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UNDERGROUND LINE FAULT DETECTION

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Abstract:- *Till last decade, a million miles of cable are threated in the air across the country. But currently it is laid in the underground which is larger to an earlier method because of its obvious advantages like lower transmission losses, lower maintenance cost and not affected by any adverse weather condition like pollution, heavy rainfall, snow and storm etc. but when any problem occurs in cable, it is very difficult to find the exact location of fault. Now a days there are no of underground fault detection method which are used. But In this paper we present one method which will be very useful identify the exact distance of the fault underground system from base station. This method is Murray loop method. This method uses the Wheatstone bridge to calculate exact distance of fault location from base station and send it to the user mobile. In this method we use voltage converter, microcontroller and potentiometer to find the fault location from line to ground fault.*

(***Keyword:*** *Detection of fault, Murray loop, microcontroller, LCD, distance of fault, potentiometer.)*

1. INTRODUCTION:-

The underground cable system is very important for distribution especially in metropolitan cities, airports and defense service. So it needs accurate and fast method to identify the faults and it clearance so that power disturbance can be resolved in very short period of time. In overhead system it is quite easy to find the faulty area than underground system because of few obvious reason. There are so many techniques in overhead system like phase measurement unit, But in case of underground systems, such system can not be used. One method presented in this paper can resolve this problem related to underground system. Murray loop method is very fast and accurate to find out fault location. Murray loop method is simple method to localize the faulty distance. This method uses the equipment are easily available. This test usually performed for earth fault and short circuit fault in underground cable. In this test the resistance of fault does not affect the result when the value of resistance is high. There are two test used known as Murray loop method and Varley loop method on the basic principle of Wheatstone bridge.

This test is used to find out underground cable fault location by using Wheatstone bridge in it by comparing the resistance. But we should use the known length of the cable in this method. .

2. OBJECTIVE:-

The proposed system has ability to locate the a fault no matter where the fault is on underground and overhead transmission line.

Identifying fault location on the single phase model and three phase model with load .To determine distance of the fault location in underground cable from the base station in kilometer. Cables have some resistance. We are mainly focusing on cable resistance. This resistance is proportional to length of cable.

3. LITERATURE REVIEW

Souvik Deb1, Soumya Das2, Dwaipayan Biswas3 and P.S. Majumdar4 (2017) presented by on the Fault Detection Phenomena of Underground Cable [1]

In this paper, one technique is developed for the detection of fault in an underground transmission line. It is very cheap, simple and easily implemented in domestic as well as industrial purpose. Underground cables are more preferred than overheads cables because it has less transmission losses and has ability to absorbs emergency power loads. These technology mostly used in smart cities.

A. Ngaopitakkul, C. Apisit, C. Pothisarn, C. Jettanasen and S. Jaikhan (2017) presented by Identification of Fault Locations in Underground Distribution System using Discrete Wavelet Transform [2]

In these paper, underground fault detection technique is presented. Discrete Wavelet Transform based on travelling waves. These is employed in order to detect high frequency component and identify fault location in underground distribution system. The first peak time obtained from the faulty bus is employed for calculating the distance of fault from sending end. These technique is tested with various inception fault angle, Faulty location and faulty phase. The demand for reliable service has led to the development of technique of locating faults.

Swapnil Gaikwad1, Hemant Pawar2, Ajay Jadhav3, Vidhut Kumar4 , Prof.A.A.Rane5 (2016) presented by UNDERGROUND CABLE FAULT DETECTION USING MICROCONTROLLER[3]

Cable faults are damage to the cables which affect the resistance of the cable. These can be lead to voltage breakdown. For locating fault in cable, the cable must be tested for fault. This prototype uses simple concept of ohm's law. The current depending on length of fault cable. These prototype assembled with set of resistor representing cable length in kilo meter and fault creation is made by switches. Then fault occurred at a distance is displayed on 16× 2 LCD interfaced with microcontroller.

Abhishek Gupta, Vikas Kumar, Rahul Sharma, Rajkumar Meena, Rakesh Choudhary, Ravit Kumar(2016)presented by DISTANCE CALCULATION FOR UNDERGROUND FOULT LOCATION[4]

Accurate fault location for transmission line is important. For distributors and retailers quick detection and analysis of fault is necessary. To locate fault in cable, the cable must be tasted for fault. This prototype uses OHMS law. The current depending on the length of the fault of the cable. These prototype is assembled with set of resistor to represent cable length in Km and fault creation is made by switches. The fault is displayed in 16× 2 LCD interface with microcontroller. The program is burnt into ROM microcontroller. The power supply consist of step down transformer 230/12, which step down the 12 V AC. By using bridge rectifier it is converted into DC.

Abhay Sharma , Akash Mathur , Rajat Gupta , Ranjeet Singh , Er. Mansi Singh (2017) Presented by UNDERGROUND CABLE FAULT DISTANCE LOCATOR [4]

The purpose of this project is to find out the fault location of underground cable. This system find out the exact distance of open circuit fault. The system uses 16F887 microcontroller to rectify DC supply. These project uses the capacitamce method. If current flow through the wire than the electromagnetic field is induced which is sensed by Darlington pair i.e remove unwanted noise then it is passed through the voltage regulator which gives 5 V supply. Embedded IC uses to represent fault. This method uses the capacitance method and represent fault in terms of yes or no. Then fault distance is displayed on 16× 2 LCD display connected to the microcontroller to display the information.

A.MURRAY LOOP METHOD

In this test ohms law is used to find out the short circuit fault. Through a series resistor we applied DC voltage at the feeder end, depending on the length of fault cable current varies. The voltage drop across the series resistor changes, this voltages is used for the determination of fault.

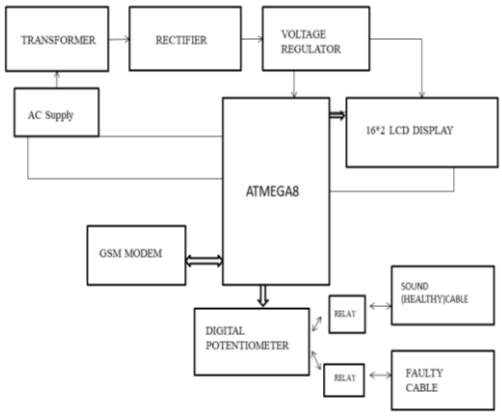

Fig. Block diagram of Murray loop method

These method is consist of set of resistor representing cable length in KM and fault is created by set of switches at every known KM. ADC that develop precise digital data which the programmed microcontroller would display the same in kilometer. The fault is occurred at distance and phase is displayed on 16× 2 LCD interfacing with microcontroller. In these we use microcontroller ATMega8 which is of 8 bit. Then program is burned into microcontroller. The power supply is consist of step down transformer 230 / 12 volt, which step down voltage to 12 volt AC. This is converted into DC by bridge rectifier. Then by using capacitive filter ripples are removed and it is regulated to + 5V using a voltage regulator 7805 which is required for the operation of microcontroller and other components.

The power supply circuit which is consist of step down transformer which is 230 V step down to 12 V. The filtered DC voltage is given to regulator to produce 12 volt constant DC voltages.

In this method, the faulty cable is connected with healthy cable by using low resistance wire, because this does not affect total resistance of cable, It should circulate the loop current to the bridge without any loss.

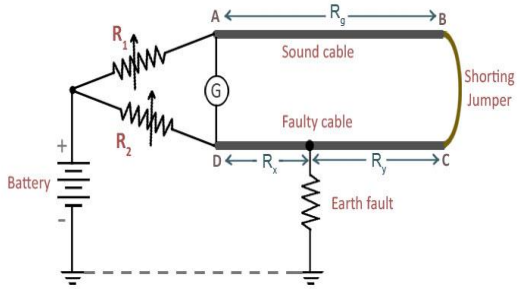

fig.(i) Murray loop test for earth fault

If r is resistance of each cable,

then, **Rx + Ry +Rg =2r**

Putting these in above equation,

$$\frac{R_1 + R_2}{R_2} = \frac{2r}{R_x}$$

$$R_x = \frac{R_2}{R_{1+} R_2} 2r$$

We know, the value of resistance is proportional to the length of the cable. Therefore the value of Rx is proportional to the length Lx. Therefore,

$$L_x = \frac{R_2}{R_{1+} R_2} \times 2L$$

5. Hardware Implementation

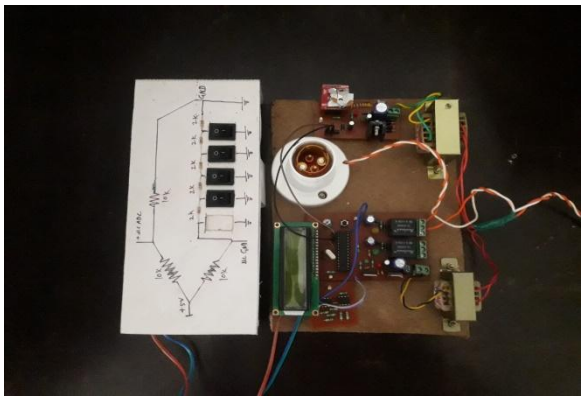

Fig. Hardware model of the project

TABLE1:RESULT OBTAINED ON THE HARDWARE

Switch position	Voltage	Line resistance	Fault Location	LCD Display
OFF	0.70	0	NO FAULT	NO FAULT
Switch 1	4.25	2k	2km	Fault detected at 2km
Switch 2	3.09	4k	4km	Fault detected at 4km
Switch 3	2.03	6k	6km	Fault detected at 6km
Switch 4	0.9595	8k	8km	Fault detected at 8km

6. CONCLUSION

We seen that the result of simulation under the faulty condition and from that we conclude that fault distance can found successfully by using this Murray loop method. So different type of fault can be found out easily.

REFERENCES

1) "Identification of underground cable fault location and development",2017 International Conference on Data Management, analysis innovation (ICDMAI) Zeal education society, Pune.

2) "Underground cable fault distance locator", international journal of scientific research and management studies, ISSN 2349-3771.

3) "Automatic fault detection and location in power transmission line using GSM 2016", International journal and advance research in science and engineering (IJARSE).

4)"Underground cable fault distance locator" International Journal of Scientific Research and Management Studies (IJSRMS).