Abstract

In order to locate the exact distance of the underground cable fault from the power station is a major constraint for the technocrats, and especially for difficult geographical conditions and climates. In the modern world power theft is one of the serious problem and it is more in case of over head transmission line so for better safety and reliable transmission underground cable are gradually implemented in urban areas. The overhead cables are mainly used for electricity transmission but it has some limitations like snowfall, heavy rain, storms and falling of trees due to natural calamities causes transmission line failures. So the underground are preferable to avoid the above problems. But when any fault occurs in the underground cable then it is difficult to detect the exact location of the fault. The paper is providing a method to detect the fault distance by use of suitable microcontroller.

I. INTRODUCTION

The exact fault of the cable is directly related with the voltage drop, which leads the current variation in the circuit. Here the dc voltage is used as source at one end for the supply purpose and the resistors are being used for indicating the length of cable and also switches are used for the creation of the fault at different location. For the calculation of the distance microcontroller is mainly used. The display circuit is showing the exact fault in kilometre. So we need to find out the fault distance in underground cable for smooth transmission. But
it may also go through some types of faults. The common Fault in cables are represented as follows:

- Inconsistency.
- Weakness on the cable, that affect performance of cable.
- Breaking of conductor.
- Due to damage in isolation.

1.1 Fault in the cables are divided into two groups:

1.1.1 Open circuit fault:
The current flow is very negligible in case of open circuit and loss is minimum, so it is better than short circuit fault and it can be detected easily. This fault can be occurred by disruption in conducting path. Such faults occur when one or more phase conductors break.

1.1.2 Short circuit fault:
It is classified into two type, symmetrical and unsymmetrical faults.

1) The symmetrical fault is also called as three phase fault because all the three phases are short circuited and Voltage of the circuit is zero.

2) In case of unsymmetrical fault, the magnitude of the current is unequal and also displaced by 120 degrees.

II. BLOCK DIAGRAM & COMPONENTS DESCRIPTION

This project uses the concept of OHMs law where a low DC voltage is applied at thefeeder end through a series resistor. There may be chances of getting short circuit fault like LL, LG and 3L which leads to the current variation. The change of voltage drop in series resistor is fed to an ADC to develop precise digital data then it is given to the programmed microcontroller to display the fault distance in kilometres in the LCD. Here the set of resistors representing cable length in KMs and the fault is created manually by the switches at every known KM to check the accuracy of the cable fault.

![Figure 1: Block diagram of under ground cable fault of distance locator](image-url)
Underground Cable Fault Distance Locator is divided into four parts – DC power supply part, cable part, controlling part, display part.

**DC power supply** part consists of supply of 230v, AC, then it is stepdown using a transformer, bridge rectifier converts AC signal to DC, and the regulator is used to produce a constant DC voltage.

**Cable part** is denoted by a set of resistors and switches. The current is sensed by the group of resistors (1k) and the occurred fault is created by slide switches. So, the voltage drop is sensed by the change in current in the cable.

**Controlling part** uses the analog to digital (ADC) to convert the input current sensing signal from the current generating circuit to the voltage drop into a digital signal and supply the microcontroller. The microcontroller makes necessary calculations regarding the distance of the fault. The driver is run 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.

**Figure 2: Circuit Diagram**

**Advantages**

- Required less maintenance.
- High efficiency.
- Public safety is improved.
- Useful for all types of underground cable.
- It is applicable to all types of cable ranging from 1kv to 500kv & other types of cable fault such as: Short circuit fault, cable cuts, Resistive fault, Sheath faults, Water trees, Partial discharges.
III. RESULT AND DISCUSSION

![Before Fault](image1)

**Figure 3: Before Fault**

In fig-3 when we are not creating any fault in any of the three phases, then the LCD shows no fault (NF). But in fig-4 we have created fault at 1KM distance in R-phase and at 2KM distance in B-phase and no fault (NF) in Y-phase that is showing in LCD.

![After Fault](image2)

**Figure 3: After Fault**

IV. CONCLUSION

In this paper we can find exact location of fault in the underground cable in KM with the help of 89S52 programmed microcontroller as well as we used a simple concept of ohm’s law, hence fault can be easily detected and repaired. In this demo model we can only measure the fault in the RYB cable within the range of 5KM distance but it can be extended to a long distance by using high precision equipment.

V. REFERENCES


TO CITE THIS PAPER