas where overhead cables may be not be possible. In this project we detect only the location of short circuit fault in underground cable line, but we also detect the location of open circuit fault, to detect the open circuit fault capacitor is used in ac circuit which measure the change in impedance & calculate the distance of fault.

XI. CONCLUSION

This paper designed, implemented a microcontroller based underground cable fault detector. We have successfully designed, implemented and tested a cheap underground cable fault detector. Our proposed method can detect both open and short circuit in underground cables with a maximum distance of 2km. In the future, effort will be concentrated to increase the maximum distance for fault detection to 3km or more, and a graphical display monitor to improve on its information of the underground cable fault could replace the LCD display.



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