Abstract

In this paper, the real-time implementation of a multi-loops quasi-linear control technique is proposed for a three-phase three-level boost-type AC/DC Vienna converter. Acquiring high stability and perfect rejection of disturbances, parametric uncertainties and initial conditions, the recently introduced quasi-linear theory is very suitable for power circuits, operating under diverse operating disturbances and parametric changes. The proposed controllers are first designed based on the general design methodology reported in literature. Their discrete versions are, then, derived for the sake of numerical implementation using a DSP. The predicted dynamics in closed loop are determined based on a previously established and experimentally validated dq small signal model. The proposed control scheme is finally implemented on a 1.5 kW laboratory prototype, supported by a DS1104 controller board of dSPACE. The obtained results attest the achievement of standards requirements in terms of AC currents Total Harmonic Distortion (THD) and Power Factor (PF),are well as the perfect regulation and balancing of split DC bus voltages for a wide clan of operating conditions, including severe utility and load disturbances.