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Underground Cable Fault Distance Locator

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ABSTRACT: The aim of this project is to detect the location of fault in underground cable lines. The proposed system finds the exact location of the open circuit fault. This system uses an 16F887 micro controller and a rectified dc supply. Here the project uses a capacitance method. When the current is flow through to the wire than the electromagnetic field is induced which is sense by a Darlington pair i.e. it removes an unwanted noise than it will be filtered and then pass through a voltage regulator gives a constantly 5v supply and then embedded IC is used to represent a fault. The project is assembled with capacitance method and representing fault in terms of yes or no. The fault occurring at a particular distance is displayed on a Liquid crystal display(LCD) interfaced to the microcontroller 16x2 LCD display connected to the microcontroller to display the information. The project will be implemented by using capacitor in an AC circuit to measure the impedance which can locate the open circuited cable. Whenever a fault occurs in a cable the buzzer produces the alarm to alert and to take an immediate action by workers. Generally, we used to overhead lines. We can easily identify the faults but in rushed places or familiar cities we couldn't use overhead lines. So, we are moving to underground cables. Underground cables used largely in urban area instead of overhead lines. We can't easily identify the faults in the underground cables. This project deals with microcontroller, buzzer and LCD. This proposes greatly reduces the time and operates effectively.

KEYWORDS: Liquid crystal display, Alternative Transients Program, Electromagnetic Transients Program, direct current, alternative current

I. INTRODUCTION

Till last decades' cables were made to lay overhead& currently it is lay to underground cable. Because the underground cables are not affected by any change in weather condition such as storm, snow, rainfall, pollution etc. But when any fault occurs in cable, it is difficult to find out the location of fault. So, we will find the exact location of fault. Now the world is become digitalized so the project is intended to detect the location of fault in digital way. The underground cable system is more common practice followed in many urban areas. While 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 cable fault. Fault in cable is represented as:

- Inconsistency.
- Any defect.
- Current is diverted from the intended path.
- Weakness or non-homogeneity that affect performance of cable.
- Caused by breaking of conductor& failure of insulation.

Fault in cable can be classified as:

1)Open circuit fault: Open circuit faults are better than short circuit fault, because when these faults occurs current flows through cable becomes zero. This type of fault is caused by break in conducting path. Such faults occur when one or more phase conductors break.
2)Short circuit fault: Further short circuit fault can be categorized in two types:

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a) Symmetrical fault: Three-phase fault is called symmetrical fault. In these all three phases are short circuit.
b) Unsymmetrical fault: In this fault magnitude of current is not equal¬ displaced by 120 degrees.

II.RELATED WORK / LITERATURE REVIEW

(a) In this paper, a technique for identifying the phase with fault appearance in underground cable is presented. The Wavelet transform has been employed to extract high frequency components superimposed on fault signals simulated usingAlternative Transients Program(ATP)/Electromagnetic Transients Program(EMTP). The coefficients obtained from the Wavelet transform are used in constructing a decision algorithm. Various cases have been investigated so that the algorithm can be implemented. It is found that the proposed method can indicate the fault types with satisfactory accuracy. C. Apisit and A. Ngaopitakkul, Member, IAEN

(b) This paper proposes an assistance tool to the pre-localization of the insulation defaults affecting electrical single-phase cables by using voltage and current measurements available in source substation. An equivalent network modeling defaults to the ground is analyzed by employing the distributed parameters approach. The per unit length values of these parameters are calculated according to the geometrical data of the cable. The specificity of this tool is the introduction of a resistance modeling sheath-ground insulation for the study of the various types of defaults to the ground (frank and resistive). Scenarios of default fault are applied to the underground cable 150 kV, connecting substations HTB of Tyna – Taparoura - Sidimansour in Sfax. A validation study is approved by the software SimulinkSimPowerSystems of MATLAB. THAMEUR ALOUI, FATHI BEN AMAR, NIZAR DERBEL, HSAN HADJ ABDALLAH National school of Engineering.

(c) This paper proposes fault location model for underground power cable using microcontroller. The aim of this project is to determine the distance of underground cable fault from base station in kilometers. This project uses the simple concept of ohm's law. When any fault like short circuit occurs, voltage drop will vary depending on the length of fault in cable, since the current varies. A set of resistors are therefore used to represent the cable and a dc voltage is fed at one end and the fault is detected by detecting the change in voltage using a analog to voltage converter and a microcontroller is used to make the necessary calculations so that the fault distance is displayed on the LCD display. Dhekale P.M., Bhise S.S., Deokate N.R. Guide-Prof.Suryawanshi R.R. S.B.P.C.O.E.,Indapur Dept. Of Electrical Engineering

(d) This paper introduces the heat transfer mechanisms in underground cable installations and analyzes the available solution methods of the diffusion equation. The heat sources and thermal resistances of the different layers of a cable installation are described. The basic concepts behind the Neher-McGrath method (IEEE) are discussed, along with its differences with the IEC standards for underground cable installations. The available commercial computer programs, designed to perform ampacity calculations are listed along with a description of the modeling capabilities of CYME's CYMCAP. Francisco de León CYME International T&D 1485 Roberval, Suite 104 St. Bruno, Quebec, Canada.

(e) This paper presents the results of investigations into a new fault location technique based on a new modified cable model, in the EMTP software. The simulated data is then analysed using advanced signal processing technique based on wavelet analysis to extract useful information from signals and this is then applied to the artificial neural networks (ANNs) for locating ungrounded shunt faults in a practical underground distribution system. The paper concludes by comprehensively evaluation the performance of the technique developed in the case of ungrounded short circuit faults. The results indicate that the fault location technique has an acceptable accuracy under a whole variety of different systems a JamalMoshtagh

III. FAULT LOCATION METHODS

Fault location methods can be classified as:
1)Online method: This method utilize & process the sampled voltages& current to determine the fault points. Online method for underground cable are less than overhead lines.
2)Offline method: In this method, special instrument is used to test out service of cable in the field. There are two offline methods as following.

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1)Tracer method: In this method fault point is detected by walking on the cable lines. Fault point is indicated from audible signal or electromagnetic signal. It is used to pinpoint fault location very accurately.

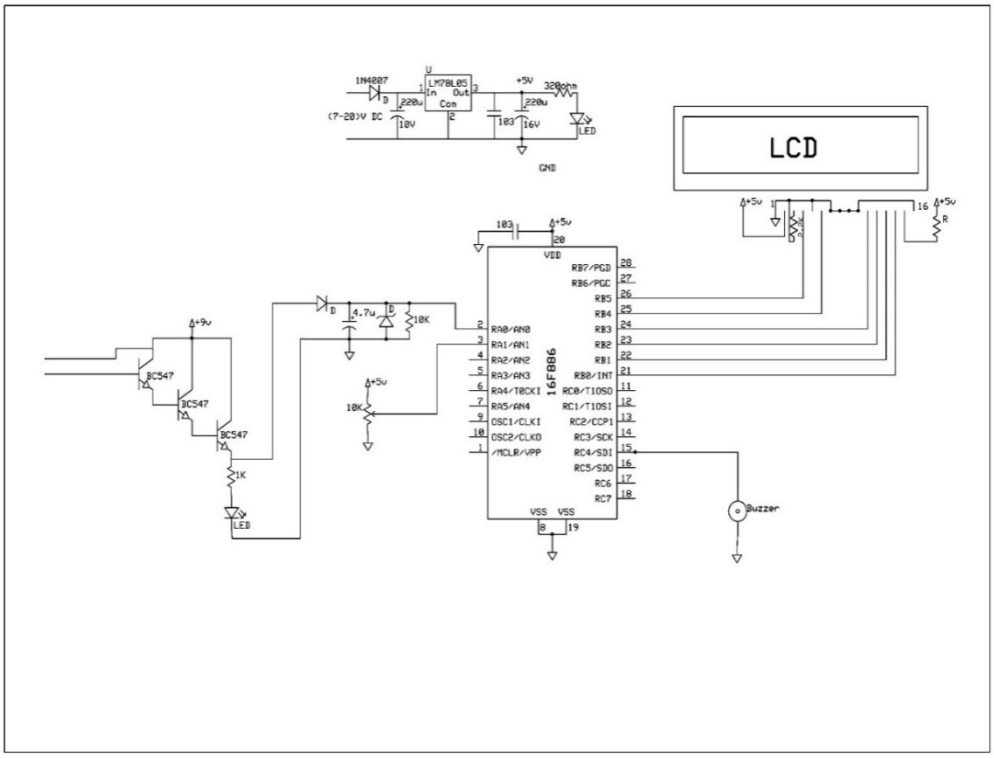
Example: 1) Tracing current method
2) Sheath coil method

2)Terminal method: It is a technique used to detect fault location of cable from one or both ends without tracing. This method uses to locate general area of fault, to expedite tracing on buried cable.

Example:1) Murray loop method
2)Impulse current method

IV. CIRCUIT DIAGRAM

The circuit uses direct current(DC) supply of 12-volt dc supply that delivers pulsating DC which is then filtered by an electrolytic capacitor of about 470 micro Farad to 1000 micro Farad. The filtered dc being unregulated, IC LM 7805 is used to get 5-volt dc constant at its pin no 3 irrespective of input DC varying from 7 to 15 volts the input.
The project uses a capacitance method. When the current is flow through to the wire than the electromagnetic field is induced which is sense by a Darlington pair i.e. it removes an unwanted noise than it will be filtered and then pass through a voltage regulator gives a constantly 5v supply and then embedded IC is used to represent a fault. The project is assembled with capacitance method and representing fault in terms of yes or no. The fault occurring at a particular distance is displayed on a LCD interfaced to the microcontroller



V. POWER SUPPLY

The power supply circuit consists of step down transformer which is 230v step down to 12v.In this circuit 4diodes are used to form bridge rectifier which delivers pulsating dc voltage & then fed to capacitor filter the output voltage from

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rectifier is fed to filter to eliminate any alternative current (AC) components present even after rectification. The filtered DC voltage is given to regulator to produce 12v constant DC voltage.

VI. 16F887 MICROCONTROLLER

- The PIC16F887 is one of the latest products from *Microchip*. It features all the components which modern microcontrollers normally have. For its low price, wide range of application, high quality and easy availability. It has 64kb external data memory **Operating frequency 0-20 MHz**
- **Precision internal oscillator**
  - Factory calibrated
  - Software selectable frequency range of 8MHz to 31KHz
- **Power supply voltage 2.0-5.5V**
  - Consumption: 220uA (2.0V, 4MHz), 11uA (2.0 V, 32 KHz) 50nA (stand-by mode)
- **Power-Saving Sleep Mode**

64kb program memory & 256 internal data memory. It increases reliability. Hardware is less because single chip microcomputer. Smaller access time& space.

VII. PROPOSED TECHNIQUE

EXISTING SYSTEM: In A-frame method, a pulsed DC is injected into the faulty cable and earth terminal to locate the ground fault. The DC pulse will flow through the conductor and return via earth from the earth fault location back to the ground stake. The flow of pulsed DC through the ground will produce a small DC voltage. A sensitive voltmeter is used to measure the magnitude and direction of the DC voltage in segments of the earth along the cable route. Analyzing the results of the measuring voltage along the route, the location of the fault in the cable can be pinpointed. A Frame is an accurate method but it is not the fastest one. This method may face a problem if the return DC finds some easier path back to the earth stake of transmitter instead of returning through the ground. If the ground is sandy, paved which provides high resistance and consequently, less current flows through the ground. In that case, the voltmeter fails to measure the voltage and fault detection becomes complicated.

PROPOSED SYSTEM: A transmission line is a specialized cable design to carry alternating current of radio frequency. That is, current with a frequency high enough that their wave nature must be taken into account. This project is work on the principle of electric capacitance sensor which will be placed near the line to be detected and whenever there will be discontinuity that is if voltage will not be present in the wire it will automatically blink the led and indicate fault occurs in the LCD display.

ADVANTAGES:

1) Less maintenance
2) It has higher efficiency
3) Less fault occurs in underground cable
4)Underground cable fault location model is applicable to all types of cable ranging from 1kv to 500kv&other types of cable fault
such as- open circuit fault, cable cuts, Resistive fault, Sheath faults, Water trees, Partial discharges.
5) Improved public safety.

VIII. RESULT

This device sense the electromagnetic field in the cable. When the device is near the cable carrying high current, this sense the signal and tells us that there is proper current flow in the cable. Now if open circuit fault occurs in the cable device shows no signal detection it means there is a fault occurs in the cable. Range of the device to detect the signal is not high but it can be increased.

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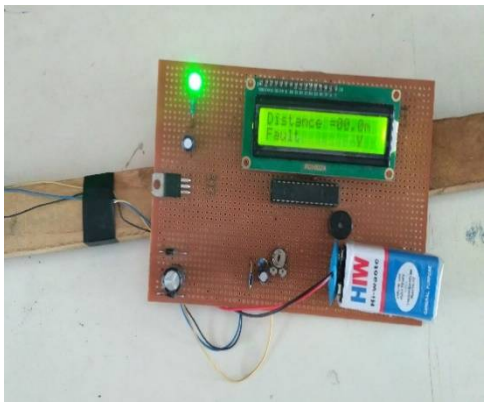

RESULT ANALYSTS			
Distance from electric wire	**Fault**	**Buzzer**	**LED**
1 Inch	**No**	**On**	**On**
1 Inch (open wire)	**Yes**	**Off**	**Off**
2 Inch	**No**	**On**	**On**
2 Inch (open wire)	**Yes**	**Off**	**Off**
4 Inch	**No**	**On**	**On**
4 Inch (open wire)	**Yes**	**Off**	**Off**
6 Inch	**No**	**On**	**On**
6 Inch (open wire)	**Yes**	**Off**	**Off**

It ranges cover up to 6 to 9 inch

IX. CONCLUSION

In this paper, we detect the exact location of open circuit fault in the underground cable by using microcontroller 16f887. &Darlington pair. For this we use simple concept of capacitance method. so, fault can be easily detected and repaired.

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