Design and experimental results of universal electric vehicle charger using DSP

ABSTRACT

Owing to the growing concerns over energy depletion and environmental issues around the world, more and more attention is given on replacing the fuel-based automobiles with electric vehicles (EVs) which have the characteristics of zero-emission and low noise. As a result, various countries have taken specific initiatives to de-carbonize their transport sectors by developing their own EV industry. Regardless of the environmental and economic benefits, substantial scales of grid-connected EVs impose incredible difficulties to the power grid. The main issues caused by EV charging to the power grid include harmonics, voltage drop, system instability, system losses and grid overloading. Therefore, this paper presents design and development of a novel method, which is by applying voltage-oriented control (VOC) algorithm in battery charging of electric bus.The power system of this work consists of three-phase PWM rectifier. The proposed method is based on mathematical analysis. Simulation and experimental works are performed to investigate behavior and performance of the proposed algorithm. This paperclearly described implementation of low and medium power laboratory prototype and operation of digital signal processor (DSP) via MATLAB / Simulink for the proposed method.

Keyword: Dq-theory; Electric vehicle (EV); Power factor; Total harmonic distortion (THD); Voltage-oriented control (VOC)