



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

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**SHORT ABSTRACT**

Distribution static compensator (DSTATCOM) is a shunt connected custom power device which is widely used for load compensation and improvement of power quality. The conventional MLIs used for DSTATCOM implementation pose some drawbacks like large component count, multiple DC-link capacitors and capacitor voltage balancing issues which complicate its design and control. To overcome these issues, a 7-level reduced switch single DC source based cascaded H-bridge multilevel inverter (RSDCHBMLI) topology is presented in this thesis. RSDCHBMLI utilizes lesser number of switches, single DC source and has no requirement of additional diodes or capacitors. As the number of switches in this topology is reduced, a single carrier level shifted pulse width modulation (SC-LS-PWM) technique is developed which is implemented in low-cost controller. The RSDCHBMLI operation is implemented and analyzed in both open-loop and closed loop using state-feedback control (SFB). SFB controller combined with SC-LS-PWM results in constant switching frequency operation of the inverter. The 7-level RSDCHBMLI is implemented as a DSTATCOM connected to weak distribution system. Both SFB current control and finite-control-set model- predictive-control (FCS-MPC) is implemented for load compensation, and it is observed that FCS-MPC gives better dynamic response. It also develops a current based DC-bus voltage controller whose gains can be easily computed and gives better performance than conventional controllers. Detailed case studies for DSTATCOM operation under various conditions of loads and source voltages are also presented.