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Distribution Side Fault Detection and Disconnection Using GSM

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ABSTRACT*:* Any distribution network is likely to get faults, and on and off nature in power availability creates loss for the supplier as well as user. Majorly, a supply line can be affected by conditions of overvoltage and over current, also under-voltage condition. During the event of any fault, the event goes unreported for long length of time. Manual reporting can lead to long interruption. To overcome this problem, a GSM based system is developed that will detect the changes in voltage and current guidelines, and using a microcontroller based circuit, the faults can be classified based on comparison between the values received from rated guidelines of the distribution side power lines. Whenever the pre-set dividing line is crossed, the microcontroller instantly

initiates a message to the area lineman and the Control Station stating the exact street location where fault is happening. The real purpose of detecting fault in real time is to protect the transformer at the earliest. Even though the line operators possess little safety equipment, there exists a chance for accidents due to unexpected errors. Also we introduce a system which will disconnect the power line from the transformer automatically without the manual work of line operator. This will improve line man safety and also reduce the patrolling time of line operator.

KEYWORDS*:* GSM modem, PIC 16F877A Microcontroller, RS-232 connector, Circuit breaker, Current transformer.

I.INTRODUCTION

Recently, electrical sudden unplanned bad events to the line man are increasing, while repairing the electrical lines due to the lack of communication between the electrical substation and maintenance staff. Losses in distribution system are much higher than losses in transmission side and also fault are more frequent in distribution side. The survey shows that 80% of the consumer's service interruptions are due to failures in distribution networks. This project gives a solution to this problem to make sure of lineman safety. Detecting and locating fault in power line is very necessary for healthy operation of power system. In this proposed system the control (ON/OFF) of the electrical lines lies with line man. This project is arranged in such a way that maintenance staff or line man has to ON/OFF the electrical line. Now if there is any fault in electrical line then line man will switch off the power supply to the line and comfortably repair the electrical line, and after switch on the supply to the particular line.

In distribution line many faults detection and indication to Electricity Board (EB) deals with the problem of detecting the fault in the transmission lines and the automatic hint to EB. Then the line man will disconnect the power supply in the transmission line. This proposes greatly reduces the manpower, saves time and operates efficiently without human interference.

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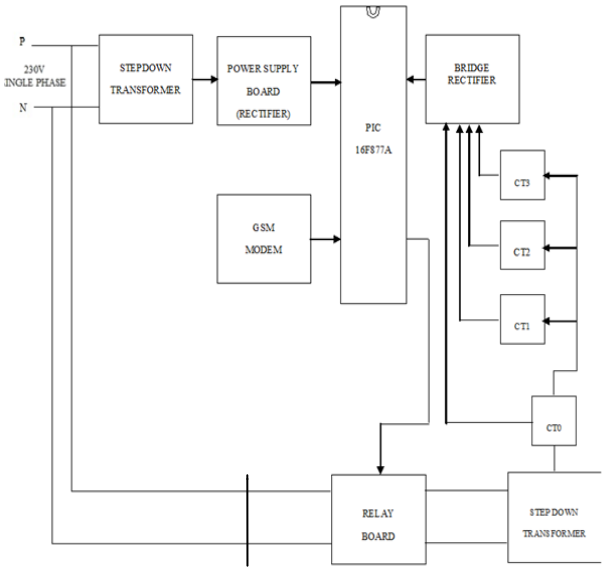

Figure 1: Block Diagram of Fault Detector and Disconnector

II.AUTOMATIC POWER LINE FAULT DETECTOR

Detecting and locating fault in power line is very necessary for healthy operation of power system. In electrical power line fault often happen many times making the power system unreliable. In this idea using wireless sensor for detecting fault which includes phase to phase, short circuit and mainly line to ground fault in power line for better reliable and best operation of the system is presented. In the proposed idea power line is divided by WNS (wireless sensor network) nodes that could sense the fault condition in power line, display to operator as well as send SMS through GSM modem to service engineer. This idea successfully carefully studies the asymmetrical faults which happen in power line. In Wireless Sensor Network (WNS) current sensor is connected with PIC 16F877A microcontroller converts the analog measured current value into digital form and then transmits the data to the main first node through transceiver. Guidelines calculated in PIC 16F877A microcontroller transmit data to control panel or substation so that immediate action can be done with the help of GSM technology.

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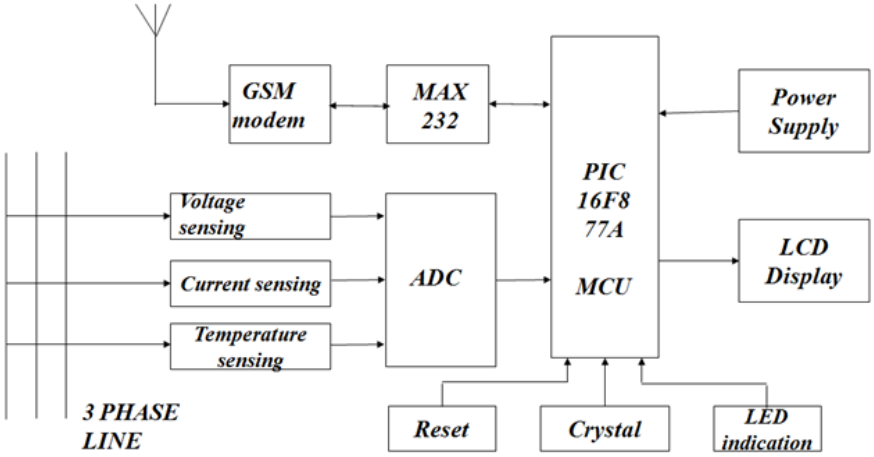

Figure 2: Block diagram of Automatic Power Line Fault Detector

2.1 Current Transformer:

The CT's are connected to the secondary side of the distribution transformer. The current transformer is connected series to the phase line. These are used to sense the current in the line when the fault had occurred. There are two major types of fault occur in the transmission line. One is open circuit fault that is increment of voltage measured by the potential transformer. Another fault is short circuit that is increment of current measured by the current transformer.

2.2 Analog to Digital Converter:

The measured output from the current and potential transformer is in the form of analog but the input of microcontroller is digital. So we can use ADC for converting analog to digital and is connected to the transformer.

III. PARTS OF APLFD

APLFD can detect the faults automatically. This can be divided into four different sections,

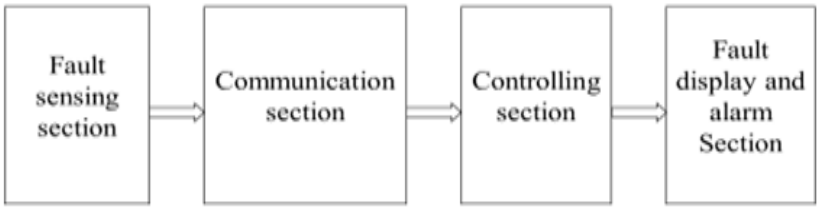

Figure 3: Block Diagram of APLFD Parts

3.1 Fault Sensing Section:

As the name shows, it senses the fault that happens in the transmission line. The Fault Sensing Section contains CT's and PT's, which detects the abnormal current and voltage differences during the fault instant. Each street contains one PT which connects across the phase and neutral and a CT which connects through the phase line.

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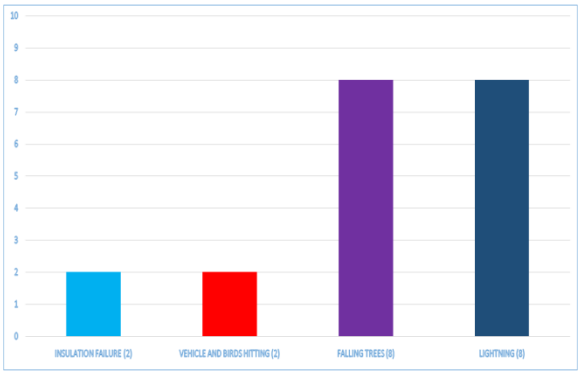

Figure 4: Common Causes of Faults

3.2 Communication Process:

Data from the field device firstly communicated to the Base Transceiver Station (BTS) which serves as an access point for all devices. The BTS placed on the strategic locations to cover a particular area or a span. Next the data moves on to the Base Station Controller (BSC) which manages the radio valuable supplies from the BTS and also it act as a link between BTS and switching system. Then the data moves on to the switching system which directs the data signal and that is the control room. Finally data arrives at the control room where another modem receives the information and displays on the screen.

3.3 Controlling Section:

The main part of this section is a PIC 16F877A microcontroller. The microcontroller which is programmed in C language to control the whole APLFD operation by using MP lab.

3.4 Fault Display and Alarm Section:

In this section there is LCD screen and a Buzzer. The output port of PIC 16F877A microcontroller is connected with LCD screen to display the different fault conditions and an alarm circuit to produce the sound during the event of fault.

IV.POWER LINE DISCONNECTOR

Recently, the power lines are disconnected from the changer using manual key. In our project the manual key is not needed because the power lines are disconnected using relay and circuit breaker with the help of microcontroller.For the operation of circuit breaker through a program is written in MP lab software file that is further burnt onto the controller with the help of flash magic. Connections are given as per the circuit diagram. While giving the connections, it should be made sure that there is no common connection between AC and DC supplies.5V power supply circuit is to be used to provide controlled 5V DC to the controller. Now both the AC and DC supplies are switched on. Relay output pins gets 230V, so they should not be touched.

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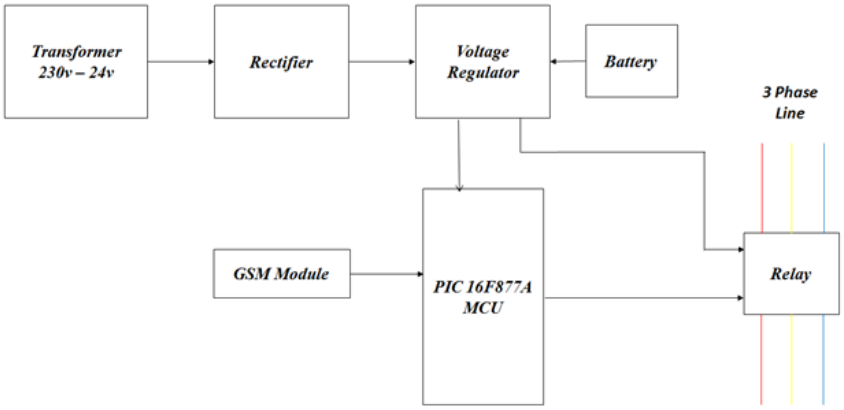

Figure 4: Block diagram of Power Line Disconnector

4.1 Bridge Rectifier:

A rectifier is a device that will be placed between transformer (230V -24V) and the voltage regulator. The device converts the alternating current from the transformer to the voltage regulator.

4.2 GSM Module:

A GSM modem is a wireless modem that works with GSM wireless networks. To send information, first place a valid SIM card into a GSM modem, which is then connected to microcontroller by RS 232 cable. After connecting a GSM modem to a microcontroller, you can control the GSM modem by sending instructions to it.

4.3 Voltage Regulator:

7805 is a device that controls the voltage electronic devices. The voltage source in a circuit may have ups and downs would not give the fixed voltage output. The electronic device maintains the output voltage at a constant value. Provides the +5V power supply to the microcontroller, relay and relay driver.

4.4 Relay:

Relays are used where it is necessary to control a circuit by a low-power signal, (separated from others completely) or where lot of circuits must be controlled by one signal.

V. CONCLUSION

The system is effective in the sense that a complete online supervising of the distribution transformer is accomplished through this system. The use of GSM modem helps in effective message signaling to the required receiver. It decides that the GSM technology used for the fault detection of three phase line through calls and messages is given to the In-charges of that location, by the means of communication protection layouts. By using this system to get the exact faulty phase under abnormal condition has been happened. No other person can reclose the breaker before they finished their work. It is effective in providing safety to the working staff. It is money saving. It can be easily installed.

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