

Manoon Boonpramuk 2009: Design and Development of Power-Electronics Based Fuel Cell Emulators. Master of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Assistant Professor Siriroj Sirisukprasert, Ph.D. 127 pages.

This thesis proposes a novel power-electronics based fuel cell emulator used to replace a real fuel cell system during the development stage of a fuel-cell inverter system. The power stage of this new fuel cell emulator consists of a three-phase rectifier and a dc-to-dc buck converter. With the collaboration of these two power electronics circuits and the anticipated control technique, the proposed fuel cell emulator effectively provides correctly emulated responses for two well-known fuel cells such as proton exchange membrane fuel cell and solid oxide fuel cells, which are suitable for vehicle drives and electrical power generations, respectively. Analysis, modeling and control strategy for the proposed systems are presented. To verify its performance, a 600 W hardware prototype of the emulator has been implemented. The output voltage range of this prototype can be varied from 10 to 70 V, and its rated output current is 15 A. The experiment results shows that the performance of the proposed fuel cell emulation is exceptional and is consistent with the proposed concept.

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