Detection of Fault Location in Transmission Line using Internet of Things (IoT)

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Abstract

Transmission lines are used to transmit electric power to distant large load centres. These lines are exposed to faults as a result of lightning, short circuits, faulty equipment’s, miss-operation, human errors, overload, and aging. To avoid this situation, and we need the exact location of fault occurrence. This problem is handled by a set of resistors representing cable length in KMs and 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 what distance and which phase is displayed on a 16X2 LCD interfaced with the microcontroller. Calculated values are sent to the receiving section with help of Zigbee. Measured values are updated in PC and monitored with help of .NET. RTC is used here to time and date reference, that when the event occurs.

Keywords: Internet of things, Overloading, PIC 16F77A, Resistors, Zigbee, .NET, Fault switches

I. INTRODUCTION

The transmission line conductors have resistances and inductances distributed uniformly along the length of the line. Traveling wave fault location methods are usually more suitable for application to long lines. A representation of an overhead transmission line by means of a number of pi-sections has been implemented using the Alternative Transient Program (ATP/EMTP) in which the properties of the electric field in a capacitance and the properties of the magnetic field in an inductance have been taken into account and these elements are connected with lossless wires. Transmission lines cannot be analyzed with lumped parameters, when the length of the line is considerable compared to the wavelength of the signal applied to the line. Power transmission lines, which operate at 50-Hz and are more than 80-km long, are considered to have distributed parameters. These lines have the properties of voltage and current waves that travel on the line with finite speed of propagation. Traveling wave methods for transmission lines fault location have been reported since a long time. Subsequent developments employ high speed digital recording technology by using the traveling wave transients created by the fault. It is well known that when a fault occurs in overhead transmission lines systems, the abrupt changes in voltage and current at the point of the fault generate high frequency electromagnetic impulses called traveling waves which propagate along the transmission line in both directions away from the fault point.

II. LITERATURE SURVEY

A. Title 1: Digital Fault Locator for Double End Fed Transmission Lines:  
Author: Micheletti.R  
Year: 2010  
The paper presents a digital fault locator by dynamic system parameter estimation for a double end fed transmission line. The method uses about 1/6 cycle of recorded fault data and does not require filtering of dc offset and high-frequency components. The system differential equations are based on a lumped parameter line model, Thevenin equivalents at both ends of the line and an unknown fault resistance. The accuracy is demonstrated by a representative set of tests results obtained with computer simulation.
Title 2: Fault location in EHV transmission lines using Artificial Neural Networks

Author: TAHAR BOUTHIBA
Year: 2004

This paper deals with the application of artificial neural networks (ANNs) to fault detection and location in extra high voltage (EHV) transmission lines for high speed protection using terminal line data. The proposed neural fault detector and locator were trained using various sets of data available from a selected power network model and simulating different fault scenarios (fault types, fault locations, fault resistances and fault inception angles) and different power system data (source capacities, source voltages, source angles, time constants of the sources).

### III. TRANSMITTER SECTION

![Transmitter Diagram]

#### A. Receiver Section:

![Receiver Diagram]

### B. Working Explanation:

To attain our concept need to use pic16f877a controller, voltage sensor, current sensor, speed sensor, buzzer, temperature sensor, LCD. The project is assembled with a set of resistors representing cable length in KMs and fault creation is made by a set of switches at every known KM to cross check the accuracy of the same. The voltage drop across the feeder resistor is given to an ADC which develops a precise digital data which the programmed microcontroller would display the same in Kilo meters. The fault occurring at what distance and which phase is displayed on a 16X2 LCD interfaced with the microcontroller.
If the temperature higher than the threshold value at that time buzzer and LCD will give intimation. Calculated values are sends to the internet with help of IOT.RTC is used here to time and date reference, that when the event occurs.

C. Error Identification Using Fault Switch:

<table>
<thead>
<tr>
<th>CAUSE:</th>
<th>AFCI SYMPTOM</th>
<th>SOLUTION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trips right away</td>
<td>Trips within 5 sec.</td>
<td>Never trips, even when &quot;TEST&quot; is pushed</td>
</tr>
<tr>
<td>1 Overload</td>
<td>yes</td>
<td>--</td>
</tr>
<tr>
<td>2 Short circuit</td>
<td>yes</td>
<td>--</td>
</tr>
<tr>
<td>3 Overheating AFCI</td>
<td>yes</td>
<td>--</td>
</tr>
<tr>
<td>4 Ground-fault</td>
<td>yes</td>
<td>--</td>
</tr>
<tr>
<td>(4) Neutral shared with another circuit</td>
<td>yes</td>
<td>--</td>
</tr>
<tr>
<td>5 Arc-fault</td>
<td>yes</td>
<td>--</td>
</tr>
<tr>
<td>AFCI device miswired</td>
<td>yes</td>
<td>--</td>
</tr>
<tr>
<td>Bad AFCI</td>
<td>rare</td>
<td>--</td>
</tr>
</tbody>
</table>

D. Advantages:
- Devices are enabled by wireless communication.
- Coverage area is large compared to the existing system.
- Less number of components and manual observation. So it is economically reliable and low cost

E. Application:
- Used in transmission line.
- Used in textile mills.
- Used in food industry.

IV. CONCLUSION

In the existing system the reliability of fault detection is poor. The method proposed now provides us a cheap and highly reliable way to locate the faults in the three phase transmission lines and also supports data storage. Hence this method can be implemented to detect the faults and retrieve the corresponding data anytime.

REFERENCES

[10] Three Phase Transmission lines fault Detection, Classification and Location Raunak Kumar Student, Electrical Engineering, National Institute of Technology, Raipur, 492010, C.G., India