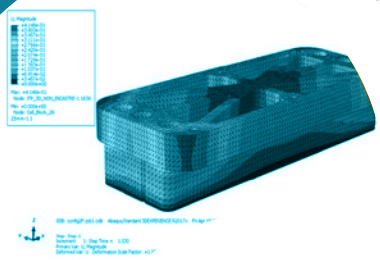
DOLPHIN

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



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Disruptive pemfc stack with nOvel materiaLs, Processes, arcHitecture and optimized INterfaces

Project ID:	**826204**
PRD 2023:	**Panel 3 – H2 end uses – transport**
Call topic:	**FCH-01-6-2018: Game changer fuel cell stack for automotive applications**
Project total costs:	**EUR 3 244 066.25**
Clean H_2 JU max. contribution:	**EUR 2 962 681.25**
Project period:	**1.1.2019–31.12.2022**
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 Systemes d'Echappement 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 OBJECTIVES

The overall aim of the project is to validate disruptive technologies for 100 kW lightweight and compact fuel cell stack designs, reaching outstanding (specific and volumic) power density while simultaneously featuring enhanced durability (under automotive application conditions) compared with state-of-the-art (SoA) stacks and being compatible with large-scale/mass production of full-power stacks. Validation of the DOLPHIN technologies will be supported by the design and fabrication of an automotive stack of 5 kW, representative of 100 kW power stacks.

NON-QUANTITATIVE OBJECTIVES

Evaluate interest in and limitations of different material and manufacturing technologies for PEMFC stacks.

PROGRESS AND MAIN ACHIEVEMENTS

- Performance has been increased to ~ 2 W/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 (Next generation automotive membrane electrode assemblies (GAIA) project).
- Interest in and limitations of different components and manufacturing processes for PEMFC stacks have been identified.
- Potentially even more efficient flow fields and catalyst layer manufacturing processes have been designed.
- The two best solutions have been defined for the manufacture of two stacks (5 kW).

FUTURE STEPS AND PLANS

- Manufacturing, assembly and testing of the 5 kW stacks based on the two technologies selected, for evaluation of the key performance indicators (kW/l, kW/kg, W/cm², €/kW, µV/h), are still to be carried out.
- In parallel, an assessment will be conducted to gauge interest in graphene coating of the membrane.
- Define and test an additional set of operating conditions as a trade-off between high stack efficiency (high Sto and RH, as for GAIA) and high system efficiency (as used in Dolphin).

QUANTITATIVE TARGETS AND STATUS

Target source	Parameter	Unit	Target	Target achieved?	SoA result achieved to date (by others)	Year of SoA target
AWP 2018	Weight-specific power density	kW/kg	4		3.4	2017 (by Auto-Stack CORE)
	Volume-specific power density	kW/l	5		4.1	
	Surface power density	W/cm²	2		1.13	
	Durability	hours	6 000		3 500	
	Stack cost	€/kW	20		36.8	

Clean Hydrogen Partnership
Co-funded by the European Union