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**APPLICATION STUDY OF A FAULT
CURRENT LIMITER IN TERMS OF
PROTECTION AND INTERRUPTING DUTY
ON THE SWITCHGEAR**

A thesis submitted to
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for the degree of
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Abstract

This Thesis addresses the research work carried out to study the impact of Fault Current Limiter (FCL) on protection coordination and interrupting duties of switchgears. Basically this thesis addresses three inter-related work packages: (a) literature survey, (b) application studies and (c) feasibility studies on two new FCL topologies.

From the literature survey, available FCL topologies were investigated with their important features. Selection of best location and an impedance value need to be based on an application study, which should be addressed protection coordination, interrupting duties of switchgears, losses and transient stability issues.

New connection of DG to networks increases the fault current and disturbs the Over-Current (OC) protection coordination. The application study of an FCL in terms of protection coordination was carried out on a real distribution network using IPSA simulation package. Selection of suitable location and impedance of an FCL with directional relays at suitable locations could be used to completely solve the problems associated with protection coordination.

Application of an FCL to the utility changes the interrupting duties of the switchgear. The effect on interrupting duties is depending on the location and impedance value. The influence of an FCL on interrupting duties of a Circuit Breakers (CB) was carried out using PSCAD/EMTDC software package. In this study, the effect of an FCL on two

interrupting duties of CB namely, short circuit current and Transient Recovery Voltage (TRV) was investigated.

As many available FCL topologies have several disadvantages, it is important to use alternatives. The feasibility of using a saturated core Magnetic Fault Current Limiter (MFCL) was studied with case studies. A laboratory scale prototype was tested and performance was validated by simulations using PSCAD/EMTDC package. A new concept for an MFCL using a three-phase rectifier to supply dc biasing current was proposed. Simulation studies were carried out with a real network to investigate the expected performance.

As Thyristor Control Series Capacitor (TCSC) is a well developed series device, it is worth to use it as an FCL device. The performance of the prototype device was investigated and validated with simulations. An application study was carried out with real scale distribution network in PSCAD/EMTDC package.

Contributions to general knowledge from this research includes: (a) identification of the best FCL connection point in terms of current limiting, protection coordination and interrupting duties of CB, (b) proposing a methodology for application studies in terms of protection coordination, interrupting duties of CB and current limiting, (c) proposing of a new saturated core MFCL topology and (d) investigating the performance of TCSC as an FCL and as a voltage regulator.

