

Electric Hazard Prevention System

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ABSTRACT

Humans and Animals die due to electrical shock in remote areas as well as in agricultural areas while contact with broken and hanging live supply wires. Safety circuitry for Distribution transformers is inadequate and due to which line remains open. This paper describes the modification to the existing distribution system with a sensing unit for the open circuit detection and power supply breaking mechanism for isolating the power supply.

Switching circuit breaks the power supply whenever damage occurs to the distribution line which protects human from electric shocks as well as it saves power.

Index Terms: Transmission line, Open circuit detection, Breaking Mechanism, wireless communication link.

I. INTRODUCTION

At present overhead transmission line and distribution system is not sufficiently safe if any damage occurs in the overhead transmission line it will get cut if it gets contact with humans or animals there may be a chance of electrocution.

Power from the distribution station gets distributed through the medium voltage line by the distribution transformer of 440v and it is not governed by any centralized system. Only fuses were used to govern these lines and it will also work only whenever short circuit occurs over those lines and it does not stop the power supply. Hence a modification to the existing power supply is required. This paper describes a safety system with a wireless communication link and a breaking mechanism which breaks the power supply and avoids the damage occurs due to the breakage in the overhead distribution line.

II. PRESENT THEORIES AND PRACTICES

Currently there is no tripping mechanism for the distribution transformers when the distribution line gets break. The existing system consists of distribution transformers of 33kv/11kv and 11kv is transmitted up to 6 km ,distribution transformers 11kv/440v are used for end customers and can be of 1 to 1.5 Km length from distribution transformers as shown in fig. 1

When any disaster happens over the 11kv line substation vacuum circuit breaker trips by earth fault. When short circuit occurs over the Medium voltages line only fuses were blown off and there was no tripping mechanism for the distribution transformer.

Also any failure over the Medium voltage lines is not indicated to the substation and the operator had no control over the faulty line. Thus it leads to lot of accidents and wastage of power . Hence it should be minimized and it can be avoided by this project.

III. LITERATURE REVIEW

The “Power Line Conductor Breakage Accident Avoidance using Wireless Communication” proposes a method for the detection in the breakage in the distribution line [1]. It also proposes a modification that

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need to be carried to the existing distribution transformer system. The above technique for the detection of breakage in the distribution line is employed with the use of the sensor that is voltage sensors.

A development of a distribution line state monitoring and controlling system by combination of remote control switches with new optical current sensors this utilizes a optical sensors for the sensing in the wire breakage in the transmission line [2].

This project gives the description about the types of sensors that could be used for monitoring purpose.

IV. DESIGN

Fuses were blown off only after any mishaps or accidents. This paper describes an alteration to the existing distribution transformer system by continuously sensing the distribution line using sensing circuit with a breaking mechanism that will switch off the power supply as shown in fig. 2

(A) Sensing circuit

The sensing unit consists of the voltage sensor in order to sense the voltage across the distribution line which detects the breakage in the distribution line[2]. The voltage sensor is a device that converts the voltage measured between two points of an electrical circuit into a analog signal proportional to the voltage. Voltage sensor is preferred over the current sensor because voltage can be measured at any instant whereas current sensors affect the system performance. The voltage sensor utilizes the voltage dividing mechanism in order to sense the voltage across the distribution line. This paper utilizes the voltage divider since it is easy to accomplish using step down transformer and by utilizing voltage divider circuit which divides the voltage into acceptable voltage for the microcontroller to process the information.

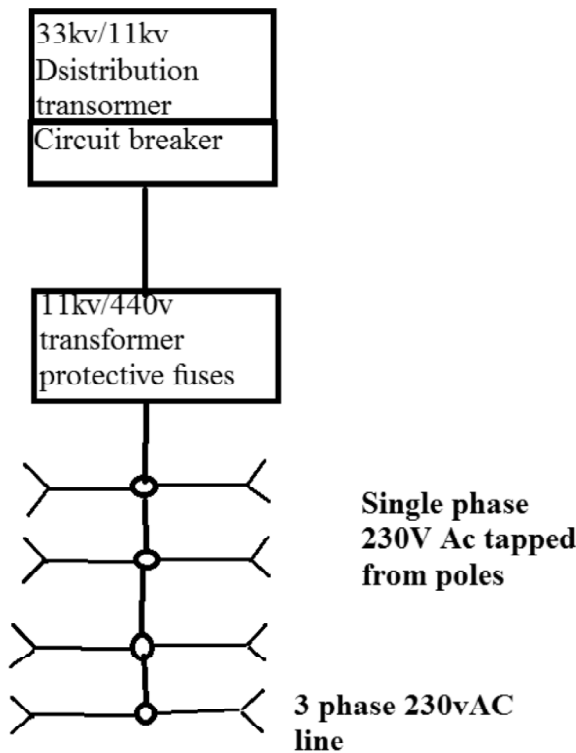


Figure 1: Existing Distribution System

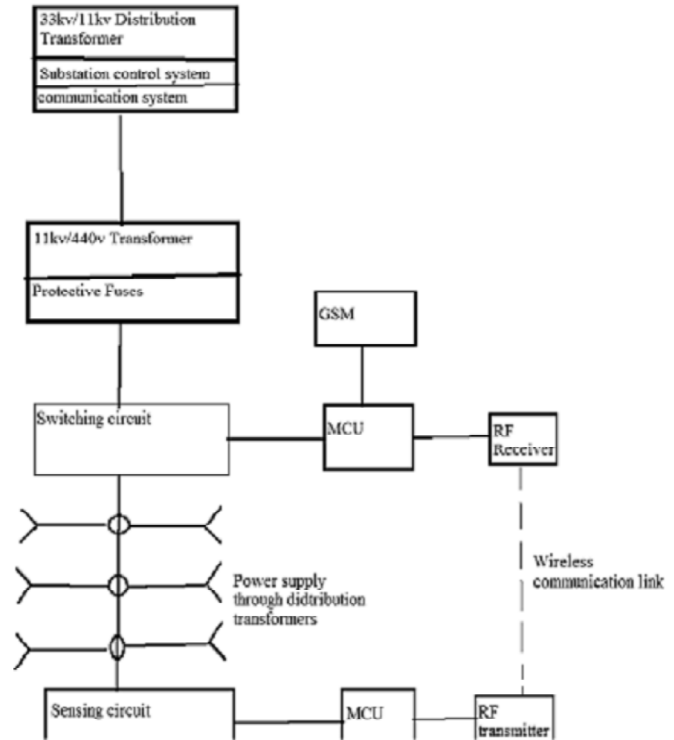


Figure 2: Safety system for the distribution system

(B) MCU Module

The MCU module consists of an pic microcontroller (pic16f877a) which is an 8 bit controller[1]. It consists of an 8 A/D converters which is used for connecting the sensor unit. The microcontroller has 8 channel for the analog inputs in which this project utilizes one channel for sensing the breakage in the distribution line. If there is an breakage in the distribution line, the sensing unit will send an analog signal to the ADC module of the microcontroller which uses threshold value for the detection. The threshold value used for the detection is 5v if there is a breakage in the distribution line it will be interpreted as 0v and if there is no breakage it will be interpreted as 5v based on the threshold value the microcontroller will give the necessary commands for the switching circuit.

(C) Communication Link

The communication link utilizes RF transceivers for the communication purpose about the breakage in the distribution line[11]. The RF transmitter generally includes a modulator that modulates the input signal and a radio frequency power modulator that is coupled to an antenna that transmits the amplified modulated input signal.

Power amplifiers are required in radio telecommunication systems to amplify signals before transmitting, because a radio signal attenuates on the radio path. For efficiency, the amplifier is often a non-linear amplifier operated near its peak capacity. It sends the data about the damage across the distribution line to the main transformer which has the switching circuit.

(D) Switching circuit

The switching circuit consists of the relay circuit which acts as an switch to isolate the power supply when it receives the attention command from the Slave MCU .This is used for the transformer protection as well as for the safety of the humans. The relay circuit acts as the switch for the transformer that will switch off the entire power supply so that no power gets transmitted through the distribution line.

(E) GSM Module

The GSM Global system for mobile communication is a standard used for mobile communications. It works on the basis of the command from the MCU. It transmits data packets via GPRS (Global Packet Radio Services) for the end customer about the breakage in the distribution line. It also useful for communicating the information about the breakage to the nearby operator so that damage can be minimized.

The GSM module is also used for transmitting the Transformer ID which will be useful to know the exact location about the breakage. It will be quite useful for the operator to know the location about the fault so they can avoid any other mishaps.

(F) Centralized control

The substation consists of an centralized computer that will continuously monitors the distribution transformers through a wired communication.The MCU unit is connected through a wired network using USB for the continuous monitoring of the transformer. This helps the operator to know the health of the transmission line as well as the efficiency of the transformer.

V. ALGORITHM**MASTER MCU ALGORITHM**

A input r1=1

Healthy power from the distribution line

A input r1 =0

It indicates a breakage in the distribution line.

SLAVE MCU ALGORITHM:

A input r1=0

=Q tripping Mechanism

A input r1 =1

= SAFE healthy of the transmission line

VI. MONITORING SYSTEM

The Monitoring system utilizes the wired networks for the continuous monitoring of the MCU module. To know the current status of the distribution transformers monitoring is used. It consists of an personal computer which will stores the status of the distribution line for a period of time. It helps us to find the exact location of the faulty transformers as well as the health of the line.

It uses a serial interfaces for the communication to the personal computer. Several types of interfaces can be used, this project utilizes the USB interface because of its flexibility and it is an universal serial interface.

CONCLUSION

Open circuit detection was quite useful to avoid the breakage in the distribution line as compared to the fuses that protects the transformer when any short circuit occurs over the transmission line. It is seen that the breakage of distribution line in transmission system increases drastically over the years. So considerations have to be taken to eliminate such mishaps so as to provide the safety of the transmission system.

APPENDIX

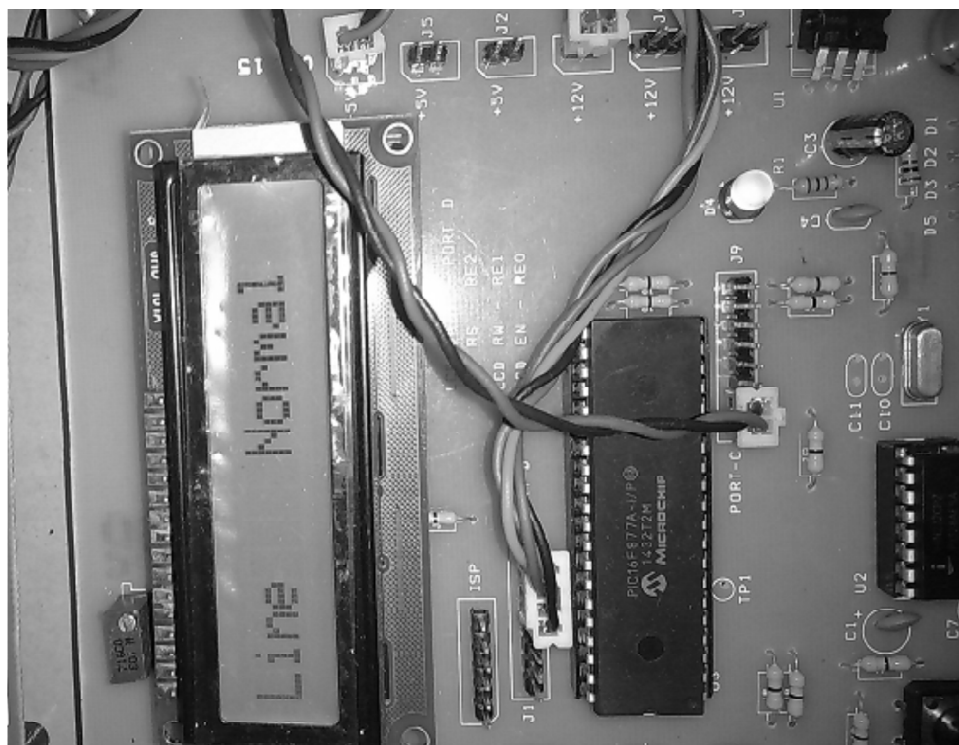


Figure 3: When line is normal

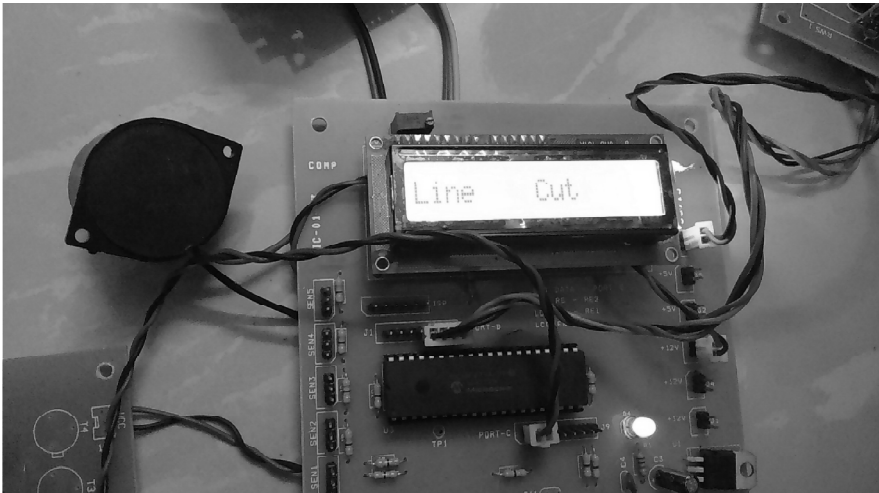


Figure 4: When line is cut

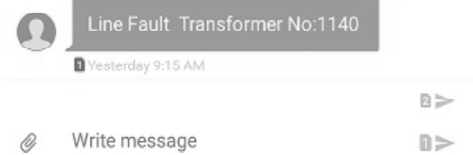
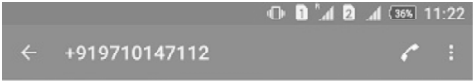


Figure 5: GSM message information about the transformer fault

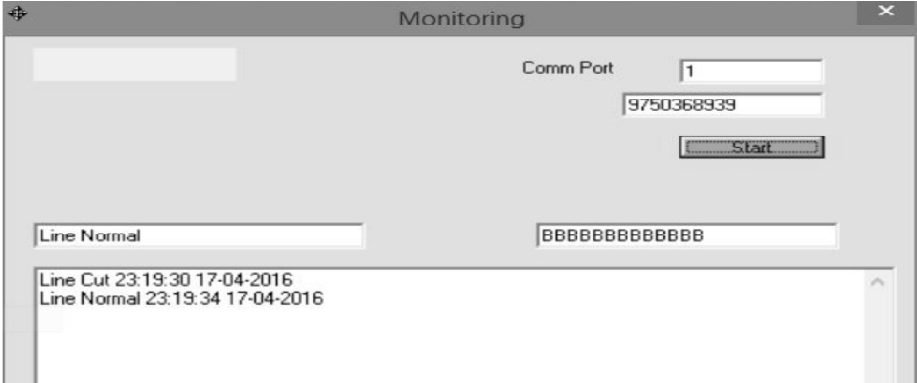


Figure 6: Monitoring transformer health

FUTURE SCOPE

The future scope of this paper deals with the continuous monitoring of the distribution transformer and store it in the database for knowing the health of the transformer.

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