Hydrogen Europe:
European Hydrogen & Fuel cell Project Database

Project ASSENT

Anode Sub-System Development & Optimisation for SOFC systems

The high temperature fuel cell technologies have potential for high electrical efficiency, 45-60%, and total efficiency up to 95%. SOFC has the added benefit of offering commercial applications from 1 kW residential to several MW stationary units with high fuel flexibility. Whilst much effort is devoted to cell and stack issues, less attention has been paid to the components and sub-systems required for an operational system. Components and sub-systems such as fuel processing, heat and thermal management, humidification, fluid supply and management and power electronics are as crucial to the successful commercialisation of fuel cell systems as the cell and stack. This project is focused on the development of fuel and water management for SOFC systems. The fuel management, and especially recirculation, is a key question in achieving high electric efficiency and rejecting external water supply. The recirculation increases the fuel utilization rate and can provide the water needed in the reforming of fuels. However, with current SOFC systems the anode circulation has been problematic from controllability and reliability points of view, and hence there is a need to develop the overall solution of the anode subsystem. This project will evaluate different process approaches for fuel and water management, e.g. blower-based approach, ejector-based approach, and water circulation by condensing from the anode off-gas/exhaust gas and evaporating back to the fuel loop. The aspects taken into account in the conceptual analysis are effects on electric efficiency and process simplicity implying easiness of controllability, and requirements on diagnostics accuracy to provide insights into failure mode prevention. In the detailed evaluation, the suitable approaches are analysed more thoroughly in terms of component availability and reliability, achievable diagnostics accuracy, controllability, effects on reformer, mechanical integration feasibility to whole system, cost effects etc.

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Project partners

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VTT - Technical Research Centre of Finland

Partners :

JÜLICH - Forschungszentrum Jülich GmbH

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Sub project categories

Research

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