DOLPHIN

DISRUPTIVE PEMFC STACK WITH NOVEL MATERIALS, PROCESSES, ARCHITECTURE AND OPTIMISED INTERFACES

Project ID	826204
PRR 2024	Pillar 3 – H_2 end uses: transport
Call topic	FCH-01-6-2018: Game changer fuel cell stack for automotive applications
Project total costs	EUR 2 962 681.25
FCH JU max. contribution	EUR 2 962 681.25
Project start - end	1.1.2019–31.12.2023
Coordinator	Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France
Beneficiaries	Chemours Belgium, Chemours France SAS, Chemours International Operations SARL, DMG MORI Additive GmbH, Faurecia systèmes d'échappement SAS, Hexcel Composites GmbH & Co. KG, Hexcel Composites Ltd, Hexcel Reinforcements SAS, Symbio, Symbio France, University of Manchester, Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg

http://www.dolphin-fc.eu/

PROJECT AND GENERAL OBJECTIVES

The overall aim of the project was to validate disruptive technologies for 100 kW lightweight and compact fuel cell stack designs, achieving outstanding (specific and volume) power density while simultaneously ensuring enhanced durability (under automotive application conditions) compared with state-of-the-art (SOA) stacks and compatibility with large-scale/mass production of full-power stacks. The validation of Dolphin technologies was supported by the design and fabrication of an automotive stack of 5 kW, representative of 100 kW power stacks.

NON-QUANTITATIVE OBJECTIVES

Evaluate the interest and limitations of different material and manufacturing technologies for proton-exchange membrane fuel cell stacks.

PROGRESS AND MAIN ACHIEVEMENTS

Increase in performance up to around 2W/cm², validated on a 100 cm² single cell, thanks to downsized rib/channel dimensions, a new membrane, new catalyst layer materials and formulation and alternative operating conditions (those of the GAIA project).

Identification of interest and limitations of various components of and manufacturing processes for proton-exchange membrane fuel cell stacks.

Design of potentially even more efficient flow fields and catalyst layer manufacturing processes.

The two best solutions have been defined to manufacture two stacks (5 kW). Manufacturing, assembly and testing of the 5 kW stacks based on the two technologies selected, to evaluate the key performance indicators (kW/l, kW/kg, W/cm², €/kW, µV/h).

In parallel, assessment of the benefit of adding a graphene coating to the membrane.

Definition and testing of an additional set of operating conditions to facilitate a trade-off between high stack efficiency (high pressure, Sto and relative humidity, as in the GAIA project) and high system efficiency (as used in Dolphin).

FUTURE STEPS AND PLANS

The project has finished.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?	SOA result achieved to date (by others)	Year for reported SOA result
AWP 2018	Stack cost	€/kW	20	Evaluation is in progress and will be included in the final RP 4 documents		36.8	2017
	Durability	hours	6 000	Evaluation is in progress and will be included in the final RP 4 documents		3 500	2017
	Weight-specific power density	kW/kg	4	Projection based on TP 1 / TP 2 tests (to be checked at the stack level): 5–7 kW/kg	⚙	3.4	2017
	Volume-specific power density	kW/l	5	Evaluation will be included in the final RP 4 documents		4.1	2017
	Surface power density	W/cm²	2	2 (Dolphin components and GAIA operating conditions), validated on 100 cm² single cell		1.3 (AutoStack-Industry project) and 1.8 (GAIA project)	2017