

Master Thesis in Electrical Engineering at Energy Lab

Design and Development of Voltage-Clamping Circuits for DCCB Application

Thesis Description:

This project aims to address the complexities of protecting DC grids, which have gained significant interest due to the increase in DC energy production, storage, and load. The development of various DC circuit breakers (DCCBs), including solid-state types, has been crucial for fault isolation in DC systems. However, the absence of natural current zero-crossing in DC systems leads to a substantial voltage drop across DCCBs during fault removal, necessitating voltage clamping circuits. These circuits absorb and dissipate the energy stored in line inductors through resistive components. The primary goal of this project is to design and simulate different types of voltage clamping circuits for DCCBs and to develop simple circuits to validate the accuracy of the design procedures.

Milestones:

- Comprehensive literature review on the four main types of voltage clamping circuits including RCD Snubbers, MOV-based Snubbers, Hybrid Snubbers (MOV+RC), and TVS-based Snubbers,
- Designing RCD snubbers (both unidirectional and bidirectional, including charge-discharge and discharge-suppressing types) and purely MOV-based snubbers for circuit breaker application, considering the maximum tolerable voltage, current, and reaction time of the circuit breaker in the design process.
- Simulating the performance of RCD, MOV-based, Hybrid, and TVS diode-based snubbers using Simulink, and comparing the results in terms of maximum voltage, oscillations, and energy dissipation time.
- Prototyping four snubber variants: charge-discharge RCD, discharge-suppressing RCD, MOV-based, and TVS-based snubbers for solid-state DCCBs to validate the accuracy of the developed design procedures through experimental testing and analysis.

Your Profile:

- Basic experience with Matlab/Simulink
- Preferably students with Lab experience
- Language: German or English

You will learn:

- Conducting experiments and testing systems and validating results
- Developing prototypes
- Simulating scenarios and analyzing data

Contact:



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