

Modelling and simulation of dual sourced front-end converter for hybrid electric vehicles

A. S. Veerendra, M. R. Mohamed, M. H. Sulaiman, K. Sudhakar & K. Peddakapu

^a Sustainable Energy & Power Electronics Research (SuPER) Cluster, Universiti Malaysia Pahang, Kuantan, Malaysia

^b Automotive Engineering Center, Universiti Malaysia Pahang, Pekan, Malaysia

^c Energy centre, Maulana Azad National Institute of Technology, Bhopal, India

ABSTRACT

The paper is concerned with Modelling and simulation of dual sourced front end converter for Hybrid electric vehicles (HEV). In this research work with the help of the renewable multilevel integrated SRM drive converter, different operating conditions are obtained by changing the ON-OFF positions of the front-end switches and the performance of HEV is observed based on the power interface between the battery and the fuel cell. To provide the phase voltage, a battery bank is used for fast demagnetisation and excitation in fuel cell driving mode. The function of 4-level converter is to generate multi-level output voltages while the battery acts as a source. An additional capacitor is introduced to enhance the torque capacity of a capacitor. During driving mode, the proposed converter integrates battery and fuel cells with a smaller number of power switches and without energy storage devices. Due to its flexible energy conversion, the proposed converter is easy to manufacture and replace owing to its modularised structure. The converter speed and efficiency remain the same even when the converter is integrated with the battery and fuel cell. Simulation on a three-phase SRM confirms the effectiveness of the proposed converter.

KEYWORDS

Fuel cell and battery; Hybrid electric vehicles; Multi-level converter; Switched reluctance motor

ACKNOWLEDGEMENT

This research work is supported by Universiti Malaysia Pahang and Mr. A.S. Veerendra is working under UMP's Doctoral Research Scheme (DRS).