Automatic Fault Detection in Transmission Lines Using GSM Technology

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Abstract— The point of convergence of this paper on automatic fault detection in transmission lines by using GSM technology. The Electric Power System is divided into many sections. One of that is the transmission system, where transmission line is transfer the power from generating station to the consumer. Both methods could encounter various types of malfunctions is usually referred to as a "Fault". Fault is simply defined as a number of undesirable but unavoidable incidents can temporarily disturb the stable condition of the power system that occurs when the insulation of the system fails at any point. A smart GSM based fault detection and location system was used to adequately and accurately indicate and locate where the fault had occured. This will ensure a shorter response time for technical crew to rectify these faults and thus help save transformers and other power devices from damage and disasters. The system uses a voltage transformer, a current transformer, 8051 Microcontroller, ADC, RS-232 connector, and a GSM modem. When the fault has occurs the system automatically detects faults, analyses and classifies these faults and then, calculates the fault distance from the control room using an impedance-based algorithm method. Finally, the fault information is transmitted to the control room. In conclusion, the time required to locate a fault is drastically reduced, as the system automatically and accurately provides accurate fault location information. By using this project, we can detect the faults of three phase transmission lines one can monitor the Temperature, Voltage, Current by means of GSM modem by sending message.

Keywords: Waste Heat, Waste Heat Recovery, Thermoelectric Generator Module, Controller, Electricity

I. INTRODUCTION

In this paper, the identification and alleviation of the single line fault in over head distribution line is presented. Due to the GSM technology is applied to measure, protect and control the distribution lines against various fault conditions. The variation in voltage and current due to open circuit fault and short circuit fault is monitored. The line temperature is measured using thermistor. If any increase /decrease in temperature level, then the message will be intimated thro' GSM. The sag in the distribution line is also detected using sag detector and monitored. Here we use GSM modem to detect the fault and to send the message to the control room.

II. TYPES OF FAULTS

There are the two types of faults shunt faults or series faults.

A. Single Line to Ground Fault

It is a shunt fault. This type of fault occurs when one conductor falls to the ground or gets into contacts with the neutral wire.

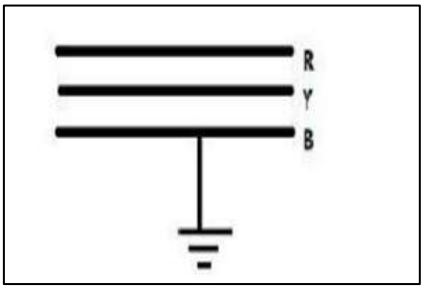

Fig. 1: Single Line to Ground Faults

B. Line to Line Fault

It is shunt faults. Occur when two transmission lines are short-circuited.

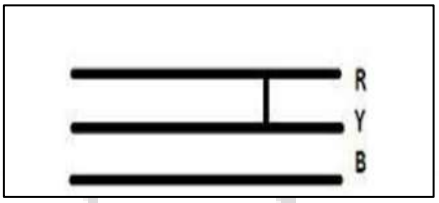

Fig. 2: Line to Line Fault

C. Double Line to Ground Fault

The third type of shunt fault is the Double Line to Ground fault (LLG). of a tree falling on two of the power lines, or other causes.

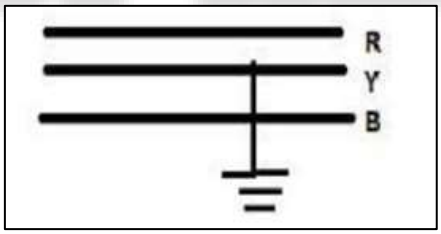

Fig. 3: Double Line to Ground Fault

D. Balance Three Phase Fault

The fourth and the real type of fault is the balanced three phases, which can occur by a contact between the three power lines in many different forms.

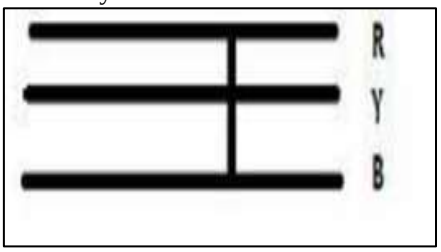

Fig. 4: Balance Three Phase Fault

III. PROPOSED METHOD FOR DETECTION AND LOCATION OF FAULT

In radial distribution system the research carry out in the fault diagnosis method. These methods use the various algorithmic approaches, where the fault location is iteratively calculated by updating the fault current

1) Impedance and Fundamental Frequency Component Based Method
2) High Frequency Component and Travelling Wave Based Method
3) Knowledge - Based Method
4) Artificial Intelligence (AI) and Statistical Analysis Based Methods
5) Distributed Device Based Methods
6) Hybrid Methods

A. Impedance and Fundamental Frequency Component Based Methods

The distance of fault from the primary distribution bus is estimated by impedance based method. Voltage and current values measured at one end or both ends of the line are required in this method. The method uses mathematical equations to estimate the fault location. Suggested a technique that used the fundamental frequency voltages and currents measured at a line terminal before and during the fault. The fault location technique was described by considering a single-phase-to-ground fault on a radial system. Nevertheless, they still considered the line to be fully transposed, and was only good for line-to-ground faults. The proposed method that was based on measurements provided by Intelligent Electronic Devices (IEDs) with built-in oscillography function. This is installed only at the substation level and on a database that stores information about the network topology and its electrical parameters. In particular, on 12kV networks application of the method was a problem.

IV. CONSTRUCTION AND WORKING

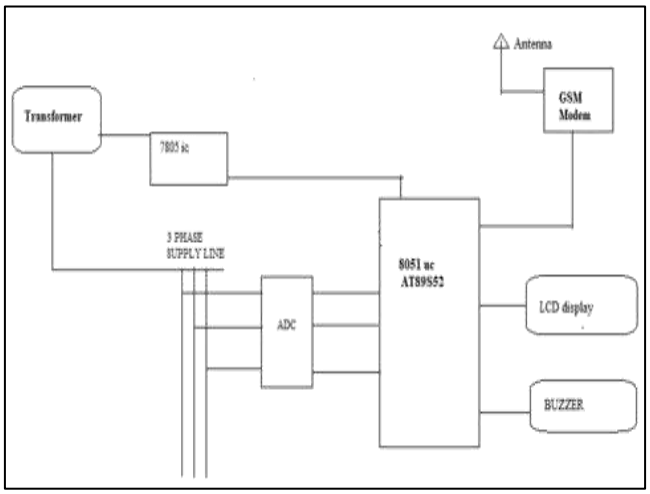

Fig. 5: Block Diagram of the Proposed Approached

The set up or field device consists of 3 major components, instrument transformer (CT and VT), GSM modem and microcontroller. The primaries of the CT and VT which are connected to the line sense the corresponding current and voltage values of the system and feed the output to the ADC of the microcontroller which converts the signal to a digital form in order to be processed by the CPU of the microcontroller.

The microcontroller serves as the central point of the set up. It contains a set of programming codes which have been stored in the EEPROM which enables it to classify the fault type based on the voltage and current values. Based on the program, the microcontroller compares these values to see whether they are within the range required. If the voltage and current values are out of range as compared to the reference, it gives an indication of a fault. The microcontroller also calculates the fault distance, relative to the device based on an impedance-based algorithm and then relays this information to the modem for transmission.

In summary, the microcontroller classifies, calculates the fault distance and relays the information to the modem for transmission via the serial communication interface (SCI) which serves as an interface between the microcontroller and the modem. The RS-232 serves as the connector between the microcontroller's serial communication port and the modem. The device is placed in the boundary of the sectionalized regions in the transmission system and the location of the fault is calculated relative to the position of the device. The unique identity of the SIM card in the GSM modem is used as an address for the device.

Power ON the system. Transmission line carried voltage directly from power supply unit (transformer) while other control circuit board system convert voltage into 5v with help of 7805 IC module.

Insert the SIM into GSM modem, LCD display connected to microcontroller unit shows the messages "Registered your mobile number.". After it from your mobile number sends the text message to insert SIM number.

After it LCD display shows messages of successful registered and your mobile number display on it. This is steps to configure mobile number to the system.

There are 3 transmission line , each have switches with it. When we press the switch , it indicates that any unconditional faults occurs. And this signal goes to controller. Controller identifies which transmission line is failed.

LCD display also shows all operation with it. Also GSM module sends particular messages to authorised person.

In this way total operation of system occurs and identify the, which transmission line faulty.

V. HARDWARE DESCRIPTION

A. LCD Display

Fig. 6: LCD Display

This device can be use to display any message, status or also can be use for debugging purpose. In this project it indicates the status of GSM and transmission line. It works on 5v.

GSM Modem

The GSM module is incorporated in the unit for accomplishing the function of sending SMS to the user's mobile phone in case of any malfunctioning of the transmission line fault process. The GSM module used is SIM 900.

Fig. 7: GSM Modem

VI. RESULT

The analysis of fault detection and location system of transmission line. Whether it is any type of fault that can be detected and located. When fault get occurs on the transmission line the signal is send to the control room or mobile phone through a GSM modem. The message receive on the mobile that is the fault between pole 1 and 2 and the fault which is symmetrical or unsymmetrical like L-G, L-L, L-L-G, L-L-L, L-L-L-G. The signal that appears on the control room or mobile phone is the L*G or any other type of fault occurred on transmission line.

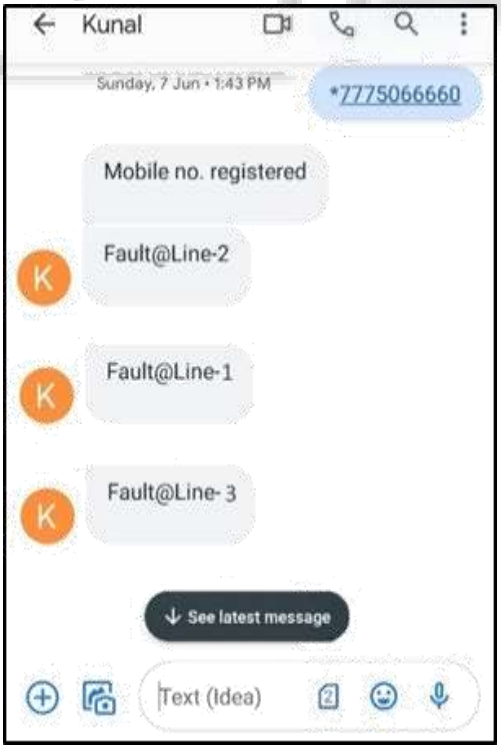

Fig. 8: SMS Receive From GSM

VII. CONCLUSION

Here, in this project we have designed a GSM based transmission line monitoring and indication system that sends information of the same to control room via SMS. The implemented system design mainly concentrates on the distribution system. It provides the way to detect the faults such as wastage of energy and power theft. The system continuously monitors various parameters of the system.

It also helps to detect the fault at the appropriate time and hence avoids illegal use of electricity. Automatic monitoring, analyzing and recording is done on the PC screen through hyper terminal. The project has continuous monitoring system integrating the GSM communication technology and the microcontroller technology. It also represents the hardware architecture and the software flow.

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