Abstract
Open Conductor Neutral Fault (floating wire fault) happens due to open conductor fault at source side. Neutral fault detection using voltage transformer (VT) is employed for 440 volt, 3 phase 4 wire system. This paper deals with the development of tripping circuit to detect the above fault in low cost and efficient for connected load using voltage transformer followed by Atmega 16 microcontroller. The controller has been programmed using Micro C AVR software which reduces tripping time than analog base tripping circuit. The voltage transformer measures voltage during fault and measured voltage signal sent to rectifier. Then rectifier sends the converted DC signal to the microcontroller. Microcontroller compares that signal with reference value and send tripping signal in the form of binary one or zero to contactor.

I. INTRODUCTION
A We all know the importance of the neutral in the three phase as well as in single phase system. Even the single phase circuit cannot be completed without neutral. If the neutral is cut or lose in 3 phase, Neutral is specifically called “Floating Neutral”.
A Floating Neutral (Disconnected Neutral) fault condition is very unsafe condition. There is a main hazardous condition that may occur is, as Single phase Appliances are design to work its normal Phase Voltage when they get Line Voltage of 440v Appliances may
Disconnected Neutral fault is a very unsafe condition and should be corrected at the earliest possible by troubleshooting of the exact wires to check and then connect properly.

Here, our project is to detect that fault and protect the domestic load like TV, fans, tubes, Refrigerator etc. by using PT we sense this high voltage and then trip the circuit by using microcontroller, relays, and contactors.

II. POWER SYSTEM SIMULATION

A. Simulation Model using MATLAB

In power distribution system, power transmits from sending end to receiving end using buses, transformers, transmission lines etc. The single phase as well as three phase load connected across these transmission lines of residential, commercial and industrial purpose. The general modeling of such system is as shown below fig. 1.

Figure 1: Pre Fault Condition simulation MATLAB

Figure 2: Open Neutral Conductor Fault Simulation MATLAB

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Here the objective is to detect neutral open conductor fault. In MATLAB we modeled the neutral open conductor fault and analyzed it as shown in Fig.2. When this fault occurs 440 V developed across the 230 v single phase load and no effect on 3 phase load. The related waveforms shown in Fig.3

**Limitations in MATLAB**

Now MATLAB has some limitations, it is complex to program the microcontroller in MATLAB. So we are using the Proteus for modeling the tripping circuit for detection of neutral open conductor fault using voltage transformer and microcontroller.

**B. Simulation Model using Proteus**

Analysis of this model is divided into two main conditions that are pre-fault and post-fault.
In pre-fault condition the input voltage across Potential Transformer is 230V. In simulation for pre-fault and post fault conditions we use SPDT switch which is adjusted to give respective input voltages. For the microcontroller we require DC voltage to sense; hence convert this voltage into DC by using bridge rectifier. The pulsating DC output is further filtered and made smooth by using a capacitor across it. The capacitor is grounded for its discharging process. Now, this voltage is fed to the microcontroller through port ADC0 port.

This port is set as input sensing port. Then by sensing this normal condition the signal is sent to the display to denote ‘LINE OK’.

The output bulbs are glowing normally and the scope shows the three phase waveform under this condition no signal is sent to relay for tripping process is shown in Fig. 5.
In post fault condition the input voltage has suddenly became 440 V to the input of voltage transformer. Further, this AC signal is sent to the Bridge rectifier for conversion in DC and then filtered by the capacitor. Now, this faulty condition is sensed by the Microcontroller and one signal is sent to the relay for tripping the signal through transistor. Here transistor works as an amplifier. Another signal is sent to the display for displaying the faulty condition. Now relay is set at set value, thus relay operates and sends signal to the three phase contactor.

Figure 7: Post Fault Three Phase Waveform

Then three phase contactors trip the circuit and isolate the load from source. In this way the load is protected from overvoltage by using this model.

III. CONCLUSIONS

Novel technique/model for protection of power system will be available in power distribution system. We are developing the neutral fault detection using voltage transformer. In this system we are avoiding current transformer based relay to reduce overall cost, with increase in efficiency of system. A neutral fault detection using voltage transformer works of the change in voltage across single phase load. The application is in rural as well as urban area whose load is single phase can be fulfilling by using this system. Also this system is able to give best alternative to current transformer based fault detection system and other methods of fault detection. The proposed model will give accurate result with ease of operation and it will be beneficial to use this model in power distribution system.

IV. REFERENCES


AUTHOR’S PROFILE

Shubham S. Jadhav is pursuing M. Tech. degree in electrical engineering with specialization in power system from Veermata Jijabai Technological Institute, Mumbai, Maharashtra, India and completed B. Tech. degree in electrical engineering from Rajarambapu Institute of Technology, Maharashtra, India in 2016. His area of interest includes Power System Stability and Protection.

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