Semi-plenary talk

Diagnostic & health management of fuel cell systems – a state of the art

Abstract :

Continuous depletion of the crude oil and gradual increase in the oil price have emphasized the need of a suitable alternative to our century-old oil-based economy. A clean and efficient power supply device based on a renewable energy source has to be available to face this issue. Among the different technological alternatives, fuel cell power generation becomes a more and more interesting and promising solution for both automotive industry and stationary power plants. However, many technological hurdles have still to be overcome before seeing the development of industrial and competitive products in these fields.

Among them, one of the major issues to be solved is their insufficient reliability and durability for stationary and transport applications. To reach this aim, efficient diagnostic and state-of-health estimation methodologies should be available, able also to operate real-time and with limited number of additional physical sensors.

This presentation will be divided in three main parts:

1. a first one to describe motivations of such a research axe, to present what fuel cell systems are, and to depict potential applications of such technology;
2. a second one to depict the state of the art on Diagnostics approaches and Health Management strategies for fuel cell systems;
3. a last one to present recent developments, to identify bridges with other applications, and to depict open problems.

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Daniel HISSEL (M’03 - SM’04) obtained an electrical engineering degree from the Ecole Nationale Supérieure d’Ingénieurs Electriciens de Grenoble in 1994. Then, he obtained a PhD from the Institut National Polytechnique de Toulouse in 1998. From 1999 to 2000, he worked for ALSTOM Transport in Tarbes (France) where he was system engineer on electrical and fuel cell buses projects. From 2000 to 2006, he has been an Associate Professor at the University of Technology Belfort. From 2006 to 2008, he has been a Full Professor at the University of Franche-Comté and Head of the “Fuel Cell Systems” Research Team of the Laboratory of Electrical Engineering and Systems. In 2008, he joined the FEMTO-ST (CNRS) Institute and became Head of the “Energy systems modelling” research team. Since 2012, he is the Head of the “Hybrid & Fuel Cell Systems” research team in the same institute and also the Director of the FCLAB (Fuel Cell Lab) Research Federation (CNRS), devoted to Fuel Cell Systems Research (over 100 researchers). His main research activities are concerning fuel cell systems dedicated to automotive and

stationary applications, modelling, non linear control and energy optimization of these systems and fuel cell system diagnostic / prognostic. He was Associate Editor of IEEE Transactions on Industrial Electronics from 2004 to 2012 and is currently Associate Editor of ASME Fuel Cell Science and Technology. He is also the President of the IEEE VTS French Chapter and member of the advisory board of the MEGEVH network, the French national network on EV and HEV. He has published more than 300 scientific papers in peer-reviewed international journal and/or international conferences.

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