

A Consideration of Inrush Restraint Methods in Transformer Differential Relays

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Abstract: There are several methods used by relay manufacturers to prevent their transformer bank differential relays from erroneously operating on bank energization magnetization currents ("inrush current"). This paper will analyze and compare each of the various methods in use to date. The trade off between security and dependability is examined in relation to properly restraining on inrush currents while remaining sensitive for energization of faulted transformer banks. A MATLAB analysis technique is presented as a means of determining the various operating quantities (2nd, 5th or total harmonic content) and how the various restraint techniques respond. Several actual digitally captured inrush waveforms and relay event reports for bank energizing cases are analyzed.

Matlab Analysis of Braytown Transformer Differential Inrush Misoperation

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Abstract: This paper describes the analysis of a bank differential misoperation. The only information available was local differential relay target indication and a digital fault recording from a remote DFR. The subsequent analysis used the MATLAB environment to plot total harmonic content (THD) with operating fundamental to show why the single-phase differential (GE STD) operated. The analysis points out the vulnerability of transformer differential relay schemes that use independent fixed percentage harmonic restraint to block operation on bank energization. A corollary presented is the possibility of "cross-blocking" schemes improperly restraining on energization of a faulted transformer bank. Several other similar supporting cases are given as appendices with a description of the MATLAB code used for analysis.