

Fault Analysis Using Over Current Relay in MATLAB Simulink

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Abstract. Power system is prone to faults, because of disoperation of the system or by the natural disasters. This may be caused by damage to the components of power system leading to great tasked for their subrogation and cutting the power supply to customers. Different kinds of fault may occur in these lines. The over-current protection relay is the most extensively used component to safeguard power systems from the detrimental effects of faults. Wrong settings (pick-up value) in over-current relay parameters can lead to false tripping or even bypassing fault conditions which can lead to a catastrophe. Therefore, it is important to validate the settings of power protection equipment and to confirm its performance when subject to different fault conditions. The major purpose of this project is to simulate the operation of over-current relay and circuit breaker under different fault conditions in MATLAB, To analysis and studies the different faults and also declares the impact on distribution line.

Keywords: over-current relay, pick-up value, distribution line, fault.

1. Introduction

Present fault analysis plays a major problem in a power system network. With the growing demand of electric power, the distribution is increasing year by year and therefore maintenance and protection of power system equipment are very important for decreasing the cost and to increase the life of the power system equipment's for reliable and uninterrupted operation. Protection system must be minimized the damage in main components, this is realized by using the methodologies and techniques of power system protection. Controller units-based relays are used for monitoring the power system performance depending on (VTs) and (CTs) respectively. For confirm a safe and credible of protection relays before putting the substation, therefore these relays must be tested. In the ring and radial sub transmission system, and distribution system. OCRs are broadly used. During the same fault, relays will detect the greatly different currents at different locations of these relays. The determination of the pickup current (I_{pu}) setting and time dial setting (TDs) of the relay is core of coordination. Fault analysis can assist to choose and develop a best device for protection. C.B. and its ratings depend on triple line fault must checked because of the big value of triple line fault current as compared with the other fault current.

Table 1.1: Various causes of fault

S.NO	CAUSE	PERCENTAGE
1	Lightning	60
2	Equipment failure	10
3	Switching to a fault	10
4	Sleet, wind	10
5	Tree falling, Sabotage	10

Over current relays are classified on the basis of their operation time, in the following categories:

1. Instantaneous Over current Relay
2. Definite Time Over current Relay
3. Inverse Definite Minimum Time (IDMT)
4. Over current Relay
5. Inverse Definite Minimum Time (IDMT) Over current Relay

2. Software Used

2.1 MATLAB

1. MATLAB is a programming platform designed specifically for engineers and scientists to analyze and design systems and products that transform our world.
2. Things we do with MATLAB.
3. Analyze data.
4. Develop algorithms
5. Create models and applications.

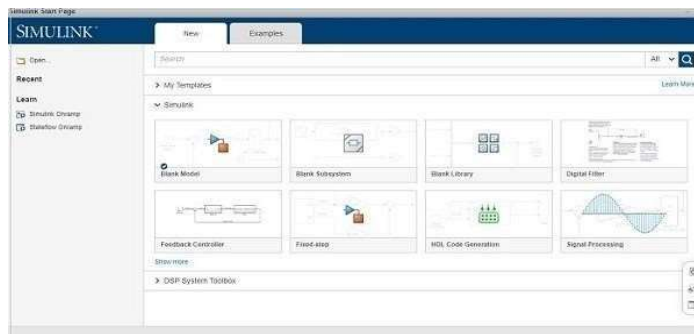


Fig 2.1: Simulink start page.

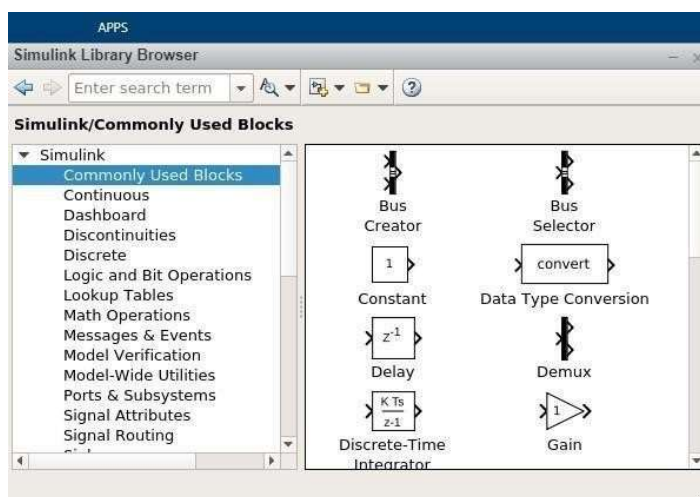


Fig 2.2: Simulink library browser

3. Block Diagram

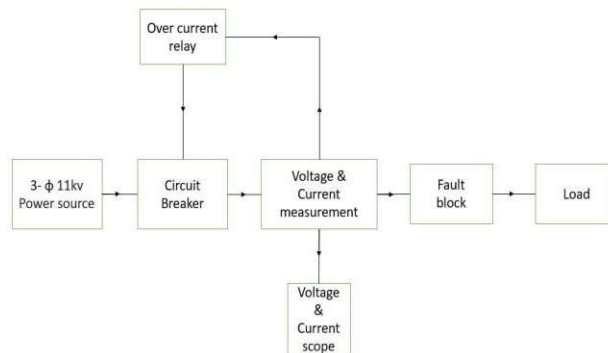


Fig 2.2: Simulink library browser

4. Flowchart

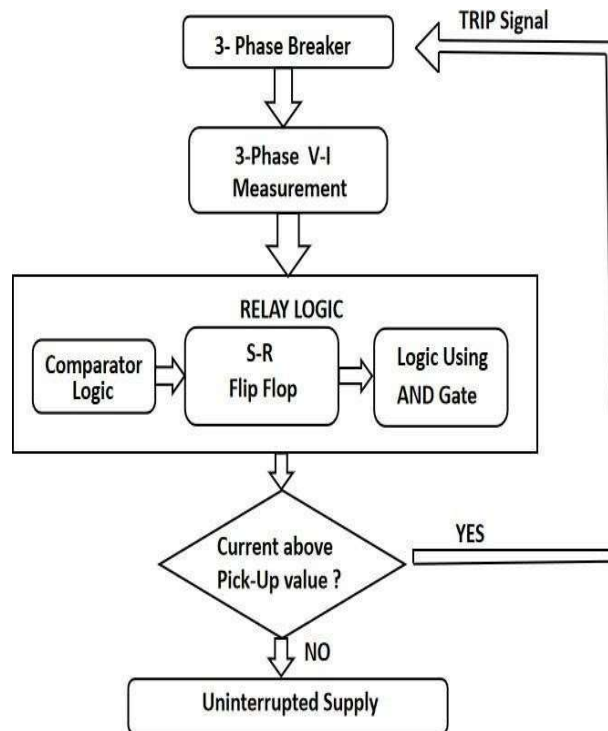


fig 4.1: flowchart

5. Working of Relay Logic

1. Firstly, the three inputs i.e., current values are from three phases.
2. Then RMS blocks computes RMS value of current

3. Relational operator has two inputs one is output of RMS block output and other is constant which has to be a pick-up value.
4. If 1st input is $>$ 2nd input, then the output is high (logic 1) of relational operator
5. For S-R flip-flop the output of relational operator is given to S and for R constant 0 (logic 0) is given
6. And the initial value of Q state is kept as 0.
7. The output Q of each flip-flop is terminated to avoid error.
8. The Q of each flip flop is given to AND gate and thus if all inputs is HIGH then only output of AND operator is HIGH.
9. And the output is given to the circuit breaker.

6. Simulation

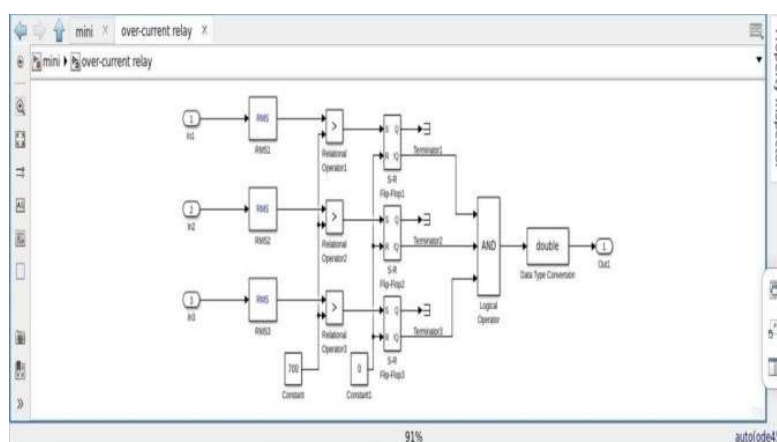


Figure 6.1: over current relay logic.

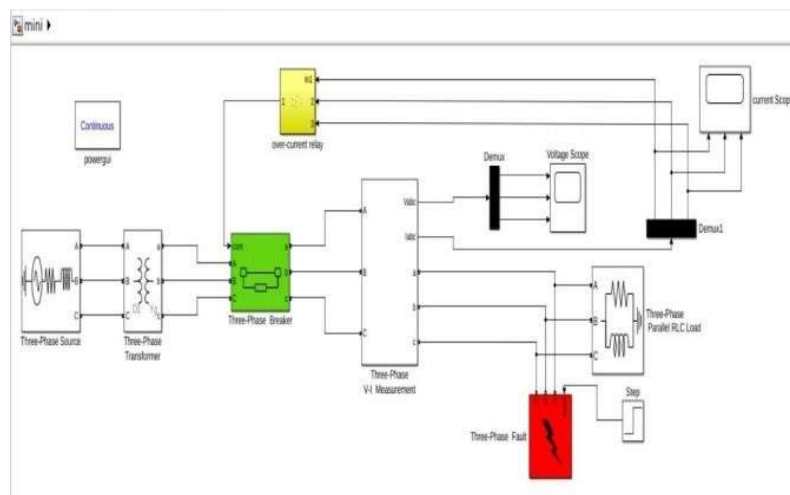


Fig 6.2: simulation

7. Results



Fig 7.1: voltage waveform under normal condition

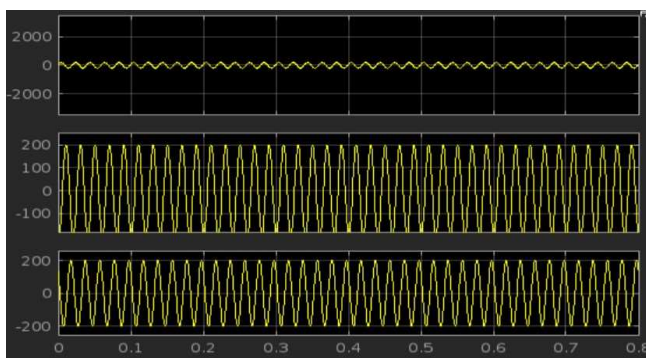


Fig 7.2: current waveform under normal condition

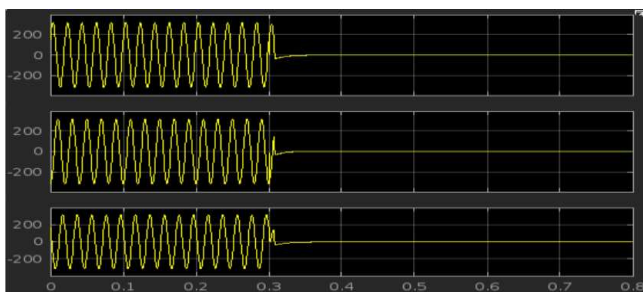


Fig 7.3: voltage waveform under fault condition

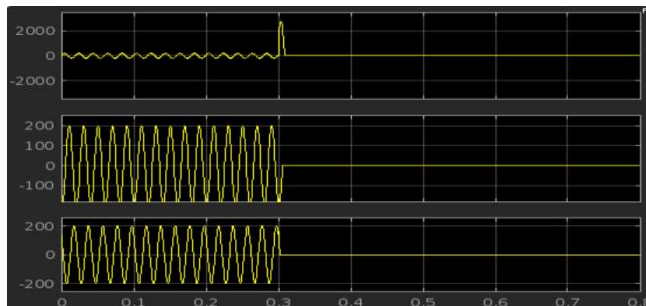


Fig 7.4: current waveform under fault condition

8. Conclusion

Thus in this project we have designed logic for over- current relay and tested it for different pick up current values for line to ground fault. And showcased current and voltage waveform under given condition in MATLAB Simulink. The coordination between over current relay and circuit breaker helps in interruption of supply. Thus peak values of current can be observed in waveform under various fault resistance condition and we can take necessary inputs while manufacturing electrical equipment.

9. Future Scope

The effect of the simulation parameters such as power system data, transmission line data, load data and fault data on fault and over current relay characteristics needs to be studied. For future enhancement, the model can be extended for other types of relay characteristic and fault types. Such as Differential relay, Impedance relay, Mho relay etc. Researcher can also think to implement relay modelling in real time system of power system. And these relays can be tested not only for line to ground fault but also line to line fault L-L-G fault L-L-L fault.

References

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