

Three Phase Fault Analysis with Auto Reset for Temporary Fault and Permanent Trip Otherwise

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Abstract— The paper is developed in tripping mechanism for three phase supply in power system. The output of project resets after a brief interruption in event temporary fault while remains tripping condition the case of permanent fault. The electrical grid substation which supply power to the many consumers failures due to some faults which is temporary or permanent. The fault damage to the power system equipment, In India it is common, The faults is LG (Line to Ground), LL (Line to Line), 3L (Three lines) in the supply of power systems and the faults in three phase system affect the whole power system. To overcome the problem the system is make, which is sense the faults and automatic disconnect the supply of power system to avoid large scale damage in control gears in the sub-stations. This system is make using three single phase transformers and they are wired in star input, star output, and 3 transformers are connect in delta connection, in have input 220 V and output is 12 volt. In the project 555 timers are used for handle. The short duration and long time duration fault condition. A set of switch used create the LL, LG and 3L fault in low voltage side, for activating the trip mechanism. The Short time duration fault returns supply to load immediately called temporary trip while long duration result called permanent trip.

Index Terms— Voltage regulator (LM7805), Relays, 555 timer, Transformer (230 V– 12V AC), Comparator

I. INTRODUCTION

The faults on most overhead lines are transient. The transient fault is insulator flashover, this fault which is cleared by immediately tripping of circuit breakers to isolate fault. The Faults tend to be less transient at lower, in distribution voltages and more transient at higher, sub transmission and transmission voltages. The Lightning is common cause of transient faults, partially result from insulator flashover from high transient voltages make by the lightning. The possibility is swing wires to the temporary contact with a foreign objects. So transient faults is clear by de-energizing to the line, for allow the fault to clear, Auto reclosing then restore service of the line. The Permanent faults will not clear up tripping and reclosing system. The example of a permanent fault in overhead line is the broken wire causing a phase to open, the broken pole causing the phases to short. The Faults on underground line is considered permanently. The Cable faults is cleared without the auto reclosing system and the damage cable repair the service is restored..

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II. FAULT ANALYSIS

Faults are classified in two parts, Active fault and Passive Fault.

2.1 Active Fault

When the current pass to one phase to another phase is known as Active fault.

The fault is cleared as quickly as possible otherwise it's damage the conductor or the equipment.

2.2 Passive Fault

The Passive faults is stressing the system beyond it's designing & long duration fault which results is active fault.

Examples:

Overloading – When load increase results in voltage increased and insulation is overheating is called overloading.

Overvoltage – The Voltage is increased to rated voltage is called over voltage.

Under-frequency – When Frequency goes below to the rated frequency it results under-frequency.

Power swings – The generators outage or loss in synchronism.

2.3 Types of Fault on a Three Phase System

Faults occurred in three phase A.C. power system so in fig - 1 are as follows:

- Phase-to-phase fault
- Phase-to-earth fault
- Phase-to-phase-to-earth fault
- Three phase fault
- Three phase-to-earth fault.

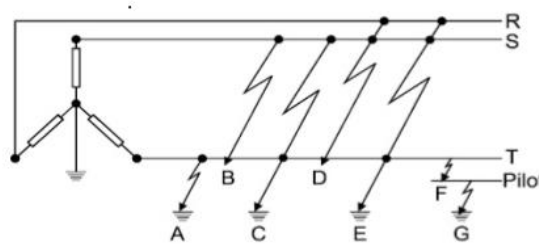


Fig-1: Types of Fault

2.4 Symmetrical & Asymmetrical Fault

The symmetrical fault is balance fault they occur in three phase power system. the three phase has equal value of fault current. Magnitude of fault current is equal. The faults are same in three line to ground fault.

A asymmetrical fault is a d.c. offset, it is transient in nature and unbalanced type fault. These are occur in single line, double line.

2.5 Transient and Permanent Fault

The Transient faults are not damage the insulation of wire the they are small in duration and these period of circuit is re-energized. The faults are occur in outdoor equipment.

Example:

The transient fault is insulator flashover and lightning stroke, when it happen the circuit is de-energized & open by circuit breaker and after interval it will reclose. The Permanent fault is a permanent nature, which damage by the insulation.

III. SCHEMATIC BLOCK DIAGRAM

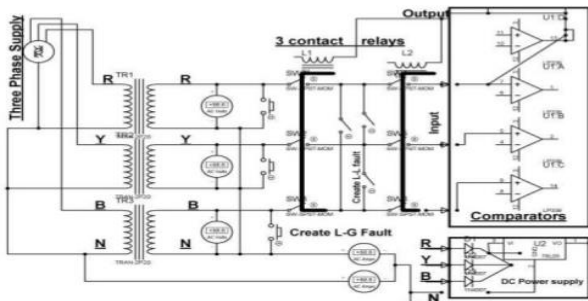


Fig-2: block diagram

3.1 Working principle

In this project use 6 step-down transformers which handle the circuit at low voltage conditions of 12v for test in 3 phase fault analysis power system. The primary of three transformer is connected to 3 phase supply in star type configuration, & the secondary of the same is also connected in star type. The next set of three transformers primary connected in star to three phase have secondary's connected in delta type. outputs of each the six transformers rectified and filtered and supply to six relay coils. six push buttons, each connect at the relay coil it mean to create the fault condition. LL Fault or 3L Fault. The Normally closed contact of relays are parallel while at common points is grounded. The parallel connect point of relay is given to pin2 by a resistor R5 to a 555 timer i.e. wired in monostable type. output of U3 555 timer IC is given through Op-amp LM358 through wire 1 & 2 is inverting in pin3, while the inverting input is fixed voltage to a potential divider RV2. The voltage pin2 coming from pd.

3.2 Operating procedure

When 3phase supply all the 6 relay coils get DC voltage and the common point disconnects to the NC and moves to the normally open points, this is providing logic high at 555 timer U1 i.e. so it kept on monostable mode. When push button across relay is pressed disconnects the relay and process contacts moves to the normally closed position & provide a logic low at trigger at pin 555 timer to develop the output to brings the U3 timer is used in astable mode for its reset pin high the astable operation took place at output which also indicate by LED.

If the fault is temporary i.e. the push button pressed release immediately by U1 monostable of U3 the output is goes to zero in event of push button pressed for time of longer duration in monostable output the longer duration active situation in U3, the astable timer the output which charges capacitor C13 & R11 such the output of a comparator goes high which drives the relay to switch off three phase load.

IV. RESULT AND ANALYSIS

The LL (Line to Line), LG (Line to Ground), 3L (Three Lines) has been observed by waveform. The faults is carried

by closing the fault switch in model. These faults are taken temporary or permanent.

4.1 Line to Ground Fault

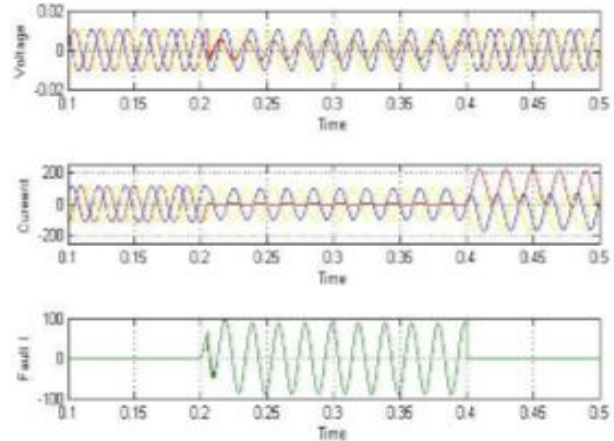


Fig-3: Temporary Line to Ground Fault

X-axis shows Time and Y-axis show Voltage, Current and Fault current between contact of Circuit Breaker. From the Figure 12, it is shown that fault occurs in line at a time 0.2 time second and it is cleared in 0.4 time second. This is a temporary fault cleared by auto reset.

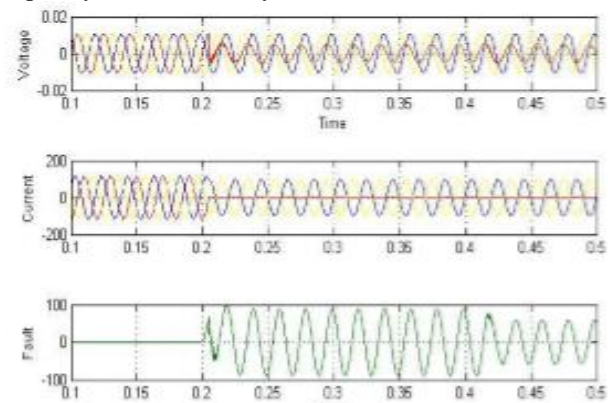


Fig-4: permanent line to ground fault

From figure 6 show line to ground fault is permanent, this is not cleared in 0.4 second. Hence, the permanent fault and line will shut down.

4.2 Line-Line-Line-Ground Fault

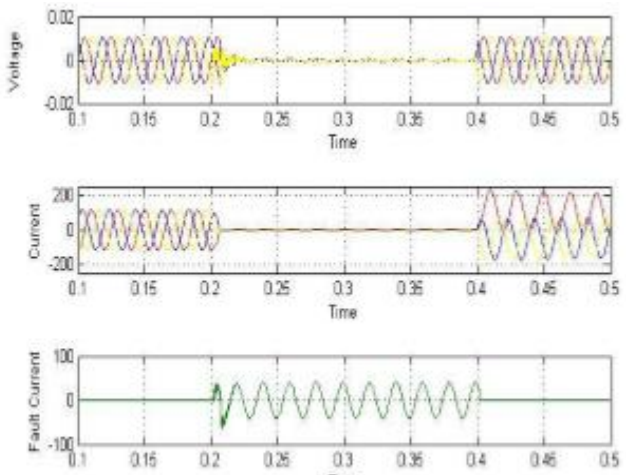


Fig-5: Temporary Line-Line-Line-Ground Fault

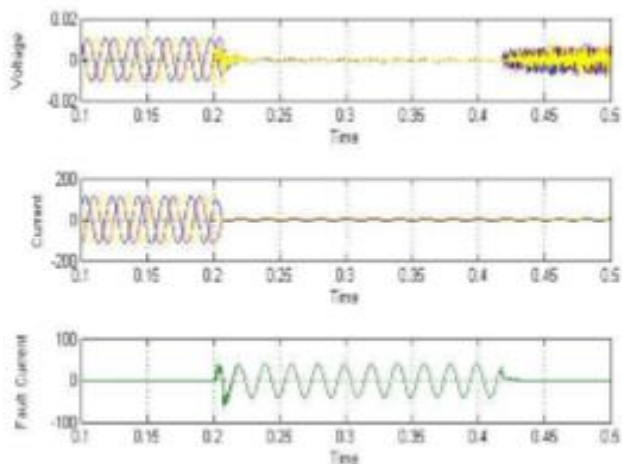


Fig-6: Permanent Line-Line-Line-Ground Fault

V. CONCLUSION

The project is design by 3 single phase transformer 20v to 12v of output develop auto tripping mechanism & 3-phase supply system to create temporary fault and permanent fault occur. In 555 timer with relay temporary and permanent fault. The short time duration fault return supply by the load immediately called temporary trip while long duration time result is permanent trip this is use in future to extend develop a mechanism for sending message by authorize via sms by interfacing gsm system.

REFERENCES

- [1]. Sathish Bakanagari,(2013) "Three Phase Fault Analysis with Auto Reset for Temporary Fault and Trip for Permanent Fault" Int. Journal of Engineering Research and Applications vol.3,1082-1086
- [2]. Akagi H., H.E. Watanabe, M. Aredes.(2007) "Instantaneous power theory and applications to power conditioning", Wiley-IEEE Press, 2007, pp. 43-105
- [3]. Aleksandar M. Stankovic (2000) "Analysis of Asymmetrical Faults in Power Systems Using Dynamic Phasors" IEEE Transactions On Power Systems 15,1062- 1068