Technical Coordinator

Mr. Wiebrand Kout

Hyet B.V.
Hydrogen Efficiency Technologies
Leemansweg 15
6827 BX, Arnhem
The Netherlands
Phone: +31 26 362 3944
e-mail: wiebrand.kout@hyet.nl

Management Coordinator

Dr. Anna Molinari

Uniresearch BV
Elektronicaweg 16c
2628 XG Delft
The Netherlands
Phone: +31 15 275 4000
e-mail: a.molinari@uniresearch.nl

PHAEDRUS

HyET Hydrogen Efficiency Technologies

ITM POWER Energy Storage | Clean Fuel

H2 Logic Hydrogen Fuel Cell Motive Power Solutions

HEXAGON COMPOSITES

DAIMLER

Shell Global Solutions

BAM

ARMINES

Hochschule Esslingen University of Applied Sciences

UNIRESEARCH

PHAEDRUS

high Pressure Hydrogen All Electrochemical Decentralized RefUeling Station

http://www.phaedrus-project.eu/

This project is co-funded by the EC 7th Framework Programme – Fuel Cells and Hydrogen Joint Undertaking

SEVENTH FRAMEWORK PROGRAMME

New Energy World JU fuel cells & hydrogen for sustainability

PROJECT OBJECTIVES

- Develop and validate of a **new concept for 70 MPa hydrogen refuelling retail stations**
- Provide a **step change in both efficiency and cost** of ownership of an integrated hydrogen refuelling system
- Demonstration of fuelling system producing **5 kg hydrogen per day,**
- Design is made of a fuelling system capable of producing **200 kg hydrogen per day**
- Validate **safety aspects, efficiency and economic viability of the system.**

PROJECT RESULTS

- An electrolyser producing high pressure hydrogen (**up to 20 MPa**) that is compact, efficient and capable of a production volume 200 kg/day;
- An electrochemical hydrogen compression system consisting of parallel units for reliable, safe and efficient compression up to 100 MPa at a **peak production of 10 to 50 kg/hr.** depending on system configuration;
- Storage tanks at low (10-20 MPa), or medium (50 MPa) and high pressure (100 MPa);
- A dispensing system equipped with a precooling unit, with a **capacity of 5 kg/3 min**.

KEY CONCEPT

The **PHAEDRUS CONCEPT** proposed is based upon the following key features:

1. **Electrochemical compression** Using special membranes and dedicated electrode configurations in a cell, hydrogen can be brought to a higher pressure by applying a DC-current over the membrane-electrode-assembly (MEA) in is an easily scalable technology.
2. **Step-improved electrolysis** An onsite electrolyser (highly efficient, compact, scalable, high outlet pressure) is one of the building blocks of the Hydrogen Fuelling Station.
3. **Modular Hydrogen Refuelling Station Architecture (HRS)** consisting of standardized building blocks for compression, storage and dispensing, enables flexibility in individual design, footprint and size while at the same time it allows for low CAPEX.

The major advantages of the PHAEDRUS concept are the efficient compression and the scalability. It means that this concept is suitable for a wide range of H_2 fuelled vehicle deployment volumes. The technology to be developed fits well with The Clean Energy Partnership and H2 Mobility infrastructure projects in Germany, which aim at stepwise deploying small, medium and large refuelling stations.

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PHAEDRUS PROJECT

Within the project a new concept and new technologies for a hydrogen retail refuelling system are developed.

The higher outlet pressure available from the electrolyser as well as improved efficiency and compression ratio ability of the electrochemical compressor will result in an **optimization of compression and storage systems** with respect to cost, efficiency and capacity.

The **station concept is flexible and scalable**, therefore perfectly suited for early vehicle deployment volumes, and subsequent growth. Also the **cooling and refuelling subsystems are optimised** as part of an overall system optimisation

For the system optimisation well-to wheel studies including thermodynamic balances are applied using simulation methods for technical/economic analyses, assessments and layouts for components and control and energy management. The simulation will serve in addition to the assessment of the potential of electrochemical compressors by studying a broader spectrum of system configurations, conducting benchmark studies and considering future R&D advancements

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