

Abstract

Ibrahim Ab Abdelsalam

Modified back-to-back current source converter and its application to wind energy conversion systems

The back-to-back (BTB) converter is used in power conversion applications such as machine drives, wind energy conversion systems (WECS), uninterruptible power supplies and high-voltage, direct current transmission systems. Various topologies have evolved around voltage source converters and current source converters (CSCs) in an attempt to meet various design and reliability constraints. This paper proposes a new CSC-based BTB converter suitable for WECS application. The proposed configuration addresses the main drawbacks of the conventional BTB CSCs, such as the over-voltage frequently experienced by switches during commutation. The inverter side converter has zero switching losses. The proposed WECS offers the following advantages: simple and easy control, reduced switching frequency and maximum power point tracking with controllable grid active and reactive power. A low-voltage ride-through (LVRT) solution is also provided in the proposed WECS. PSCAD/EMTDC simulation is used to assess the steady-state and dynamic behaviours of the proposed system under different operating conditions and during LVRT. Experimental results allow steady-state and dynamic behaviour assessment of the proposed system under different operating conditions.