HCTL Open International Journal of Technology Innovations and Research (IJTIR)
http://ijtir.hctl.org
Volume 16, July 2015
e-ISSN: 2321-1814, ISBN (Print): 978-1-943730-43-8

Simulation Study on Different Operating Conditions of (Star-Star) Three Phase Transformer

Ravi Shankar Chauhan[1], **Amrita Sinha**[2]

Chauhanravi50@gmail.com

Abstract

The paper studies the different operating condition of transformer such as normal condition, magnetizing inrush, over-excitation, external and internal fault condition .We established power system model of (star-star) three phase transformer based on MATLAB/Simulink and calculate the differential current for the different operating condition of transformer. The differential current data help us to improve the performance of protection of transformer and also help to distinguish between the different operating conditions of transformer.

Keywords

Three phase transformer, fault detection, simulation.

Introduction

Transformer differential protection improves realization of traditional protection techniques with computer's technical advantages.it is necessary to study the different faults of transformer to explore new protection principle and improve the transformer protection performance. But there are many drawbacks regarding testing environment, testing conditions and safety. To overcome these shortcomings, we used the system based on the Simulink technology.it can significantly reduce the development and testing costs.

System module parameters setting

1. Three phase circuit breaker components

Setting initial status of breakers, transition times, snubbers resistance and capacitance. Breaker resistance shown in figure1.

[1]PG student (Power system), Dept. of EIED, Thapar university Patiala.
[2]Assiatant professor, Dept. of EIED, Thapar University Patiala.

2. Three phase circuit breaker components

Setting initial status of breakers, transition times, snubbers resistance and capacitance .breaker resistance

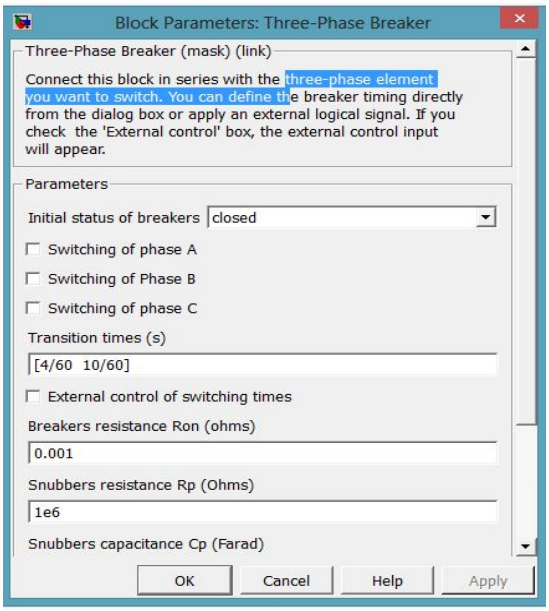


Figure 1: parameter setting for three phase circuit breaker

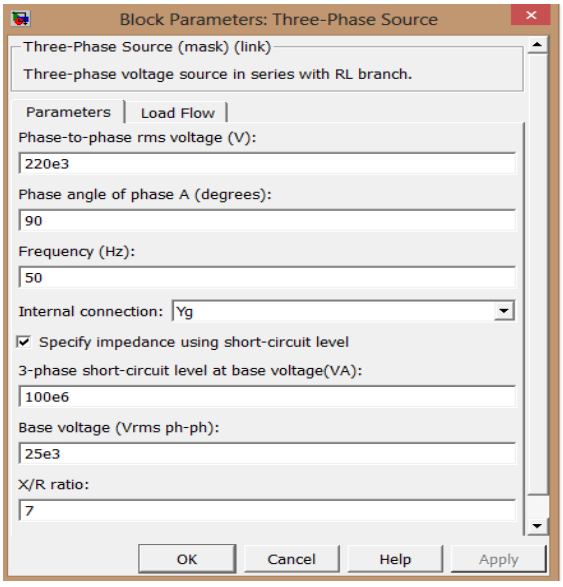


Figure 2: parameter setting for three phase source

3. Three phase power components

Setting the phase voltage, phase angle, frequency, internal connections, short circuit base voltage level, X/R ratio. Shown in figure2

4. Three phase transformer components

Setting the rated power, frequency, parameters of windings1, parameters of windings2

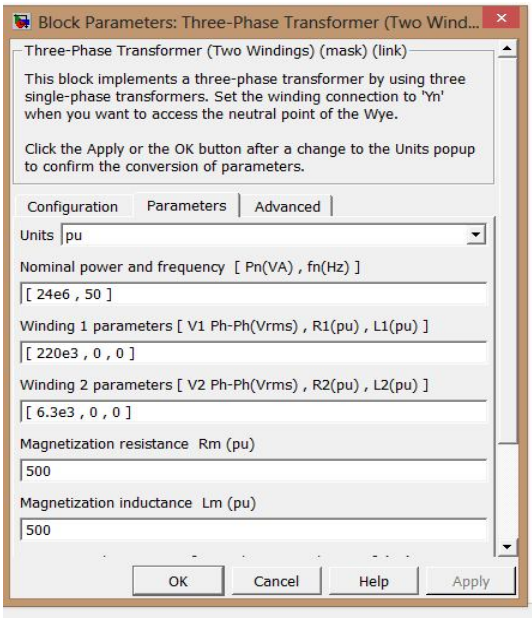


Figure 3: parameter setting for three phase transformer

Simulation and modelling of different operating condition of (star-star) three phase transformer

1. Normal condition

When the transformer is operating normally, the differential current of transformer is shown in figure5.

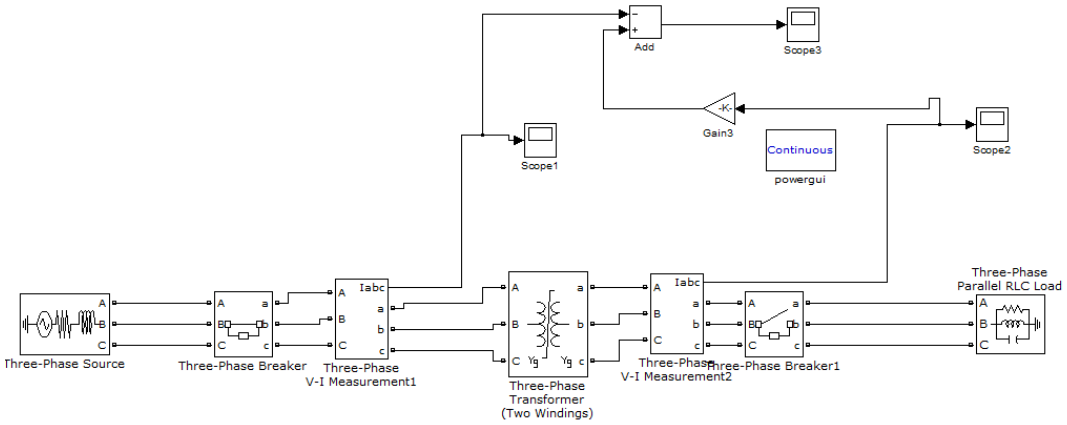
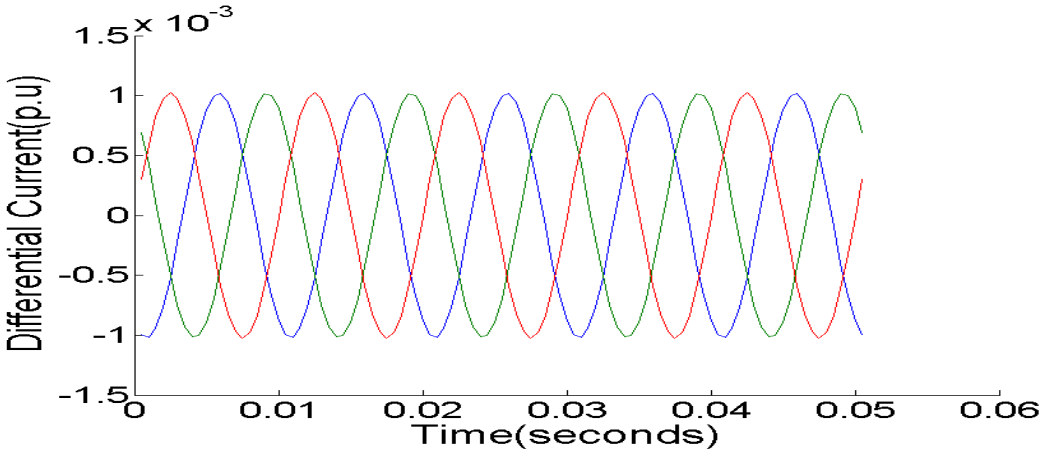
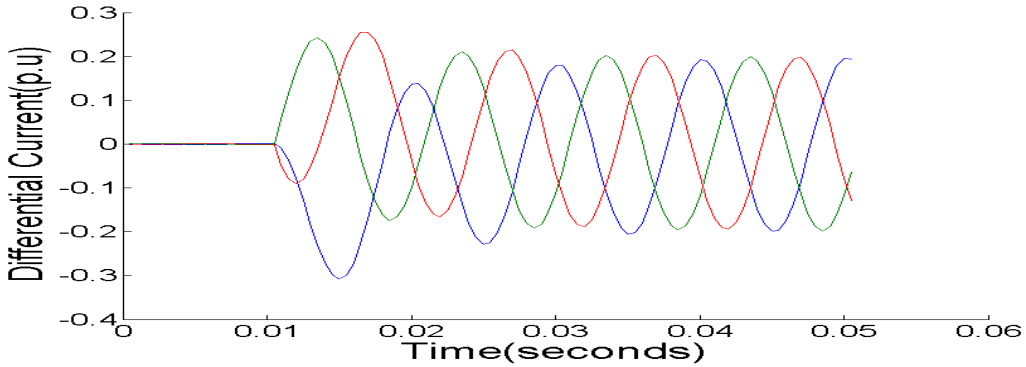


Figure 4: simulated power system model for normal, inrush and over-excitation condition of transformer



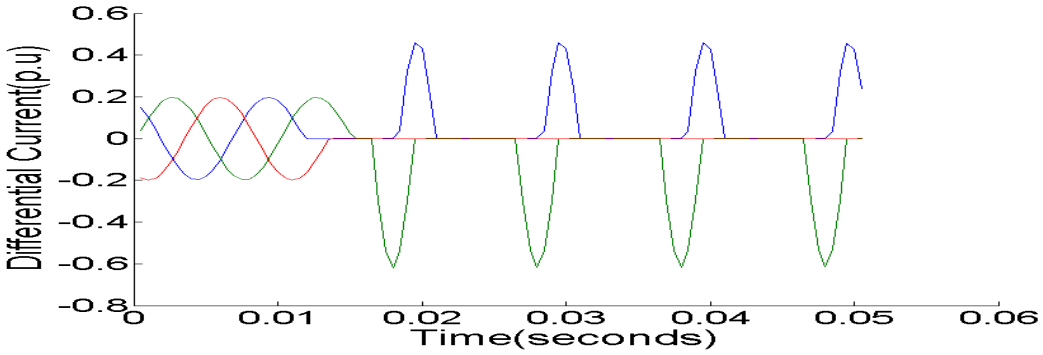
2. Inrush condition

When an unloaded transformer is switched on, it draws a large initial magnetizing current which may be several times rated current of transformer. This initial magnetizing current is called magnetizing inrush current.



3. over-excitation

When transformer is operates at different voltage levels over-excitation condition occurs



4. Internal fault

When A and B phase is short circuit then LLG fault condition occurs and differential current shown as

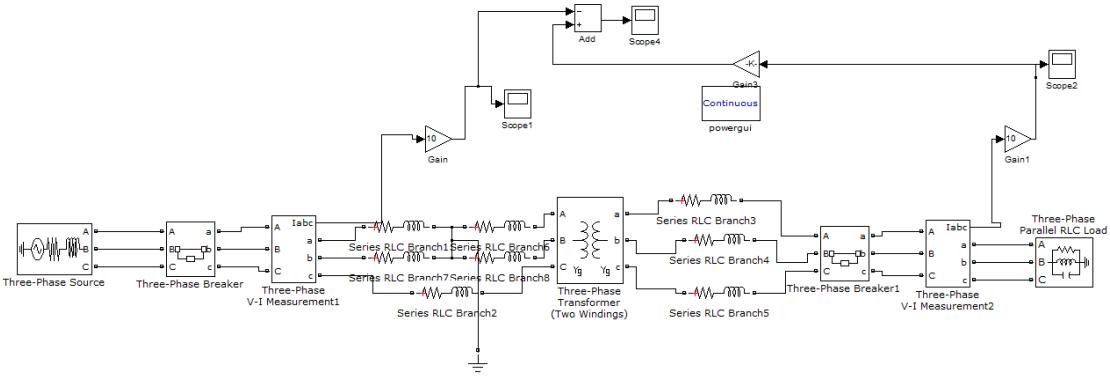
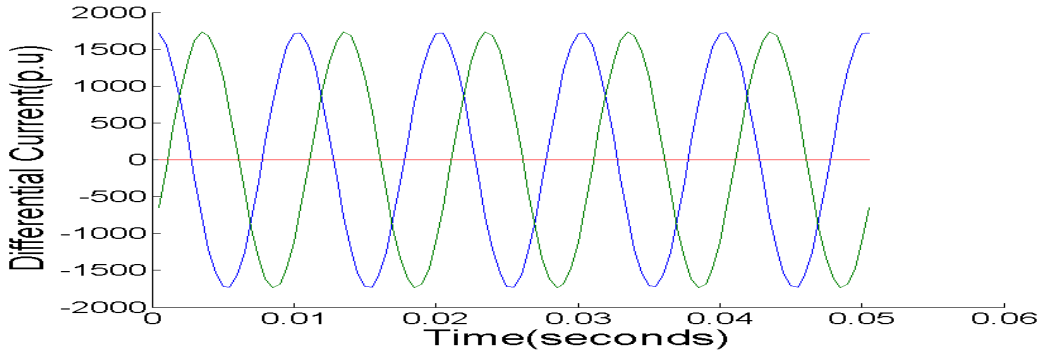


Figure 5: simulated power system model for internal fault of transformer



5. External fault

Fault at different location of transmission line

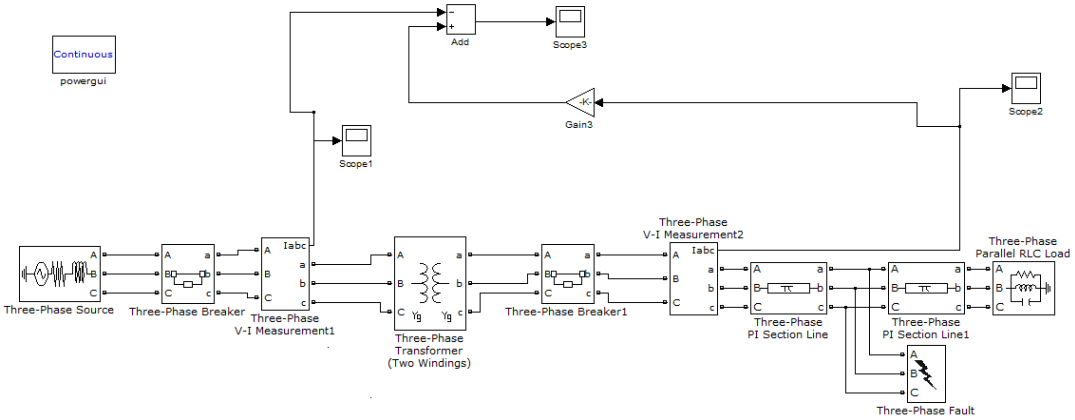
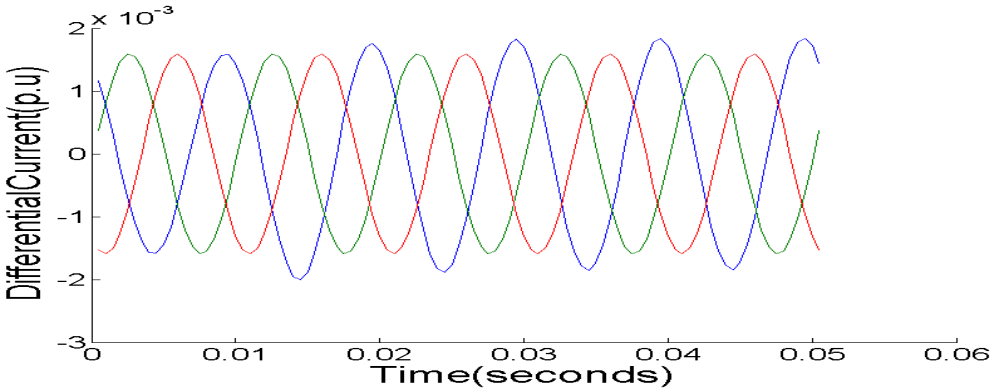


Figure 6: simulated power system model for external fault condition of transformer



Conclusion

In this paper, we established the different model of (star-star) transformer based on MATLAB/Simulink and shown the different waveforms of different operating condition of transformer. Using Simulink to simulate different state such as normal condition, magnetizing inrush, over-excitation, internal and externals fault .By the simulation study; we investigated and improved the performance of protection of transformer.

References

[1] Hainhui Song ,Fangming Zhao, Di He.simulation study on internal fault of transformer 2012 internaional conference on solid state devicesand material science [Online] Available at www.sciencedirect.com

[2] Harish Balaga, DN Vishwakarma, and Amrita Sinha. Numericaldifferential protection of power transformer using ann as a pattern classifier. In *IEEE Int. Conf. on Power, Control and Embedded Systems*, 2010.

[3] Harish Balaga , Neha Gupta 1, DevendraNathVishwakarma, GA trained parallel hidden layered ANN based differential protection of three phase power transformer, Electrical Power and Energy Systems (2015) .

[4] OU M X. Analysis and Realization of Transformer Computer Protection's Double Configuration [J]. Qinghai ElectricPower,2003.