

CYRUS offers a noise free hydrogen compression system based on metal hydrides using only water as the cooling / heating medium



## this issue

Fundraising **P.1**

Product Development **P.2**

What next **P.3**

## UNIQUE ADVANTAGES



**ZERO NOISE LEVELS**  
ability to install Hydrogen Refueling Stations (HRS) in residential areas



**VERY LOW O&M COSTS**  
use only cheap, low-grade thermal energy; do not include mechanical parts



**LOW ENVIRONMENTAL IMPACT**  
no use of Critical Raw Materials; can be driven only by RES or/and Waste Heat



**MODULARITY, & RELIABILITY**  
modular product with high availability and reliability

## CYRUS CREATES THE FUTURE OF HYDROGEN COMPRESSORS FOR TRANSPORT APPLICATIONS

Transport applications are responsible for almost 25% of Greenhouse Gases Emissions in Europe. Hydrogen is the most efficient clean energy carrier in this sector. To support this shift towards cleaner energy, new infrastructures of Hydrogen Refueling Stations (HRS) are already underway. Hydrogen compressors are a key element of these stations, accounting for ca. 50% of their capital costs and over 60% of their O&M costs.

CYRUS PC has developed and manufactured a new series of Metal Hydride Compressors with unique advantages:

- Pressure over 500 bar
- No use of CRMs
- Use of low – grade thermal energy resulting in very low O&M costs

CYRUS compressors are ideal for HRS in residential areas due to their zero noise levels (no moving parts). In addition, they are flexible and modular and present high availability and reliability.

We are looking for partners in the following areas:

- HRS Manufacturers & Operators
- H2 Vehicles Manufacturers
- H2 fleet operators
- Electrolyzer manufacturers
- Logistic centers

in order to collaborate in the development of HRS with unique characteristics and create the future in such applications.

## Awards & Grants

### EIT Climate-KIC Start-Up Accelerator

Award in the form of cost reimbursement of 50,000 EUR for the participation in stage 3 of the EIT - Climate KIC acceleration

### THE DIGITAL GATE INNOVATION CHALLENGE

Innovation Award on Scientific Research to enhance efficiency and reduce carbon footprint of airport transport services using compressed hydrogen as a fuel

### MITEF Greece Startup Competition 2020

Finalist of the MITEF Greece Startup Competition 2020

### UNI.FUND - AN EQUITY FUND FOR CAPITAL GROWTH

Pre-seed financing for the implementation of go-to-market strategies and helping build the foundations of the entrepreneurial ecosystem

### COMPETITIVENESS AND ENTREPRENEURSHIP

H2CYRUS project funded under the 2nd Round of the Single State Aid Action "RESEARCH - CREATE - INNOVATE" (2020 - 2022). Total Budget: 549.850,00 €



## Fundraising

CYRUS joined Uni.Fund's family

Supporting research commercialization and targeting high potential start-up companies, Uni.Fund recently funded Cyrus P.C., a spin-off of the National Center of Scientific Research "Demokritos", for accelerating company's commercialization strategy.

A strategic investment of 200 k€ by Uni.Fund has been already placed during the 1<sup>st</sup> round of fundraising, while Uni.Fund acquired the 20% of the company.

Leveraging the extensive expertise and strong network of our team in the global energy sector, CYRUS will use Uni.Fund's funding aiming at creating the future of hydrogen compressors for transport applications.

"Create a new market and play a leading role in Europe"

The recent partnership with Uni.Fund offers significant added value to the company, increasing innovation potential, resources to maintain high quality research and development activities, the company's recognizability and thus ultimately contributing to successful market penetration.

CYRUS vision is to develop a global business in the field of metal hydride hydrogen compressors and to provide support services for the penetration of these products in the global hydrogen market, playing a leading role in Europe.



## Our Products

CYRUS thermal compressors are non-mechanical high-pressure hydrogen compressors using metal hydrides. Hydrogen compression based on the reversible hydrogenation / dehydrogenation ability of metal hydrides (MH) has been proposed and investigated as a reliable process to compress hydrogen to high pressure without contamination and with relatively low energy costs. The method utilizes a reversible heat-driven interaction of a hydride-forming metal or alloy or intermetallic compound with hydrogen to form MH and offers an attractive alternative to conventional (mechanical) and other newly developed (electrochemical, ionic liquid pistons) concepts for hydrogen compression.

The advantages of MH compression include simplicity in design and operation, absence of moving parts, compactness, safety and reliability, and the possibility to utilize waste industrial heat and/or excess renewable energy (e.g. solar thermal) for the required heating of the MH tanks.

The metal hydride-based hydrogen compressor can be tailored to cover a wide range of operating pressures and pressure ratios by selecting suitable alloys. Its operating principle offers an innovative economic alternative to traditional mechanical hydrogen compressors apart from the technical application for hydrogen storage in solid material.

## EYE ON IT

### Current Product developments

**Model: MH-200-CYRUS-1.0**

Maximum operating pressure: 30 Mpa

Target fueling pressure: 20 Mpa

MH operating temperature: 10 °C to 90 °C

Cooling/heating medium: water

Energy requirement: 4.5 kWh/kg H<sub>2</sub>

CE certified

**Model: MH-350-CYRUS-1.0**

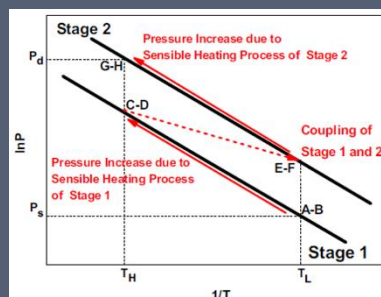
Soon Available

## Q&A Technology Tips

### Q: How to achieve higher compression pressures.

A: To have a high outlet pressure, more hydride units can be serially connected, each unit with a different alloy and successively higher operating pressure. The most important properties of an alloy suitable for hydrogen compression are good hydrogen absorption - desorption rate, smaller process enthalpy, fast reaction kinetics, great structural stability during the cycles. For compression, metal hydrides with large pressure to temperature gradients are desired, especially in the range of low temperatures.

This operating principle, called thermal hydrogen compression system, is based on the equilibrium pressure as a function of temperature and hydrogen content of the hydride.





## Business Development

The expected growth rate of the respective market is very high. It is a niche market with few players / competitors – low competition, especially in MHC technology – giving us the opportunity to get a significant market share and play a leading role in Europe

## What next

- **Actual system proven in operational environment (TRL 9)**  
Model MH-200-CYRUS-1.0 proven in a fully operational Hydrogen Refueling Station (HRS) environment; system already commissioned successfully.
- **New alloys for hydrogen compression > 500 bar**  
Develop and produce new materials (metal alloys) to construct and bring to the market of a new reliable, safe, silent and vibration-free - no moving parts - hydrogen compressor that can raise hydrogen pressure more than 500 bar; R&D in progress.
- **2<sup>nd</sup> round of fundraising**  
A second round of financing by private equity investors and venture capitalists has been launched for our business.
- **Complete and qualified production line**  
Development of a complete production line & certification procedures; direct connected with the 2<sup>nd</sup> fund raising round.



LEFKIPPOS Technology Park  
Patr. Grigoriou E' & 27 Neapoleos str.  
15341 Athens, Greece  
[info@h2cyrus.eu](mailto:info@h2cyrus.eu)  
[www.h2cyrus.eu](http://www.h2cyrus.eu)