Raising the bar: ENDURE elevates Alkaline Electrolysers through Enhanced Current Density and Stability

A Green Hydrogen Partnership funded research and innovation project ENDURE kick-off took place in Tallinn, Estonia on the 9th and 10th of January.

A consortium of highly recognized partners prepared a successful project proposal under the topic HORIZON-JTI-CLEANH2-2023-01-03 Advances in alkaline electrolysis technology. The Grant Agreement (GA: 101137925) was signed between the ENDURE consortium and the European Union on the 1st of December 2023.

The ENDURE project will result in an innovative electrolyser stack design with innovative technological components. ENDURE will yield in higher durability thanks to decreased degradation rate of alkaline electrolysis cells and stacks via electrode improvements, design and material innovation on stack level and via the development of accelerated testing procedures. By the end of the project the sub-components and the short stack of at least 5 cells will be tested, validated and demonstrated at a lab scale.

The main objective of ENDURE is to improve the current density and stability of electrolysers bringing the performance and durability of alkaline electrolysers to a new level. The number of publicly available durability data on alkaline electrolysers is scarce; therefore, the efforts will contribute to enriching the understanding of current density and stability of electrolysers for the scientific community.

More specifically, the goal is to drastically decrease the degradation rate and increase the efficiency of alkaline cells and stacks via the development of hierarchically structured flow-engineered monolithic porous transport electrodes, via design/material improvements on stack level, and via accelerated testing procedures.

Within the 3-year ENDURE project a PGM-free alkaline electrolyser stack with PEM-like performance and low degradation rate will be developed. Proposed innovations include:

- Development of 3D structured, laterally graded, flow-engineered, monolithic porous transport electrodes (PTE), drastically improving electrode kinetics and mass transport compared to state-of-the-art cells;
- Multi-level computational fluid dynamics (CFD) modelling coupled with advanced X-ray tomography;
- Novel PGM-free high performance electrocatalysts fabricated using inherently scalable methods;
- Stack-level improvements and performance validation using 100 cm^2 and 1000 cm^2 stack platforms, and benchmarking with state-of-the-art;
- Building upon the work done by the Joint Research Centre (JRC), the development of harmonised test protocols and accelerated testing procedures for alkaline water electrolysers.

In the project, the consortium will adopt an approach combining computer simulations, rapid prototyping, and through experimental validation on a single cell, Single Repeat Unit (SRU) and short stack level.

The project technical coordinator, Rainer Küngas (Stargate CTO) commented:

“Alkaline electrolyser technology has been in industrial use for decades, and, therefore, the common misconception is that alkaline systems have reached a performance plateau. The ENDURE project is all about demonstrating that alkaline electrolysers still have a lot of potential left, both in terms of performance as well as durability. Stargate is very proud to be part of the project consortium that brings together leading research and commercial partners in Europe.”

The objectives can only be reached by a collaboration connecting top-level research groups and commercial players at the international level (Estonia, Germany, Spain, Belgium, and Sweden). The consortium is very well balanced in terms of academic and industrial players covering different links in the electrolysers’ value chain:

Coordinator

- Stargate Hydrogen Solutions OÜ, leader of cell and stack development and management

Partners

- Fraunhofer IFAM, leader of electrode development and scale-up
- Center for Solar Energy and Hydrogen Research (ZSW), leader of testing and validation
- Aragon Hydrogen Foundation, leader of establishing methods and baseline and testing of the 10 kW stack
- Permascand AB, contributes to electrode development
- Université Catholique de Louvain, leader of dissemination and exploitation, contributes to electrode development through Computational Fluid Dynamics (CFD)

Start

- 01/01/2024

Duration

- 36 months

Budget

- € 2 495 480

Funding entity

- Clean Hydrogen Partnership

Funded by the Clean Hydrogen Partnership and its members