AUTOMATIC UNDERGROUND CABLE FAULT DETECTORUSING IOT

Mr. Ankit S. Gaulkar Electronics & Telecommunication, PJLCE,Nagpur,India

Mr. Karunesh V. Gaurkar Electronics & Telecommunication, PJLCE, Nagpur, India

Ms. Kajal V. Dhoble Electronics & Telecommunication, PJLCE, Nagpur, India

Ms. Prachita K. Yerane Electronics & Telecommunication, PJLCE, Nagpur, India

Prof. Nisha WarambheElectronics & Telecommunication, PJLCE, Nagpur, India

ABSTRACT :-

Electricity has become the most sought after amenity for all of us. Gone are the days when electricity would be only limited to cities. It is now reaching to every distant parts of the world. So we have now a complex network of power system. This power is being carried by the transmission lines. These lines travel very long distances so while carrying power, fault occurring is natural. These faults damages many vital electrical equipments like transformer, generator, transmission lines. For the uninterrupted power supply we need to prevent these faults as much as possible. So we need to detect faults within the shortest possible time. Microprocessors and microcontroller based systems used for these fault detection have been advancing rapidly. The proposed paper simulates Numerical Overcurrent relay that detects faults using microcontroller and ADC. These relays are more reliable and have faster response than the traditional electromechanical relays and Static relays. They have increased range of setting, high accuracy, reduced size, and lower costs, along with many other functions, such as fault event recording, autoresetting, etc. This project is about designing the Numerical relay where the fault is detected when the input value exceeds the reference value set in the relay which then gives the trip signal to the circuit breaker.

Keywords: *IOT , ATMEG16, Display, Transmission Line*.

1.1-INTRODUCTION:-

Underground cables have been widely implemented due to reliability and environmental. To improve the reliability of a distribution system, accurate identification of a faulted segment is required in order to reduce the interruption time during fault, i.e., to restore services by determining a faulted segment in timely manner. In the conventional way of detecting a fault, an exhaustive search in larger-scale distance has been conducted. This is time-consuming and inefficient. Not only that the manpower resource is not utilized, but also the restoration time may vary depending on the reliability of the outage information. As such, deriving an efficient technique to locate a fault concerns can improve system reliability. Use of underground power cable is expanding due to safety considerations and enhanced reliability in the distribution and transmission systems in recent times. Due to safety reasons and highpower requirements in densely populated areas, use of underground cable has seen a sharp hike in recent times .Till last decade's cables were made to lay overhead and currently we use underground cable. Because the underground cable are not affected by any adverse weather condition such as storm, snow, heavy rainfall as well as pollution .But when any fault occur in cable, then it is difficult to locate fault So we will move to 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. In A-frame method, a pulsed direct current (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, since the operator has to walk along the length of the cable from the transmitter to the ground fault. 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 complicated.

1.2-LITERATURE SURVEY:-

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. 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 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.[1]

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. [2]

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. [3]

Frequent fault in underground cables due to the breakdown of paper plastic insulation due to chemical reaction or poorworkmanship during installation and the difficulties in locating the approximate fault area have been a serious problem.Most Underground Faults are located by unearthing the entire length of cable to enable visual inspection to be carriedout. In case where visual inspection is not helpful then the entire length of cable is replaced. This manual method is notonly expensive but also results in heavy loss of revenue to the power distribution company. This research is aimed atdesigning an underground cable fault location distancedetection to solve this problem.The research work will help inidentification and location of underground cable fault without unearthing the entire length of the cable before repair orreplacing entire cable due to difficulty in locating the fault.

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. DhivyaDharani.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.

1.3-Theory

Above figure shows block diagram of transmission line faults detection using IoT . It consist of atmega 16 , LCD 16*2 display , power supply , optocouplers, switch board , a switch board is used to generate faults of phase and it gives output to the optocoupler an optocoupler is used as a voltage sensor it senses we uses three optocoupler for sensing voltages on three phase it senses voltage and gives output to the atmega 16 we have to connect output of optocoupler to atmega 16 at ADC port because the output of optocoupler is analog .an atmega 16 microtroller IC is brain of project which is programmed by user as per requirement when it detects faults on any phase then it display msg on 16*2 LCD display and at same time it upload a same status faults on internet with the help of IoT. An IoT is used to upload data on internet which is given by microcontroller. A power supply is used to converts 230v AC supply voltage in 5v constant reulated DC supply voltage which is necessary to all circuit and devices which is mounted on circuit board.

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 meters (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.

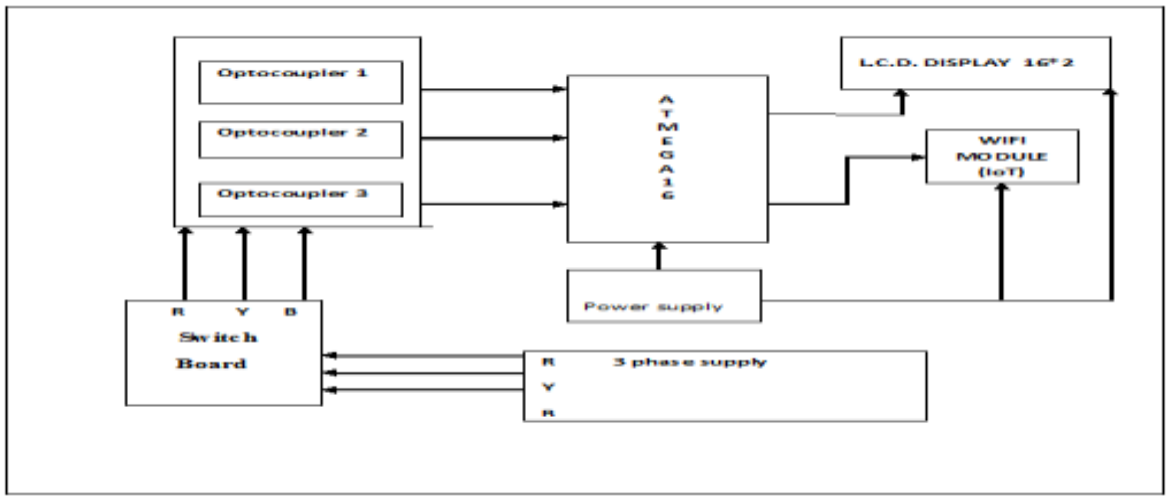
1.4-RECTIFIER:-

The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability .The circuit has four diodes connected to form a bridge. A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as rectification.

1.5-LCD:-

Liquid crystal display are interfacing to microcontroller .Most commonly LCD used are 16*2 &20*4 display. In display means 20 represents column & 4 represents rows. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

BLOCK DIAGRAM:-



1.6-Fault in the cable can caused by

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

1.7-Advantages:-

- Less maintenance
- It has higher efficiency
- Less fault occur in underground cable
- Underground cable fault location model are applicable to all types of cable ranging from 1kv to 500kv&other types of cable fault such as-Short.

1.8-**Types of Fault**

Faults has many types. Frequently occurs the faults are given below .

- Short Circuit Fault Open Circuit Fault
- High voltage fault
- Low voltage fault

1.9-Short Circuit Fault

A short circuit fault occurs when there is an insulation failure between phase conductors orbetween phase conductor(s) and earth or both. An insulation failure results into formation of a short circuit path that triggers a short-circuit conditions in the circuit.

2.0-Open Circuit Fault

An open-circuit fault occurs if a circuit is interrupted by some failure. If the circuit is notclosed that is called open circuit fault.

2.1-High voltage fault

High voltage fault occur due to the increases in the voltage above 240 V.

2.2-Low voltage fault

Low voltage fault occur due to the decreases in the voltage below 220 V.

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