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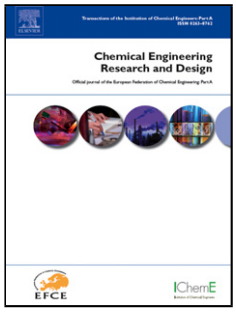

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Model Predictive Control (MPC) Strategies for PEM Fuel Cell Systems - A Comparative Experimental Demonstration

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Highlights

- Multivariable model predictive control (MPC) strategies for PEM fuel cells
- Online demonstration of dynamic optimization techniques using nonlinear model
- Industrial-grade automation at a small-scale fully automated PEM fuel cell unit
- Implementation of an integrated Energy Management Framework for MPC strategies
- Power generation at optimum temperature, fuel consumption and starvation avoidance

Abstract

The aim of this work is to demonstrate the response of advanced Model-based Predictive Control (MPC) strategies for Polymer Electrolyte Membrane Fuel cell (PEMFC) systems. PEMFC are considered as an interesting alternative to conventional power generation and can be used in a wide range of stationary and mobile applications. An integrated and modular computer-aided Energy Management Framework (EMF) is developed and deployed online to an industrial automation system for monitoring and operation of a PEMFC testing unit at CERTH/CPERI. The operation objectives are to deliver the demanded power while operating at a safe region, avoiding starvation, and concurrently minimize the fuel consumption at stable temperature conditions. A dynamic model is

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