

HYBRID ZVZCS RESONANT CONVERTER FOR HVDC SYSTEM

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Novel hybrid resonant zero-voltage zero-current switching three-level converter with capacitive output filter is proposed in this paper, which undergoes half of the input voltage for switches and is suitable for offshore wind farms in medium-voltage dc (MVDC) collection systems. The proposed converter, utilizing two transformers with very different power ratings, adopts IGBTs for all six power switches and operates in discontinuous current mode and can achieve zero-current switching for the four main switches and rectifier diodes over the whole load range. Meanwhile, the auxiliary switches with small current rating can realize zero-voltage switching naturally. Hence, the switching loss is reduced, which is vital in MVDC applications. By the trajectory formulas of the resonant current and voltage, the trajectory paths can be achieved, which is helpful to compare the peak and turn-off currents of switches. The design rules of main parameters can be deduced with the trajectory formulas and paths. The influence of the turn's ratio of auxiliary transformer and the resonant capacitance on the peak and turn-off currents is discussed in detail. The operation principles of the proposed converter are analysed and verified by the simulation and experimental results.

