Arduino Based Uunder Ground Cable Fault Detection Over GSM

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Abstract -The objective of this project is to determine the distance of underground cable fault from base station in kilometres USING an Arduino. 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 Ohms 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 inbuilt ADC of Arduino to develop precise digital data for display in kilometres.

The project is assembled with a set of resistors representing the cable length in km and the fault creation is made by a set of switches at every known km to cross check the accuracy of the same. The fault occurring at a particular distance, the respective phase along with the distance is displayed on the LCD. The same information is also sent to the concerned authority mobile phone over GSM, interfaced to the Arduino. Further this project can be enhanced by using capacitor in an ac circuit to measure the impedance which can even locate the open circuited cable, unlike the short-circuited fault only using resistors in DC circuit as followed in the above proposed project.

1.INTRODUCTION *(Size 11, Times New roman)*

To supply electric power, we use Power cables. To avoid unwanted interference, we place them underground. This makes it very tough to work out the precise location of the faults that occur. A fault might occur thanks to a many of reasons such as digging, earthquake, construction work, etc. The maintenance process associated with that specific line is difficult thanks to unknown location of the fault within the line. The motive of the project is to detect and locate the fault in underground cable. The system developed here works on the idea of Ohm's law. The proposed technique is used for identification as well as it is also used to send the information about the fault to the authority using GSM and for security of people it cut the power supply on that particular location and display the fault location in KMs on LCD Display.

The underground cable is frequently followed in many urban areas. While fault occurs for a few reasons, at that point the repairing process associated with that specific cable is difficult thanks to not knowing the precise location of cable fault. Fault in cable is represented as: Any defect, Inconsistency, fragility that affects purpose of cable Current is diverted from the intended path, from many decades, low voltage and high voltage distribution lines of underground cables are operated worldwide. To reduce the effect of distribution networks to environment underground high voltage cables are used more and more. Underground cables are widely utilized in power distribution networks thanks to the benefits of underground connection, involving more security than overhead lines in inclemency, less susceptible to damage by storms or lightning. It is less costly for shorter distance, ecofriendly and low maintenance. But if any fault occurs in cable, then it is difficult to locate fault. So, this project is employed to detect the situation of fault in digital way. The main purpose of locating the faulty point in an underground cable in order is to ease quicker repair, improve the system stability and reduced blackout period. The underground cable system is very convenient for distribution mainly in urban areas such as, metropolitan cities, airport and defense services. The paper uses the quality concept of Ohms law. This project contains a set of resistors representing cable length in KM's to find the distance of fault in KMs and fault creation is made by a set of switches at every known KM. The fault generated at a specific distance and therefore the respective phase is displayed on an LCD interfaced to the Arduino.

2. Body of Paper
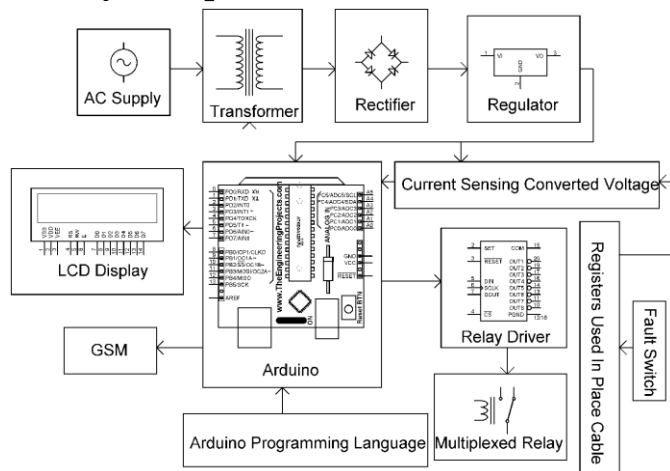
This project deals with Line to Ground fault. Our intention is to find the distance at which fault has occurred. For this we need to first find the resistance of the cable because we know the direct proportionality between the resistance and length.

We also find the voltage drop across the resistor. We know the given input voltage and the resistances hence using voltage divider formula $V_0=R_2/(R_1+R_2)*V_{in}$. We can notice that as resistance increases, voltage increases.

As this is a demo project, we are using 5v dc supply and not 230v, We will be substituting this supply and then detect the fault. In this particular program we have considered the distance between the two resistors (used as faults for sample here) to be 5km in all the three phases (R,Y,B).

We create a fault manually by the slide switch connected across the resistors and then check the distance at which fault has occurred. And send to message the gsm Once the fault is sensed at a certain distance the relay trips and isolates the rest of the circuit. A reset button is used to erase and display the latest button.

We use relays to trip so that the resistor does not heat much, and damage and the relay isolates the circuit hence displaying 0 v on the analog read.

When there is no fault then the R2 will be infinite the analog voltage will be 5 volts (multiplying factor).

The underground cable fault detects the message through the gsm signal.

Advantages, Disadvantages and Application

Advantages:

1. Any type of cable fault detects.
2. Human resource is required less.
3. Particular operation will be done with zero error.
4. Arduino open hardware-simplest programming language.
5. Cost of finding location of the fault reduces.
6. Complexity in finding the fault reduces

Disadvantages

1. Showing limited distance on kit.
2. showing the faults at the 1KM radiation.

Application

1. Industrial cable fault.
2. In communication system.

Acknowledgement

Conclusion

The short circuit fault at a specific distance within the underground power cable is found to rectify the fault efficiently using fault switch and straight forward concept of Ohm's law and Voltage Divider Rule is used. The fault displays on the LCD screen and sends message to user. Underground cables are susceptible to a good sort of faults thanks to underground conditions such as wear and tear, rodents etc. Also detecting fault source is difficult and full line is to be dug so as to see entire line and fix faults. So here we propose underground cable fault detection to detects the exact fault position. The repairmen know exact location of fault and which part is to be dug to detect the fault source. This saves a ton of time, money and efforts and also allows to faster service to underground cables.

References

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