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# PROTECTION OF LARGE TRANSFORMERS THROUGH DIRECTIONAL RELAYING IN THE PRESENCE OF CONTROLLED SERIES CAPACITOR BY ESTIMATION OF FAULT DIRECTION

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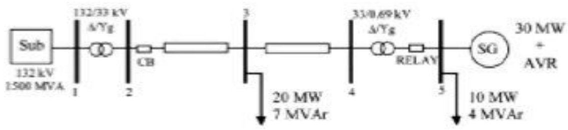
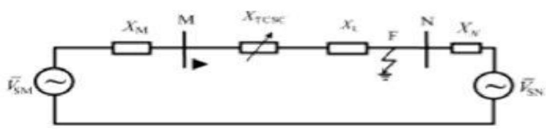
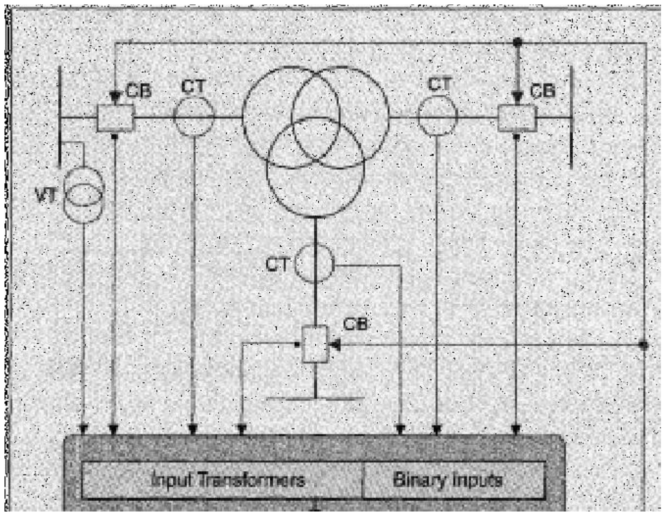
***Abstract: Large power transformers belong to a class of very expensive and vital components of electric power system. When a power transformer experiences a fault, it is necessary to take the transformer out of service as soon as possible so that damage is minimized. This paper proposes a fault direction estimation technique for a line with a - controlled series capacitor,The method is tested for different fault situations, such as high resistance fault, time delay fault, as well as over voltage and current , and is found to be upto the mark. Results are seen in a designed model of transmission line simulated through MATLAB.***
***Key words: matlab, series capacitor control, power transformer***

## I. INTRODUCTION

The operating conditions of power transformers do not make the relaying task easy. Protection of large power transformers is one of the most challenging problems in the power system relaying area. Advanced digital signal processing techniques and recently introduced artificial intelligence (AI) approaches to power system protection provide the means to enhance the classical protection principles and facilitate faster, more secure, and dependable protection for power transformers. Also, it is anticipated that, in the near future, more measurements will be available to transformer relays, owing to both substation integration and novel sensors installed on power transformers. All of this will change the practice for power transformer protection, This paper addresses the problems with directional relaying in the presence of TCSC in a line and proposes a solution. It is found that a single classifier using the phase information of sequence components is inadequate to provide direction of fault for all situations for a line with TCSC. More reliable protection algorithms can be achieved by combining several protection principles together [15], [16]. The voting method, which uses various classifiers in combination, is applied for directional relaying.



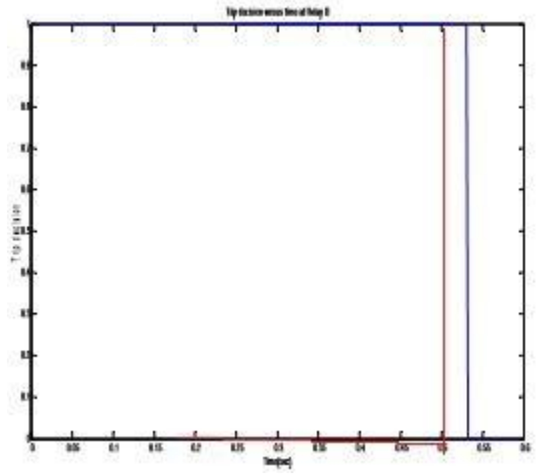

presents the general hardware configuration of a digital power transformer relay. The differential relaying principle is used for protection of medium and large power transformers. Another relaying principle uses differential active power to discriminate between internal faults and other conditions. Instead of the differential currents, the differential power is computed and monitored. The operating signal is a difference between the instantaneous powers at all of the transformer's terminals. This approach calls for measuring voltages at all terminals but pays back by enabling the avoidance of the vector group (angular displacement between the current and voltages at different windings) and ratio compensation.

## II. PROPOSED MODEL

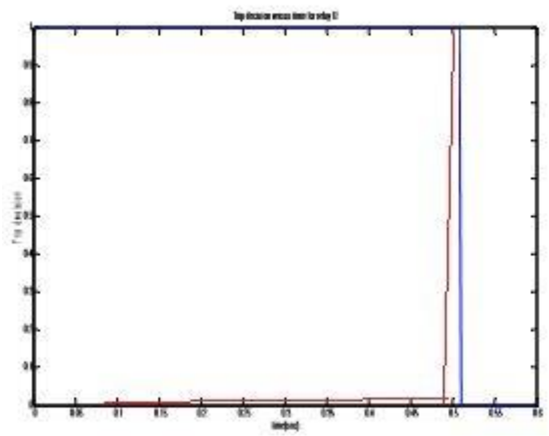
The single-line diagram of the network used in this paper. It comprises a 132 kV, 60 Hz, sub transmission system with short-circuit level of 1500 MVA, represented by a The venin equivalent (Sub), which feeds a 33 kV distribution systemthrougha132/33kV, transformer. In this system, there is one 30 MW synchronous generator (SG) connected at bus 5, which is connected to the network through one 33/0.69 kV, transformer all network components were represented by three-phase models. Distribution feeders were modeled as series impedances and transformers were modeled using the circuit. Power system test studies have been undertaken to examine the performance of the new relay for different asymmetrical faults and conditions using a three-phase model power system. The model power system based on a double phase generating station includes two 7.0 kVA synchronous generators driven by Fig. 1. The relay hardware connected to the model power system. d.c. machines. The test generators are directly grounded. One of the generators has been fitted with a personal computer, which is supported via a DSP and a data acquisition system to monitor the three-phase-currents and voltages at the generator terminal for digital relaying as seen in Fig. 1.

## III. RESULT ANALYSIS

(i) The response of relay B and C using the directional controlled series capacitor approach is found to be more superior compared to the one using the inverse time over current characteristics. From figure 1 below we can see that it takes less than 550ms for the backup relay to trip in an event of a single phase fault located 25Km from the main relay. In order to see the effect of a more severe fault we shall see how this relay reacts to a double phase fault. the red line marks its comparision against the inversion over current approach.



(ii) The response of relay B and C using the directional controlled series capacitor approach is found to be more superior compared to the one using the inverse time overcurrent characteristics. From figure 1 below we can see that it takes less than 550ms for the backup relay to trip in an event of a single phase fault located 25Km from the main relay. In order to see the effect of a more severe fault we shall see how this relay reacts to a double phase fault. the red line marks its comparison against the inversion overcurrent approach.



## IV. CONCLUSION

The results obtained from the fuzzy logic overcurrent relay and the inverse time relay shows that the response of the fuzzy logic relay is superior compared to the inverse time overcurrent relay when it comes to distance of fault from main relay and fault severity. This can be seen from the fact that the biggest coordination difference of the fuzzy overcurrent relay was only 70ms. However the membership functions of this relay needs to be refined in order to solve the problems of violating the coordination constraint.

## REFRENCES

[1] A.F. Elneweihi. E.O. Schweitzer III, and M.W. Feltis, “Negative Sequence Overcurrent Element Application and Coordination in Distribution Protection” Presented at the IEEE Power Eng. Soc. Summer Meeting, Seattle, WA, Jul. 12-16. 1992.

[2] Hossien Askarian Abyaneh, Majid Al-Dabbagh, Hossien Kazemi Karegar Seyed Hesameddin Hossien Sadeghi “ A New Optimal Approach for Coordination of Overcurrent Relays in Interconnected Power System” IEEE Transactions On Power Delivery, Vol 18, No 2, April 2003.

[3] Bijoy Chattopadhyay, M.S. Sachdev, T.S. Sidhu “An On-Line Relay Coordination Algorithm For Adaptive Protection Using Linear Programming Technique” IEEE Transactions On Power Delivery, Vol. 11, No 1, January 1996.

[4] Hossien Askarian Abyane, Karim Faez, Hossien Kazemi Karager “ A New Method For Overcurrent Relay Using Neural Network and Fuzzy Logic” 1997 IEEE TENCON pp 407-409.

[5] IEEE Recommended Practice for Specifying Thyristor-Controlled Series Capacitor (TCSC), IEEE Standard 1534-2009, (revision of IEEE Standard 1534-2002).

[6] N.G.HingoraniandL.Gyugyi,Under standingFACTS. Piscataway, NJ: IEEE, 2000.

[7] S. G. Helbing and G. G. Kiuady, “Investigationsof an advanced form of series compensation,” IEEE Trans. Power Del., vol. 9, no. 2, pp. 939–947, Apr. 1994.

[8] IEEE Standard for Interconnecting Distributed Resources With Electric Power Systems,

[9] IEEE Std. 1547™, Jul. 21, 2003. [2] G59/1 Recommendations for the Connection of Embedded Generating PlanttotheRegional Electricity Compan iesDistributionSystems,1991.

[10] “Impact of Increasing Contribution of Dispersed Generation on the Power System,” CIGRÉ, Working Group 37.23, 1999.

[11] “Dispersed Generation,” CIRED, CIRED Working Group 4, 1999.

[12] N.Jenkins,R.Allan,P.Crossley,D. Kirschen, and G.Strbac, Embedded Generation, 1st ed. London, U.K.: Inst. Elect. Eng., 2000.

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