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Analysis And Faults Detection of Three Phase Transmission Line

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ABSTRACT

The electrical substation which supplies the power to the consumer, have failures due to some fault which can be temporary or permanent. These faults lead to substantial damage to the power system. The faults might be LL, LG, over voltage in the supply system and these faults can affect the power system. To overcome this problem a system is built, which can sense these faults automatically using microcontroller. For power to be useful in a home or business; it comes off the power station and is optocoupler to the suitable level of voltage. It is the transformers that step up the voltages or step down the voltages according to consumer's requirement. We can say that Transformer plays important role in our Power System. To maintain reliability in power system it important to protect the 3 phase devices like inductive, resistive, etc. against various faults occurring in it. This fault should be identified and analyzed quickly for their remedies. The aim of our project is to study and implement various fault detection technique and monitoring system.

1. INTRODUCTION

The paper is design for the automatic tripping mechanism when temporary fault and permanent fault occur. The faults occur in the transmission line are under voltage, overvoltage, overcurrent, temporary and permanent fault. a small branch falling on to the line can cause a temporary fault. Permanent faults are those that will not clear upon tripping. An example of permanent fault on an overhead line is a broken wire causing a phase to open, or a broken pole causing a phase to short together. On transmission circuits can be a major factor when attempting 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 effect on system stability (particularly at transmission system). The features are as follows: -1. Isolate the load when there is increase in the load. 2 Type of fault that it can sense; low voltage, high voltage, high current 3. If the load is isolated because of low voltage, it

will be switched on automatically when the voltage gets stabilized. 4. Indication of type of fault that has been occurred on a 16/2 LCD. Different sections of the project are designed on these separate PCB so that the paper can be demonstrate easily.

This paper aimed to design reduce the outed time due to fault and provide higher level of service continuity to the customer. Furthermore, successful high speed reclosing auto reclosing on transmission circuit can be a major factor when attempting to maintain system stability. For those fault that are permanent auto reclosing will reclose the circuit into a fault that has not been cleared which may have adverse effect on system stability.

A. Nature and Causes of Faults

Nature of a fault is simply defined as any abnormal condition, which causes a reduction in the basic insulation strength between phase conductors, or between phase conductors and earth or any earthed screens surrounding the conductors. In practice, a reduction is not regarded as a fault until is it is detectable, that is until it results either in an excess current or in a reduction of the impedance between conductors, or between conductors and earth, to a value below that of the lowest load impedance normal to the circuit. Thus, a higher degree of pollution on an insulator string, although it reduces the insulation strength of the affected phase, does not become a fault until it causes a flashover across the string, which in turn produces excess current or other detectable abnormality, for example abnormal current in an arc-suppression coil [4].

2. PROPOSED METHODOLOGY

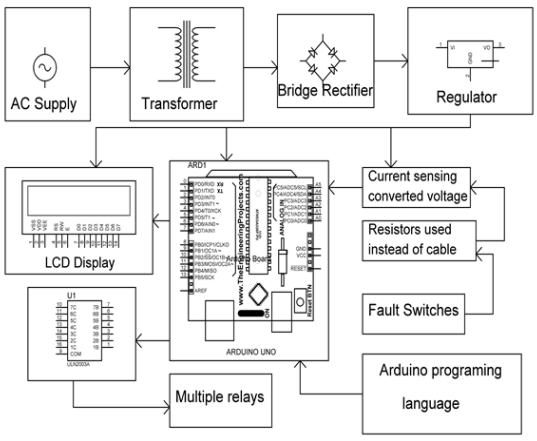

Figure 1: Block diagram of Proposed System

The project uses one step-down transformer for handling the entire circuit under low voltage conditions of 12V only to test the 3-phase fault analysis. 12V only to test the 3-phase fault analysis. The primaries of one transformer are connected to a 3-phase supply in star configuration, while the secondary of the same is also connected instar configuration. The output of the transformer is rectified and filtered and are given to 3 relay coils. 12fault switches, each one is connected across the relay coil, meant to create a fault condition either at star i.e., LL Fault and 3L fault. LED'S are connected at their output to indicate their status. The Microcontroller issued which converts the analog value of the voltage to digital one which is displayed on 16x2 LCD screen. If the fault is created by means of any fault switches the digital value shown on the LCD screen will fluctuate abnormally giving the fault location. If the fault is cleared within the specific time period, then it will be temporary fault if it is not then there will be permanent trip. This relay is meant for disconnecting the load to indicate fault condition.

- LG Fault is a short circuit between one line and ground due to physical contact caused by lightning or storm.
- LLG fault occurs when two lines come in contact with the ground and each other. This is mainly caused by storm damage.

Table 1: Number of Components used

Equipment	Range	Quantity
Transformers	12-0/500mA	03
Transistor	BC547	03
Relay	5V/SPDT	03
Display	16×2LCD display	01
Voltage Regulator	IC 7806	01
Power supply	12V/1Amp	01
PCB, Resistor, Capacitor, etc.		

A. Flowchart

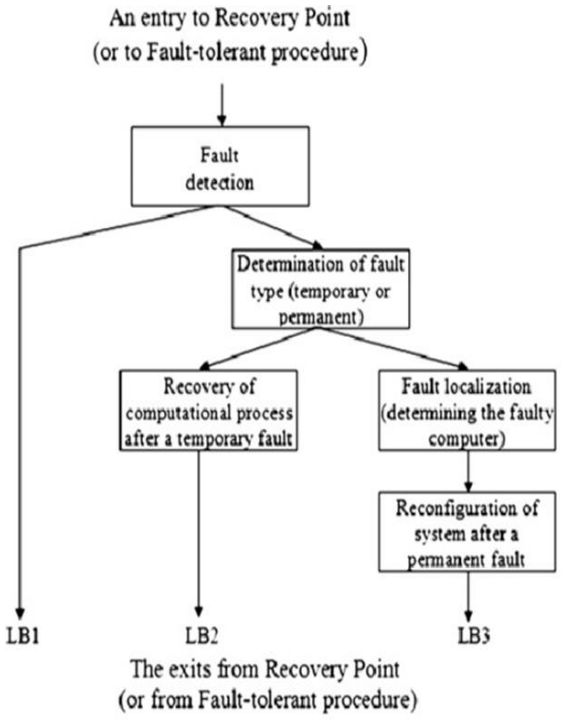

Figure 2: Flowchart of proposed System

3. EXPERIMENTAL SETUP

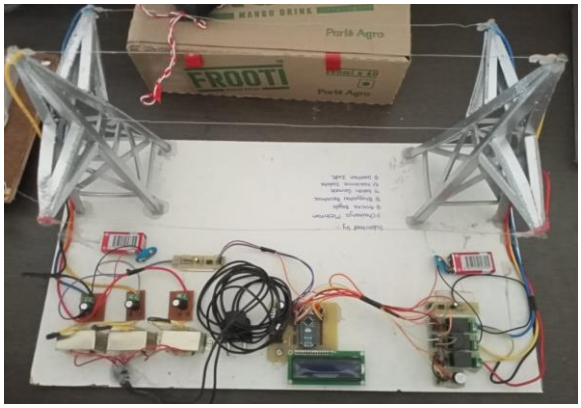

Figure a: Experimental Setup

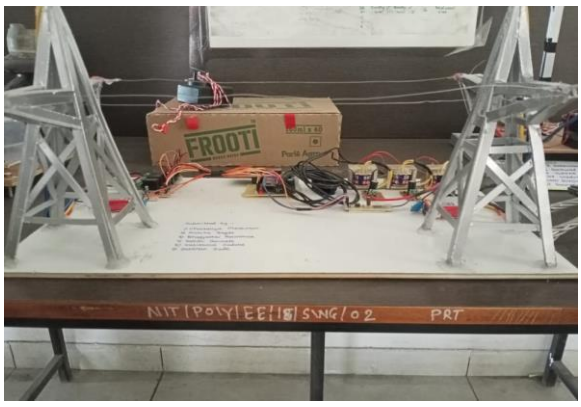

Figure b: Experimental Setup

4. RESULT

From the working model of our experiment, we were able to analyze the three-phase system fault by using individual 3 single phase transformers as system supply side. The paper sense's fault and is able to send notifications to phone with the help of the Wifi module by identifying the exact nature of the fault.

5. ADVANTAGES AND DISADVANTAGES OF PROPOSED SYSTEM

Advantages of three phase fault analysis with auto reset on temporary fault and permanent trip otherwise as follows:

- This invention will accurately identify 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.
- The invention 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.
- A timer is also provided to identify weather the fault is temporary or permanent. By doing so frequent tripping of the system can be avoided as temporary faults are self-correcting.
- A individual re-closure to every phase so that if there is fault in any one phase then that phase only is deactivated keeping the other phases in working condition.by doing so the efficiency of the system increases
- This invention provides relatively low cost and reliable apparatus for the intended purpose.
- The invention will respond correctly to phase-ground faults occurring simultaneously on two of the three phase lines.
- By using this proposed circuitry work should be completed time to time. Also auto reclosing can significantly reduce the outage time due to faults and provide a higher level of service continuity to the customer.
- It helps to maintain system stability.

Disadvantages

If any fault occurs due to natural calamities, then this invention will not able to overcome the fault.

CONCLUSION

This three-phase fault analysis system is built using six single phase transformers out of which three are wired in star in star out configuration, and the rest 3 are connected in delta connections. The input to the transformers is 220 volt and output is 12 volts. For introducing faults on the low voltage side, set of switches are used that create LL, LG, and 3L faults. The supply returns to the load in the case of a short duration fault and is referred as a temporary trip while long duration disconnection of supply and load shall result in a permanent trip.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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The author declare that they have no funding support for this study.

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