Sensorless AC Current Control with Backstepping Design for a PWM AC-DC Converter

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Abstract.

In this paper, a novel sensorless AC current control scheme is proposed for the design of PWM AC-DC converter. This design strategy deals with nonlinear backstepping controllers and AC current observer to achieve the purpose of current following. In general, PWM AC-DC converter design requires AC current measurement to achieve control goals, the backstepping observer employed estimates the AC current, and then nonlinear controllers based on backstepping design algorithm are developed to realize the sensorless AC current for the PWM AC-DC converter system.

The proposed control scheme is not only used to stabilize the PWM AC-DC converter system, but also to drive the AC current tracking error to converge to zero asymptotically.

Furthermore, the simulation results have clearly illustrated that the proposed nonlinear backstepping controllers are quite effective and efficient for the PWM AC-DC converter current tracking control without the need of current sensors. The strategy control was robust to uncertain parameters and gave a very high power factor and small ripple in the current line supply