

Discrimination of Internal Faults and Inrush Currents for Large Modern Power Transformer

Abstract - This paper presents a differential protection approach for large high quality power transformers that have low inrush currents of about 3.14 times rated currents. Such transformers have low second harmonic level, which results in conventional differential protection malfunction. A scheme for internal faults and inrush currents discrimination based on both discrete Fourier transform DFT and discrete Wavelet Transform DWT is proposed. The proposed method has been designed based on the percentage of the sum of wavelet transform coefficients D1 and fundamental differential current (based on a 1 kHz sampling rate). It has been tested by extensive EMTP/ ATP simulations for different faults and switching conditions on El Tebbin Power Plant 220/21 kV generator/power transformer. It is proved that it has a high capability for discrimination even in the case of inrush with low second harmonic content and internal fault currents with high second harmonic component. All tests proved that the proposed scheme is reliable, accurate, and fast.

Index Terms – Differential protection, inrush current, power transformer, Wavelet Transform.

Link

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