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Overhead Distribution Line Fault Detection

Vaisakh R Krishnan[1], Jerin Jose[1], Hassic Samad[1], Alan George Thomas[1], Sreeji S[1]

Electrical and Electronics Department, Amal Jyothi College of Engineering, Kanjirappally, Kerala, India[1]

Abstract: This paper introduces overhead distribution line fault detection. A device is made which can be installed in homes or any other buildings though which we can detect the fault occurred in that distribution line. Similarly the substation module receives the signal from the homes and in turn signals to switch off the line under the fault. A prototype of the system is made and is running in good condition. The proposed method is based on Radio Frequency communication.

Keywords: Relays, Radio Frequency communication, Circuit breaker, Substation.

I. INTRODUCTION

Detecting and locating fault in distribution network has been a major challenge for the power electric community for decades. The transmission and distribution overhead lines produce grounding, short circuit fault due to various reasons and this has brought great risk to the pedestrians. With the introduction of aluminium conductor, the vulnerability to damage increased due to its easily abraded surface. Prompt and accurate location of faults in a large-scale distribution system can accelerate system restoration, reduces outage time, and improves system reliability. In case of broken conductor in overhead line distribution system, the pedestrian may be injured from high voltage conductor if the system cannot detect and make a command to open the circuit breaker. This paper introduces a new method through which we can easily detect and locate the fault in overhead distribution line.

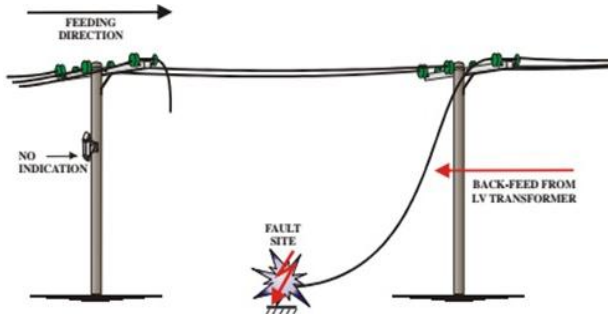

Fig.1. Fault detection

II. FEASIBILITY

a. The current issue related to fault detection in overhead distribution line is that the solutions are not economically feasible.
b. A serious view of the media reports that in the year 2013 atleast 241 people, including children had died out of 441 instances of electrocution. No amount of compensation can replace the precious lives.

III.WORKING

The system consists of three sections. The sections are as follows:

1. Home section
2. Substation section
3. Transformer section.

Consider two home modules. Here, the device used is PIC16F883. It is used along with an RF modem. It is placed in each of the above sections.

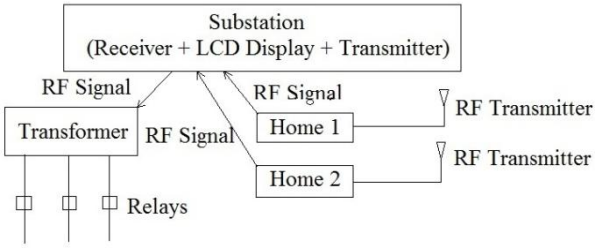

Fig.2: Basic Block Diagram

1. **Home Section**

Consider two home modules. RF module is placed in each home module. It sends RF signals to the substation when there is no current flow in the line.

2. **Substation Section**

It consists of a receiver, LCD display and a transmitter. The receiver receives the RF signals from the home modules. The LCD display displays the consumer number of the home module where the fault occurred. So we can identify the faulted line section. The RF transmitter sends signal to the transformer section.

3. **Transformer Section**

Its receiver receives the signal from the substation. Relays are placed in the receiver side. When signal is received , these relays trip.

IV.SIMULATION AND RESULTS

1. Home Section Module

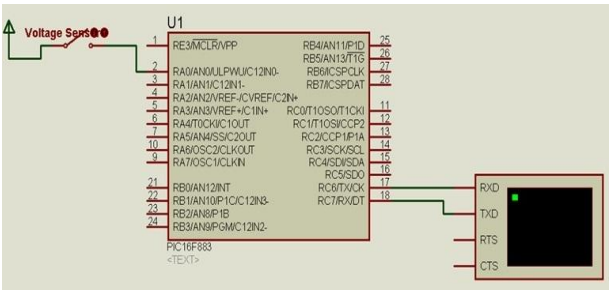

Fig.3. Simulation of Home section module

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Fig.3. the voltage sensor remains closed when there is current flow through the line. Otherwise, it opens.

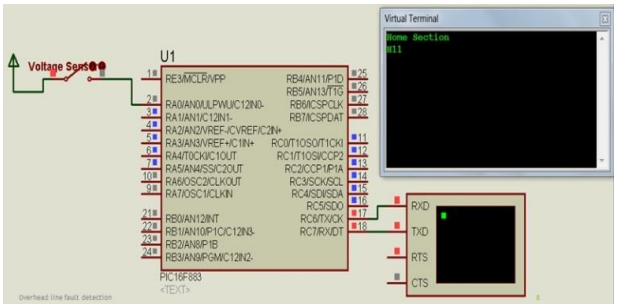

Fig.4. Simulation result of Home section module

Fig.4 shows the case when the voltage sensor opens due to fault in the line.

2. Substation Section Module

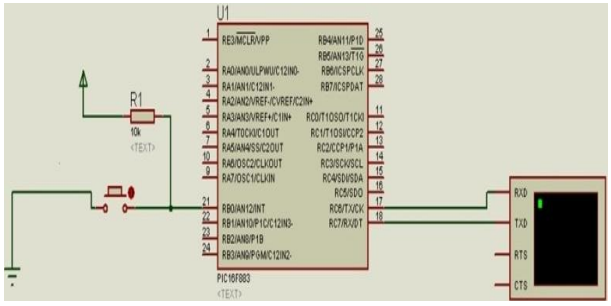

Fig.5. Simulation of Substation section module

In Fig.5 the substation module acts upon the signal received from the home modules.

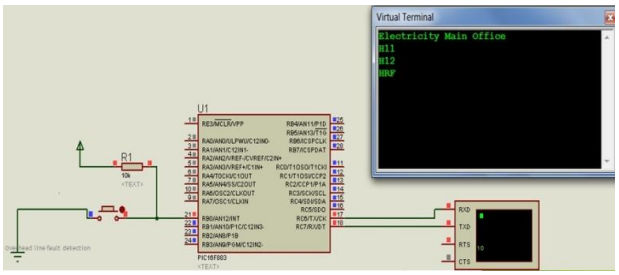

Fig.6. Simulation result of Substation section module

Fig.6.Module receives the signal from both the home modules. Thus it gives signal to transformer section to operate the relay.

3. Transformer Section Module

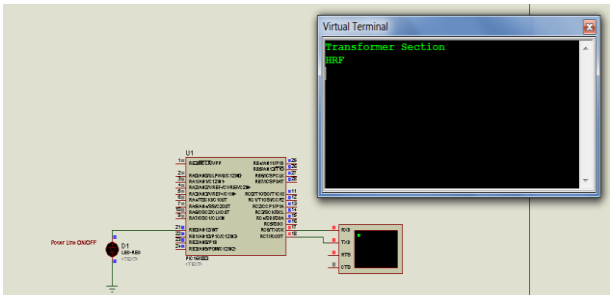

Fig.6. Simulation of Transformer section module

Fig.6 The transformer section receives signal to turn off the supply.

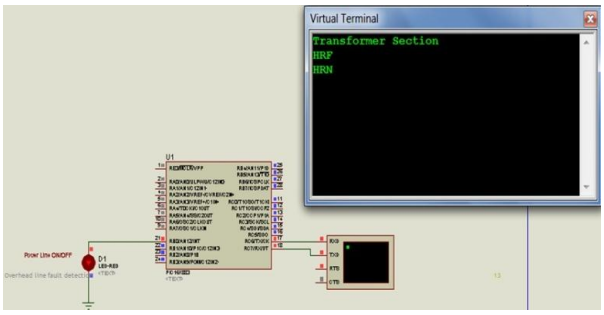

Fig.7. Simulation result of Transformer section module

Fig.7.The transformer section receives the signal to turn back on the supply after maintenance.

V. APPLICATIONS

a. As a measure to prevent losing of many lives modernization of existing power transmission system has to be established all over the state in a phased manner.
b. An automatic tripping arrangement is designed here which accounts for the safety of people by proper control automatically.
c. It can avoid accidents due to conductor snapping and thereby preserve life and credibility of utilities, and improve reliability and revenue stability.

VI. CONCLUSION

There is a need to overhaul the power transmission system even in rural areas of the state. The proposed equipment which will work without any human interface but serve to safeguard lives is thus inevitable both for the utility and for the valuable lives. As Electrical Engineers, we feel it as our prime responsibility to save these precious lives from electrocution.

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