



Hydrogen Europe: European Hydrogen & Fuel cell Project Database

Project SAPPHIRE

System Automation of PEMFCs with Prognostics and Health management for Improved Reliability and Economy

The SAPPHIRE project will develop an integrated prognostics and health management system (PHM) including a health-adaptive controller to extend the lifetime and increase the reliability of heat and power-producing systems based on low-temperature proton-exchange membrane fuel cells (LT-PEMFC). The PHM system can actively track the current health and degradation state of the fuel-cell system, and through the health-adaptive control counteract the degradation of cells and balance of plant, and thereby boost the lifetime of the controlled system beyond the current lifetime expectancy. An important part of project is to develop novel prognostics approaches implemented in the PHM for estimation of the remaining useful life (RUL) of the PEMFC. An efficient sensor configuration for control will be chosen using controllability analysis methods, also including indirect sensing/estimation techniques to replace expensive measurement principles. Based on sensor inputs and input from the control system, the PHM algorithms identify the probable failure modes trajectories and estimate the remaining useful life. The consortium's competence ranges from first principles estimation, to signal processing, regression and data-driven techniques, such as neural networks. This ensures an efficient choice of methods. The project covers a full cycle of research activities, from requirement specification and laboratory experiments, through study of degradation phenomena and selection of prognostic methods, to synthesis of the control system and its testing on the target PEMFC system. A technical-economical analysis will be performed in order to assess the impact of the developed tool in terms of lifetime improvement. The project is expected to produce hardware and software solutions and have a significant scientific output. The implemented solutions resulting from the project will be tested and validated by the research and industrial partners.

Project Information

Type of project : Research

Timing : 01/05/2013 > 30/04/2016

Project website: <http://https://sapphire-project.eifer.kit.edu/index.php/about>

Project Budget : 3.269.417 €

Funding

European Union through FCH JU: [Grant agreement 325275 - CORDIS link](#)

Project partners

Coordinator :

Stiftelsen SINTEF

Partners :

SAPPHIRE

ZSW - Zentrum für Sonnenenergie- und Wasserstoffforschung Baden-Württemberg

Ballard Power System Europe A/S (Previously Dantherm)

ECOLE NATIONALE SUPERIEURE DE MECANIQUE ET DES MICROTECHNIQUES

SVEUCILISTE U SPLITU, FAKULTET ELEKTROTEHNIKE, STROJARSTVA I BRODOGRADNJE

Sub project(s)

Sub project 1

Country: Norway

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Sub project categories

Research

Project Id: 1081

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