SYMPATHETIC TRIPPING IN DISTRIBUTION NETWORKS, CAUSES, ANALYSIS, AND SOLUTION

By

Hossam El-din Mohamed Ali Sabra

A thesis submitted to the

Faculty of Engineering at Cairo University

In Partial Fulfillment of the

Requirements for the Degree of

MASTER OF SCIENCE

In

Electrical Power and Machines Engineering

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Title of Thesis:

Sympathetic Tripping in Distribution Networks, Causes, Analysis and Solution

Key Words:

Network Protection, Custom Logic Scheme, Distribution Networks, Earth Faults, False Trip, Sympathetic Trip.

Summary:

In this thesis, problems that affecting the proper operation of the earth fault protection elements in distribution network are reported. One of these problems is the unnecessary sympathetic tripping phenomena to the healthy feeders during or after fault occurrence on an adjacent feeder. A relay-based solution is proposed and implemented for MV distribution network to overcome the sympathetic tripping phenomena. Two proposed custom logic schemes are applied, one for outgoing relays and another one for incomer-relay. The proposed solution is based on extensive analysing of actual recorded cases of sympathetic tripping phenomena that are reported from a 22 kV real distribution network located in Giza, Egypt.

The proposed custom logic scheme is extensively examined on the simulated network using ATP Program. Symmetrical and unsymmetrical faults are simulated to present different types of the sympathetic tripping phenomena. The proposed scheme is modelled using MODELS language in ATP to evaluate its capability to overcome the false tripping. The final results demonstrate the suitability of the proposed solution in avoiding the unnecessary false sympathetic tripping of both incoming and outgoing feeders on distribution systems.

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