Multiple combination strategies for a modular PEMFC System Active Fault Tolerant Control

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Proton exchange membrane fuel cells (PEMFC) are sensitive systems which needs optimal operating conditions for performance keeping. However some abnormal conditions also called faults, leads to the fuel cell performance drop. Therefore, faults have to be mitigate as fast as possible before any irreversible degradation. The literature review [1] shows several kinds of fault occurrence. Each of them influence in a different way the fuel cell operation. In a previous paper [2] an active fault tolerant control (AFTC) architecture has been proposed for a multiple fault mitigation. The proposed strategy is designed with a combination between diagnosis tools, a decision algorithm and control strategies. The decision algorithm is based on the *a priori* knowledge of fault nature and on a fault structural analysis. The fault structural analysis is a low level qualitative representation of the fuel cell behavior model. It is independent of the model parameters values and only consider unweight links between variables and parameters. Parameters are sensitized by fault occurrence during the fuel cell operation. Fault structural analysis thus allow the exhibition of all available antagonistic control variables for each fault mitigation. Therefore, the paper aims to bring a new contribution for active fault tolerant control strategy applied on a single-cell fuel cell for flooding and drying out issues. Experimental validation is carried out with several combination of AFTC and the result are presented and analyzed in this paper.