



Three Phase Transmission Line Fault Detection

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Abstract- This paper proposes In the modern scenario, due to increase in demand and supply across the world, the field of power system is taking its turn and advancements are being introduced day to day. Protection against the transmission line fault is an important issue in electrical power system, because most of the faults occur in transmission line. This project deals with the classification and detection of fault in a three phase transmission line using Arduino System. Different types of faults are created in a two-bus system at different locations using MATLAB and fault currents in all the phases are acquired. Then, DWT is applied on the faulty signals and the detailed coefficients are obtained, which in turn are used in the algorithm to classify the three phase fault in the transmission line system.

Keywords: Arduino UNO , AC Load , LED Display , Relay , Wires (RYB) , AC Supply , Switches , Diode

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I. INTRODUCTION

As from the latest research 70% to 90% of faults are occurred in overhead transmission line which are transient. There are many fault due to some kind of error or natural error Lightning is the most common cause of transient faults, partially resulting from insulator flashover from the high transient voltages induced by the lightning. Other possible causes are swinging wires and temporary contact with foreign objects. Thus, transient faults can be cleared by momentarily de-energizing the line, in order to allow the fault to clear. Auto reclosing can then restore service to the line that's why we make this made this project. The project is designed to develop an automatic tripping mechanism for the three phase supply system. The project output resets automatically after a brief interruption in the event temporary fault while it remains in tripped condition in case of permanent fault. The electrical substation which supply the power to the consumer's i.e. industries or domestic can have failures due to some faults which can be temporary or permanent. These faults lead to substantial damage to the power system equipment. In India it is common to observe the failures in supply system due to the faults that occur during the transmission or distribution.

The faults might be LG (Line to Ground), LL (Line to Line), 3L (Three lines) in the supply systems and these faults in three phase supply system can affect the power system. To overcome this problem a system is built, which can sense these faults and automatically disconnects the supply to avoid large scale damage to the control gears in the grid substations. A set of switches are used to create the LL, LG and 3L fault in low voltage side , for activating the tripping mechanism. Short duration fault returns the supply to the load immediately called as temporary trip while long duration shall result in permanent trip.

II. LITERATURE SURVEY

A. Transient faults are didn't damage the insulation of wire and there are small in time duration and after that period circuit is re-energized. These faults are occur on outdoor equipment because the air is main medium to take place the transient fault. Example of transient fault are insulator flashover and lightning stroke, when it happen the circuit is de-energized or open by circuit breaker and after a brief interval it will reclose. Permanent fault as name suggest it is the permanent fault, which damage permanently to the insulation. In this period line will permanent de-energized and repaired. [1]

B. A symmetrical fault is a balanced fault which are occurred on three phase. These three phase has same value of fault current. Magnitude of all fault current is same. These faults are same in three line or three line to

ground fault. An asymmetrical fault has a D.C. offset, transient in nature and unbalanced fault. They occur on single line, double line or single line to ground or double line to ground. [2]

C. The authors discuss various faults that have been simulated to develop an automatic tripping mechanism for the three phase supply system while temporary fault and permanent faults occur. Here timer 555 has been used with relay for the fault analysis. Short duration fault back to the supply to the load immediately called as temporary trip while long duration shall result in permanent trip. [3]

D. This project is designed in the form of hardware for three single phase transformers 230V to 12V of output for to develop an automatic tripping mechanism for the three phase supply system while temporary fault and permanent fault occurs. Here we used 555 timer with relay for the fault is temporary or permanent. Short duration fault returns the supply to the load immediately called as temporary trip while long duration shall result in permanent trip. The concept in the future can be extended to developing a mechanism to send message to the authorities via SMS by interfacing a GSM modem [4]

E. The author proposed use of relay. A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays were used extensively in telephone exchanges and early computers to perform logical operations. [5]

F. The author proposed resistors. Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel-chrome). Resistors are also implemented within integrated circuits, particularly analog devices, and can also be integrated into hybrid and printed circuits. [6]

III. METHODOLOGY

It is a system that detects the fault in the three phase lines of power transmission and give us a particular distance where the fault occur. If we cut down the load of any particular line by turning off the switch that we applied in the project then it seems that there is a fault occur and then the LCD screen shown the particular line of three phase and the range (distance) from where the fault occurs. It encompasses such a load analysis system which minimizes unnecessary power service interruptions and outages. By using this system the secondary arc current can be abruptly reduced. This system is even appropriate for long transmission line transmitting high voltage

3.1 Arduino Nano:

The Arduino Nano is a compact microcontroller board that is based on the ATmega328P or ATmega628 microcontroller. It has the same connectivity as the popular Arduino UNO board and is designed to be sustainable, small, consistent, and flexible. Compared to the UNO board, the Nano board is much smaller in size. The Arduino Nano is programmed using the Arduino Integrated Development Environment (IDE), which is compatible with a variety of platforms. To start a project using the Arduino Nano board, we need to have the Arduino IDE and a mini USB cable. The Arduino IDE software must be installed on a laptop or desktop computer, and the mini-USB cable is used to transfer the code from the computer to the Arduino Nano board.

3.2 Relay :

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

3.3 Diode :

A diode is a semiconductor device that essentially acts as a one-way switch for current. It allows current to flow easily in one direction, but severely restricts current from flowing in the opposite direction. Diodes are also known as rectifiers because they change alternating current (ac) into pulsating direct current (dc). Diodes are rated according to their type, voltage, and current capacity. Diodes have polarity, determined by an anode (positive lead) and cathode (negative lead). Most diodes allow current to flow only when positive voltage is applied to the anode.

3.4 AC Load :

AC loads are devices which receives alternating-current (AC) electrical power from a source in an electrical system. A programmable AC load bank is commonly integrated into circuits for testing and measurement of current, voltage and frequency.

IV. Result

3.4 Switches :

These smaller toggle switches are also known as microswitches or snap action switches. They feature a sensitive spring-loaded toggle and respond to a small amount of applied force. The spring is energised by the inflow of current and this moves the contacts into place. Principally designed for lower currents, microswitches are cheap and widely used in both domestic and industrial equipment, often as sensors to detect the position of a component for safety reasons. For example, they can be used to ensure a door or hatch is shut before power is activated and to trigger a shutdown of the current when the door or latch is reopened.

3.5 Resisters :

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High- power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity. Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

3.6 LED display :

A LED display is a flat panel display that uses an array of light-emitting diodes as pixels for a video display. Their brightness allows them to be used outdoors where they are visible in the sun for store signs and billboards. In this system we are using this for displaying the range and the signs of particular line in which the fault occurs . It is connected directly to the arduino in which the programming is done to in order to display the distance and the range of fault .

This paper describes a system that detects the fault in the three phase lines of power transmission and give us a particular distance where the fault occur . If we cut down the load of any particular line by turning off the switch that we applied in the project then it seems that there is an fault occur and then the lcd screen shown the particular line of three phase and the range (distance) from where the fault occurs. This invention will accurately identifies hazardous faults requiring line de- energization, and also accurately discriminates, or distinguishes, a hazardous fault from other events for which the line should remain energized and encompasses such a load analysis system which minimizes unnecessary power service interruptions and outages. By using this system the secondary arc current can be abruptly reduced. This system is even appropriate for long transmission line transmitting high voltage

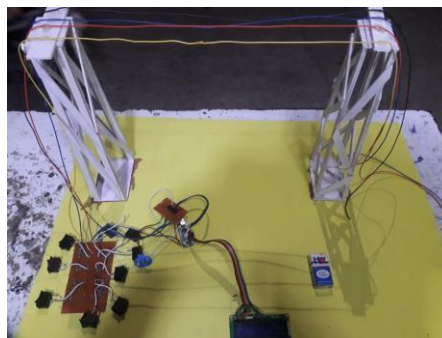


FIG 2. OVERALL CONNECTION OF THE PROJECT.

V. CONCLUSIONS

We present a project which is aimed to design reduce the outage time due to faults and provide a higher level of service continuity to the customer. Furthermore, successful high- speed reclosing auto reclosing. On transmission circuits can be a major factor when attempting to maintain system stability. For those faults that are permanent, auto reclosing will reclose the circuit into a fault that has not been cleared, which may have adverse effects on system stability (particularly at transmission levels).

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