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UNDERGROUND CABLE FAULT DETECTION AND DISTANCE IDENTIFIER OVER INTERNET OF THINGS (IOT)

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ABSTRACT

Underground cables are electrical power cables that are buried in the ground for the transmission and distribution of electricity. They are often used in urban areas where overhead power lines are not practical due to aesthetic or safety reasons. 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. Detecting the fault source is difficult because entire line is to be dug in order to check fault at cable line. So, to overcome those problems we are proposing the underground cable fault detection system using IOT. The proposed system is to find the exact location of the fault and the information has to be sent to the user mobile phone by using IOT module.

I.INTRODUCTION

1.1 Introduction

The objective of this project is to determine the distance of underground cable fault from base station in kilometers. 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 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 an ADC to develop precise digital data which the programmed microcontroller would display in kilometers.

The project is assembled with a set of resistors representing cable length in KM's and fault creation is made by a set of switches at every known KM to cross check

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the accuracy of the same. The fault occurring at a particular distance and the respective phase is displayed on an LCD interfaced to the microcontroller. 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 circuit fault only using resistors in DC circuit as followed in the above proposed project.

1.2 Objective of the project

The objective of this project is detecting faults in underground cable. To determine the distance of underground cable fault from base station in kilometers. Preventing equipment damage by detecting cable fault.

1.3 Existing System

The existing system for fault detection in electrical networks relies on:

1. Manual Inspection: Visual checks by technicians.

2. Periodic Maintenance: Scheduled maintenance checks.

3. Limited Automation: Basic automation with limited real-time monitoring.

1.4 Proposed System

The proposed system is to find the exact location of the fault and the information has to be sent to the user mobile phone by using IoT module. The operation of the system states that when the current flows through the fault sensing circuit module the current would vary depending upon the length of the cable from the place of fault that occurred if there is any short circuit fault with the Single Line to ground fault, or double line to ground fault, or three phase to ground fault. Then microcontroller will process the digital data and the output is being displayed in the LCD connected to the microcontroller in kilometers and phase as per the fault conditions. This Output is also displayed in the webpage through the IoT Wi-Fi Module ESP8266 connected to the system.

1.5 BLOCK DIAGRAM

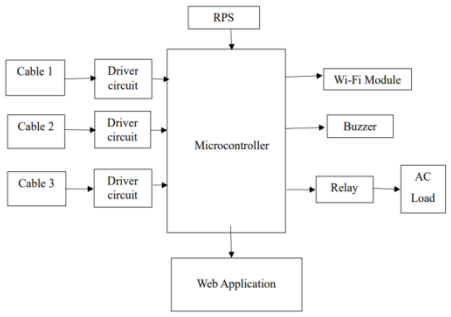

Fig 1.1: Block diagram

HARDWARE REQUIREMENTS

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: 1. RPS

2. Arduino uno

3. 3 cables connected to the microcontroller

4. Wi-Fi Module

5. LCD 6. Buzzer

II. LITERATURE SURVEY

Literature survey earlier to begin a research project is essential in understanding fault in underground cable lines, as this will supply the researcher with much needed additional information on the methodologies and technologies available and used by other research complement around the world. Dhivya Dharani.A, Sowmya.T the paper titles as—Development of a Prototype Underground Cable Fault Detector‖ —Cable faults are damage to cables which affects the resistance in the cable. If allowed to persist, this can lead to a voltage breakdown. To locate a fault in the cable, the cable must first be tested for faults.

This prototype uses the simple concept of OHMs law. The current would vary depending upon the length of fault of the cable. This prototype is assembled with a set of resistors representing cable length in Kilo meters and fault creation is made by a set of switches at every known Kilo meter (km's) to cross check the accuracy of the same. The fault occurring at what distance and which phase is displayed on a 16X2 LCD interfaced with the microcontroller.

The program is burned into ROM of microcontroller. The power supply consists of a step-down transformer 230/12V, which steps down the voltage to 12V AC. This is converted to DC using a Bridge rectifier.

The ripples are removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components. Nikhil Kumar Sain, Rajesh Kajla paper titled as ―Underground Cable Fault Distance Conveyed Over GSM. 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

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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 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.

R.K.Raghul Mansingh, R.Rajesh, S.Ramasubramani, G.Ramkumar titled as ―Underground Cable Fault Detection using Raspberry Pi and Arduino‖- The aim of this project is to determine the underground cable fault.

This project uses the simple concept of CT Theory. When any fault like short circuit occurs, voltage drop will vary depending on the length of fault in cable, since the current varies CT is used to calculate the varying.

The signal conditioner manipulates the change in voltage and a microcontroller is used to make the necessary calculations so that the fault distance is displayed by IOT devices.

III. WORKING METHODOLOGY

➢ Install the system in required area, start the system.

➢ Synchronise the system with mobile through the android app by given credentials.

➢ If the fault occur (i.e, line and ground connected) then the buzzer gives the alarm and get the notification in the mobile through application.

➢ Here we have three cables if fault occur in any cable get the notification with repected names. Shows the name in virtual lcd and physical lcds.

IV.RESULT

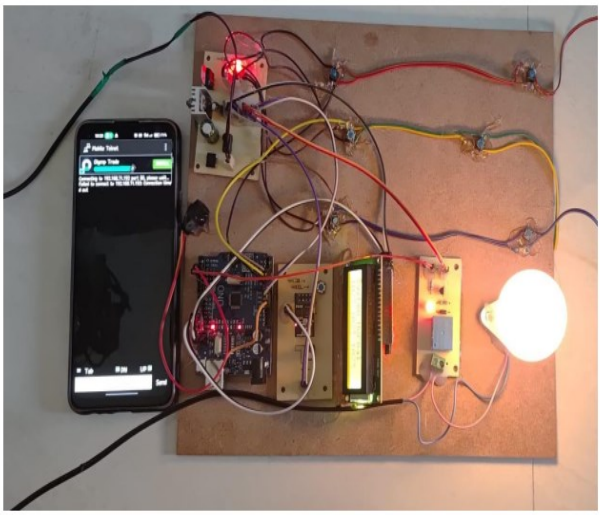

Fig 4.1: Result

ADVANTAGES AND APPLICATIONS

Advantages:

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Less maintenance

Reduces the need for manual inspections and maintenance checks.

Easy Fault Detection

Accurately identifies the location of faults, reducing the time and effort required for repairs.

Improved Safety

Enhances the reliability and safety of electrical networks by enabling proactive fault detection and response.

Applications:

Electrical Network Management

Enhances the reliability, safety, and efficiency of electrical networks.

Smart Cities

Essential for modern urban infrastructure, where under ground cables are widely used.

Industrial Applications

Suitable for industries that require continuous power supply, such as manufacturing, healthcare, and data centers.

Power Distribution

Useful for utilities and power distribution companies to improve the reliability and efficiency of their networks.

CONCLUSION

The Underground Cable Fault Detection and Distance Identification over IoT project offers a reliable and efficient solution for detecting faults in underground cables. By leveraging advanced technologies like IoT, this system enables real-time monitoring, automated alerts, and precise location tracking of faults. The project's advantages, including reduced maintenance, higher efficiency, and improved safety, make it an essential tool for electrical network management, smart cities, and industrial applications. With its potential to minimize downtime and enhance the reliability of power distribution systems, this project has significant implications for modern infrastructure and industry.

FUTURE SCOPE

1. Increased Automation:

Implementing automated repair or isolation systems to minimize downtime and enhance reliability.

2. Expansion to Other Infrastructure:

Applying similar technologies to detect faults in other underground infrastructure, such as water or gas pipelines.

3. Improved Security:

Enhancing the system's cybersecurity features to protect against potential threats and ensure data integrity. By exploring these future directions, the project can continue to evolve and provide even greater benefits to the electrical industry and beyond.

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