



Hydrogen - A Competitive Energy Storage Medium To Enable the Large Scale Integration of Renewable Energies

Seville, 15-16 November 2012

HyET Electrochemical Hydrogen Compression

HyET technology

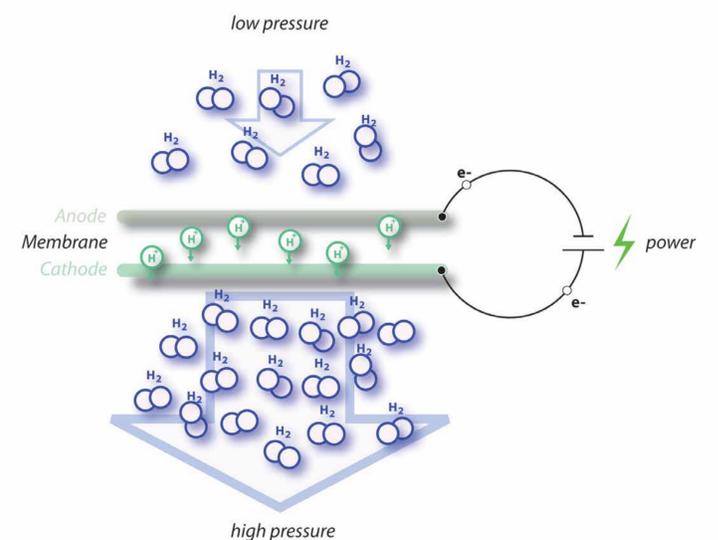
HyET's electrochemical compression technology is the most efficient way to compress hydrogen. A compressor system will have an efficiency of 90% and a capacity of up to 2000 kg/day. Efficiency, footprint, noise and costs are all positive points compared to traditional mechanical compressors.

Electrochemical compression will lead to a step change in hydrogen storage efficiency.

Working principle

Hydrogen is fed to the anode, and an electric potential between 0.1 and 0.5 Volt is applied. Hydrogen molecules are catalytically oxidized to produce protons which pass through the membrane to cathode, where they are rejoined by electrons to form molecules again. As long as hydrogen and power are supplied, this electrochemical reaction continues to compress hydrogen.

The hydrogen compression process can be reversed. At the high pressure side hydrogen is catalytically dissociated to produce two protons which pass through the membrane, where they are joined at the low pressure side with two electrons to form a hydrogen molecule again. In this way the decompression generates DC electric power



Working principle

Technical results

HyET has reached a (world record) pressure of 1000 Bar on lab scale, and expects to be able to reach this pressure level at industrial scale soon. HyET owns a number of patents and patent applications relating to system configurations, components and materials. The delivery of 2 kg/day compressors to selected customers for R&D purposes has started.

Future Work

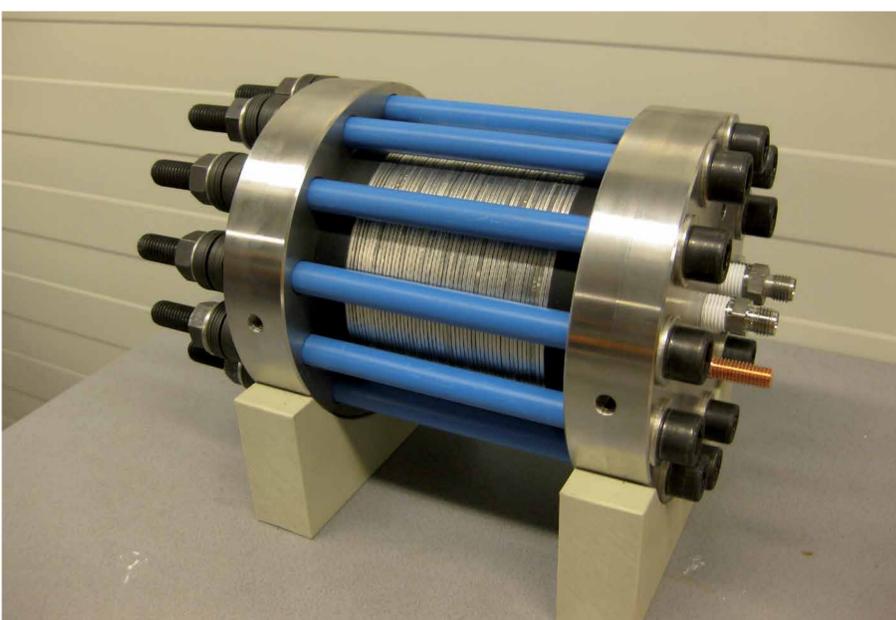
Issues to address are cost reduction, optimization of the MEA and understanding and elimination of degradation mechanisms of the materials and components. Part of this work will be done within the FCH-JTI project Don Quichote, which will demonstrate the technical and economical viability of an integrated hydrogen storage system for renewable electricity linked to a hydrogen refuelling facility.

Conclusions

Electrochemical compression technology will significantly improve the efficiency of hydrogen energy storage systems. Due to the absence of moving parts and friction, there is much less heat generated compared to traditional compressors. An extra efficiency benefit comes from the possibility to reverse the compression process, and use the pressure difference as a source of electric power. Prototype HyET compressors are commercially available for selected customers.

Project Overview

- Wiebrand Kout; Wiebrand.Kout@HyET.nl; +31 6 23 765 745
- FCH-JU-2011-1 Proposal No. 303411:Don Quichote
- 10/12 to 10/17
- www.HyET.nl



2 kg/day Electrochemical compressor