

COSHMYC DEMO

Final Event

Tuesday, 14 October, at 14:00 to 15:30 CEST

COSMHYC DEMO
INNOVATIVE H₂ COMPRESSION



Co-funded by
the European Union



- **General presentation of the project & main achievements - *EIFER***
- **Advances on hydrogen compression technologies – *MAHYTEC*, *EIFHYTEC***
- **Demonstration of the COSMHYC DEMO compression solution at the new HRS – *CCTVI***
- **Results & next steps – *EIFER***
- **Q&A on innovative hydrogen compression**

COSMHYC DEMO – FINAL EVENT INTRODUCTION

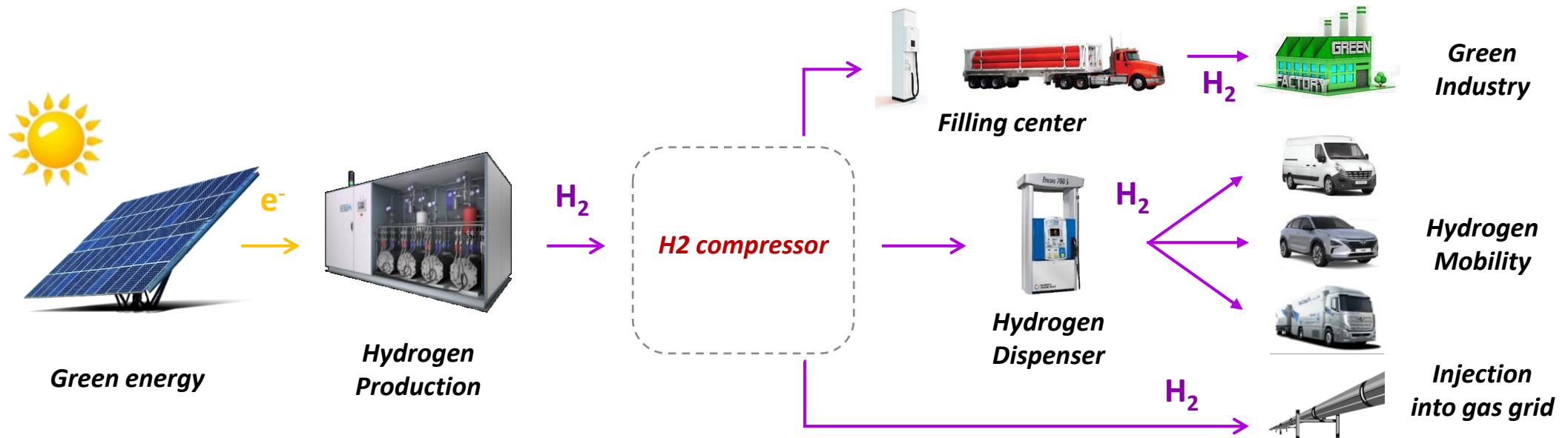
Rami Chahrouri
14.10.2025, Online

FCH2 JU call for proposals 2020

- **Project Name:** COSMHYC DEMO - COmbined Solution of Metal HYdride and mechanical Compressors: DEMonstration in the Hysoparc green H2 MObility project
- **Topic title:** Convincing demonstration of innovative compression solutions in a full-size scale HRS.
- **Goal:** Innovative H2 compressor technology development should demonstrate how it will reduce the HRS cost and footprint while increasing its reliability for a cost-effective compression towards the 2024 targets.
- **Project conditions include:**
 - 1 year of testing
 - Fleet of vehicles
 - 700 bar HRS
 - 200 kg/day
 - TRL increase from 5 to 7
 - Hydrogen purity assessment



Compression plays a key role in the hydrogen value chain



INTRODUCTION

2017 - 2020



- First concept of hybrid metal-hydride/mechanical compression solution
- Successful demonstration of 2-stage metal-hydride in full-scale prototype
- Rare earth-free metal hydrides and innovative reactor tank designs developed
- Valuable lessons learned in safety, construction, system limits and operation

2019 - 2023



- Scale-up of COSMHYC solution for higher compression capacity and flow rate
- Implementation of lessons learned in first project
- Dual-Crank mechanical compressor developed and successfully tested
- Further development of rare earth-free metal-hydrides and reactors... including heat exchangers

2021 - 2025



- First demonstration of the COSMHYC hybrid compression concept in a real life hydrogen refuelling station
- Construction of a new dual-pressure HRS in the frame of the project
- Uncovering of new challenges by commissioning new technology in public HRS
- Open questions of compressor integration identified and concept further developed

INTRODUCTION - PARTNERS



FCH2 JU call for proposals 2020

- CCTVI (Communauté de communes Touraine vallée de l'Indre) is located near **Tours, France**
- CCTVI's HYSROPARC project aims at producing onsite green hydrogen by electrolysis from PV.
- The hydrogen will be used for different mobility applications and supplies a fleet owned by CCTVI
- Station Address:
Rue Charles Lindberg, 37250 Sorigny, France

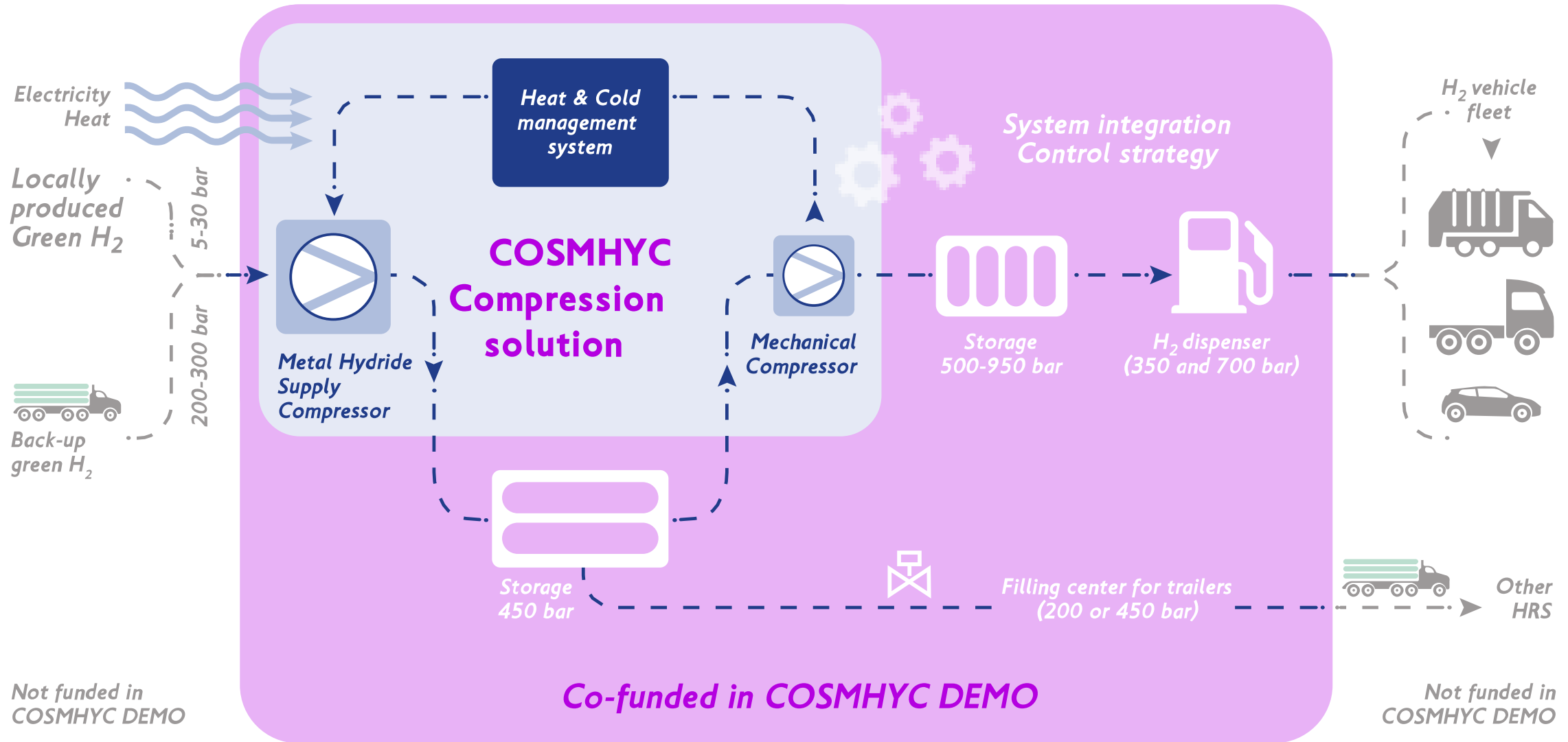


Technical SPECS

- Dual Pressure Station 350 bar & 700 bar
 - Garbage Truck 700 bar
 - Passenger vehicles 700 bar
 - Utility Vehicle 350 bar
 - Bus 350 bar
- Capacity of 200 kg per day with possibility to scale-up in long-term
- Possibility to supply HRS from electrolyser and trailers
- Filling Center to fill trailers with green hydrogen from electrolysis
- Innovative metal hydride supply compressor combined with a modified dual-crank mechanical compressor also developed in the COSMHYC series



PROJECT SCOPE – FUNCTIONING PRINCIPLE



MAIN ACHIEVEMENTS

- Authorization achieved from the public authorities within project timeline
- Commissioning of the HRS in 2024 and successful demonstration of the full hybrid compression solution in 2025, including design and manufacturing of integration panels for the project. Full station integration CE-certified!
- CEP SAT tests carried out, as well as hydrogen purity tests
- Green hydrogen supply by trailers throughout the demonstration phase
- Several communication events carried out including an “avant-premiere” event at the HRS focusing on regional stakeholders to encourage adoption of hydrogen technologies.

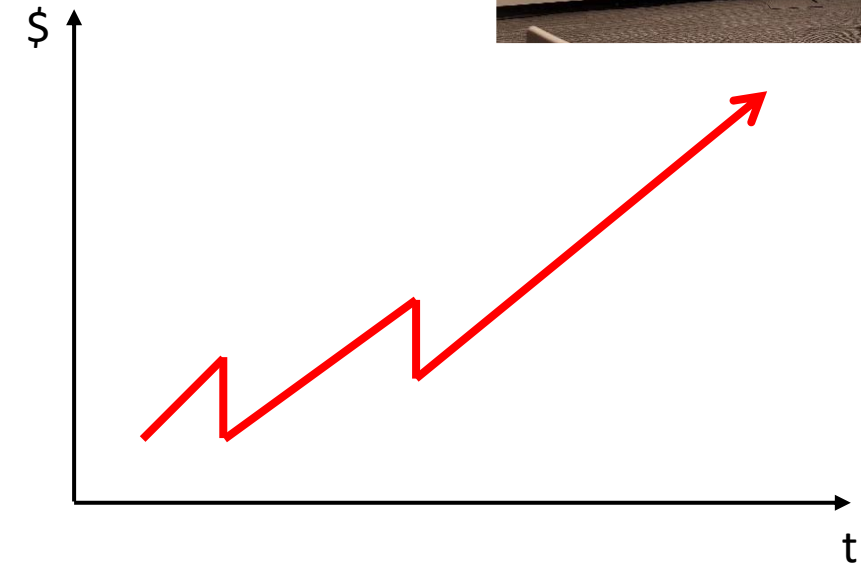


- COVID-19 Global Pandemic!
- Geopolitical turmoil, supply chain collapse, inflation, energy crisis...

Despite very difficult conditions, all objectives achieved!

LOCKDOWN!

2 m distance



COSMHYC₂ DEMO

INNOVATIVE H2 COMPRESSION



FINAL EVENT- MAHYTEC

Marlène GROSSON, MAHYTEC

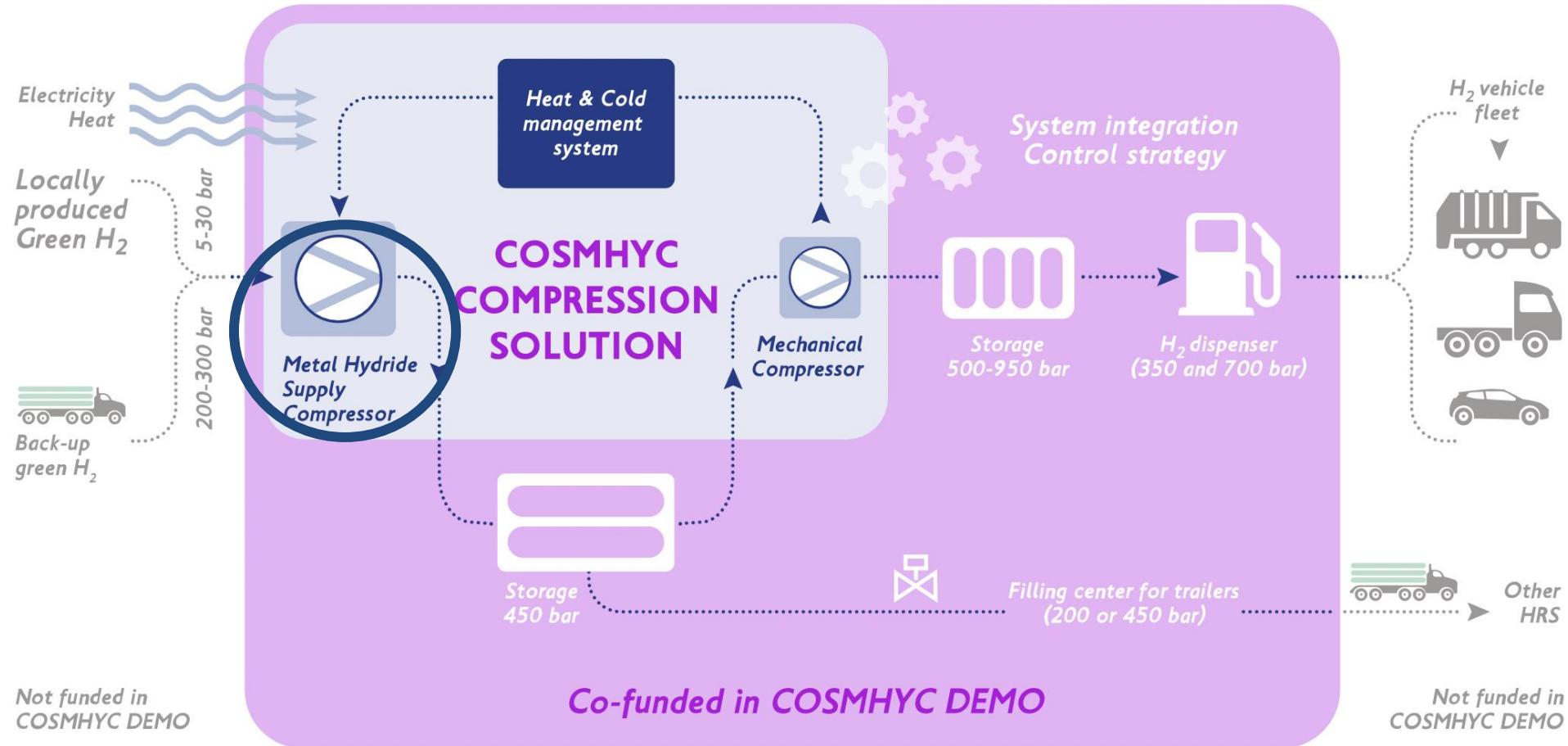
14.10.2025, Online meeting



The project is supported by the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research



SUMMARY



- I. Rare earth free metal hydrides selection
- II. Metal hydrides production
- III. Reactors design
- IV. Metal hydride reactors assembly

I. RARE EARTH FREE METAL HYDRIDES SELECTION



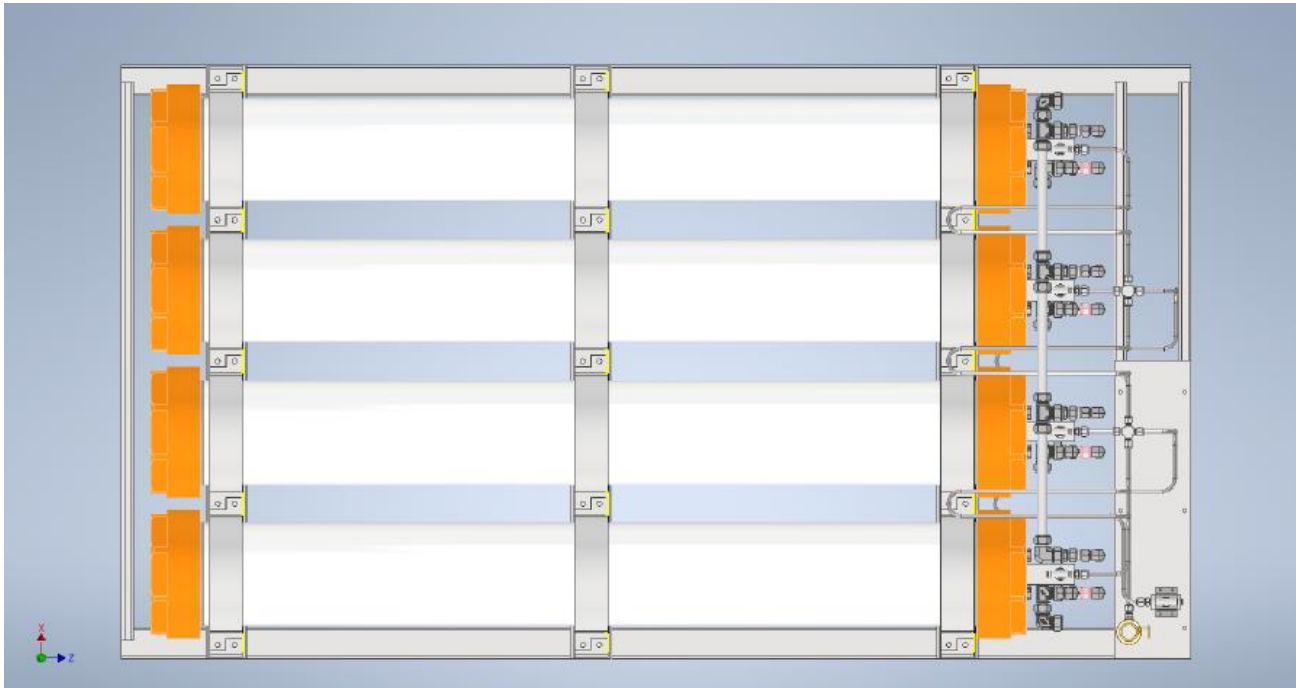
- Previous experience
- Research
- Performance test

II. METAL HYDRIDES PRODUCTION

- Around 2 tones
- Technical challenges



III. REACTORS DESIGN



- Temperatures challenges
- Evolution of former design
- Reach characteristic and price objectives

IV. METAL HYDRIDE REACTORS ASSEMBLY

- 28 tanks
- 8 racks
- Long period of supply
- Long certification process



THANK YOU FOR YOUR ATTENTION

COSMHYC₂ DEMO

INNOVATIVE H2 COMPRESSION



FINAL EVENT

Simon MASTIO, EIFHYTEC
14.10.2025, Online meeting



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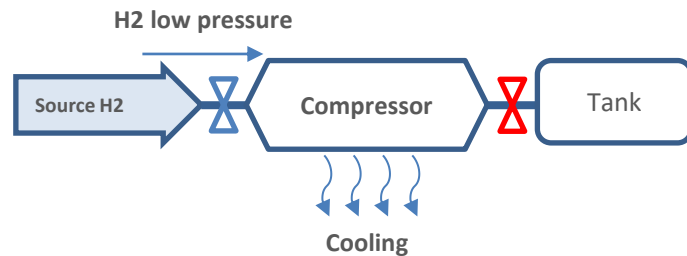


- Thermochemical compression
- COSMHYC DEMO specifications
- Design & integration
- Installation & commissioning

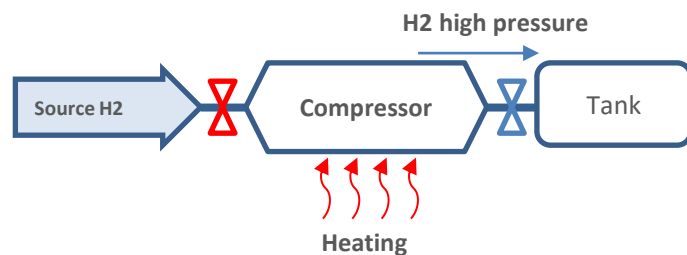
Metal Hydride Compression

- Using an absorption/desorption principle in metal hydrides
- No moving parts = reduce wear & tear, no noise, no vibration
- Possibility to recover waste heat

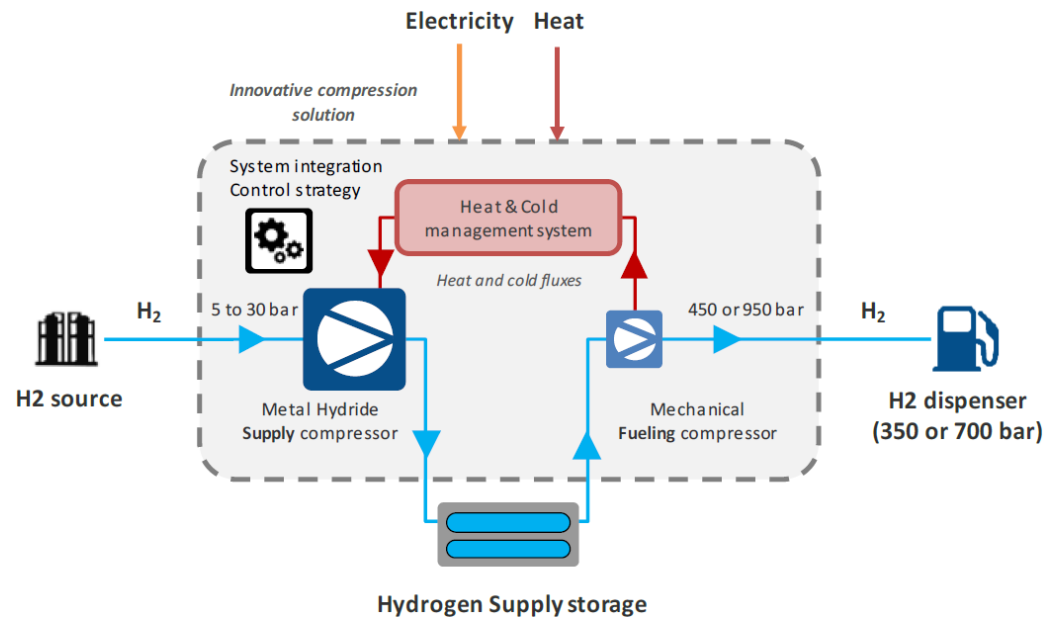
Absorption



Desorption



- MHC = supply compressor for the HRS and filling center
- 2-stages compressor from **30 → 450 bar**
- Targeted flow of **200 kg/day**
- **ISO 14687:2025 grade D**
- **CE-certified**, ready-to-market machines



- Containerized and **standardized** design
- **Modularity** in terms of pressure and flow
- Design allow **easy maintenance**
- **Fully constructed in T3 2024**



INSTALLATION & COMMISSIONING

- Civil engineering facilitated, no vibration constraints
- Installation and commissioning < 1 month
- Availability > 98%
- **CE certification reached !**

CE



THANK YOU FOR YOUR PARTICIPATION !

Simon MASTIO

simon.mastio@eifhytec.com



COSMHYC DEMO FINAL EVENT

Nicolas Quéromès, CCTVI
14.10.2025, Online meeting

Building an innovative hydrogen refueling station

Increasing usage and consumption on a HRS

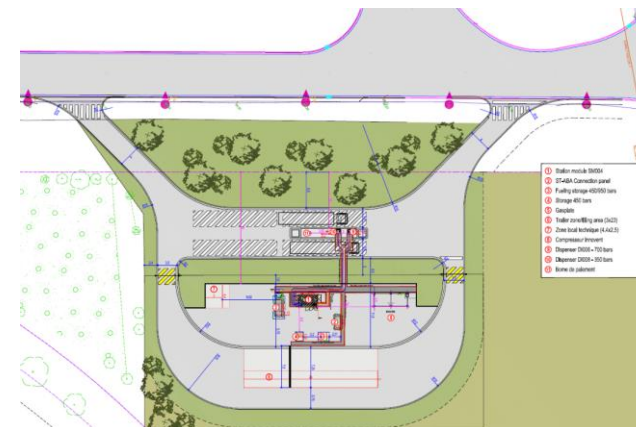
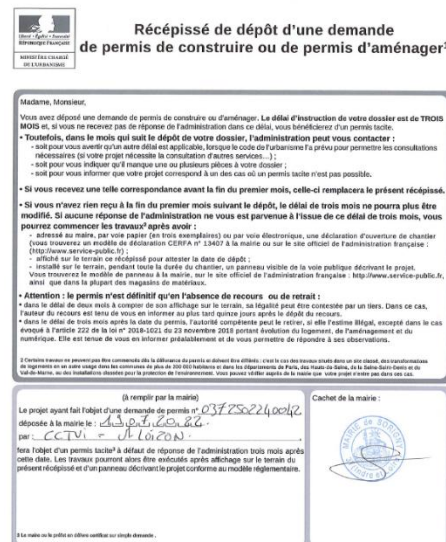
Using the HRS as a tool for training and dissemination

Sept 2021:
Contract between Cavendish
and CCTV

2022 Danger Study &
Environmental Impact Study

July 2022: Building Permit

2022: Initial Design plan



Clean Hydrogen Partnership

The project is supported by the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research



site preparation, civil engineering, and arrival of Cavendish HRS from sept 2022 to july 2023

View the timelapse video here: [The refuelling station demonstration site](#)

BUILDING AN INNOVATIVE HYDROGEN REFUELING STATION

February 2024
Eifer Gas panel and
storage installation



Eifer panel and HRS operating permit

May 2024
flocked the station for
communication purposes



July 2024
HRS operating permit



October 2024
HRS Commissioning



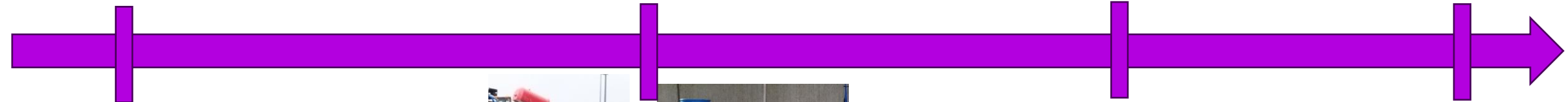
BUILDING AN INNOVATIVE HYDROGEN REFUELING STATION

Eifhytec compressor, final adjustment and compliance And public opening



December 2024– beginning of 2025
Installation and Commissioning of HRS

February 2025
Installation of the Flame detector and
trailer security valve
→ increases safety at the station in
accordance with the safety study



May 2025
Public opening of the HRS



July 2025
Installation of the Point of Sale

An innovative Hydrogen refueling station built in 4 years



- A lot of work has been done to increase usage at the hydrogen station, including:
 - Participation on local and national meeting (up to 15 meeting)
 - membership in national associations promoting hydrogen
 - response to calls for proposals for vehicle deployment (deployment of hydrogen ecosystems (ADEME 2022) and light commercial vehicle (ADEME 2025),
 - Business development

CCTVI help companies to develop their products by making available the hydrogen recharging infrastructure it owns.

INCREASING USAGE AND CONSUMPTION ON A HRS



CCTVI help companies to develop their products by making available the hydrogen recharging infrastructure it owns

This has brought a wide variety of vehicles to the station

We have thus enabled the refueling of an aircraft towing vehicle developed as part of the European project “Tulip”.

INCREASING USAGE AND CONSUMPTION ON A HRS: A VARIETY OF VEHICLE





There is a queue at the hydrogen station.

An image that is unfortunately all too rare.

USING THE HRS AS A TOOL FOR TRAINING AND DISSEMINATION

As a local authority with strong roots in its region, the CCTVI wants to help increase knowledge and economic development potential related to hydrogen.

- Communication with high school students (Lycée Grandmont)
- Training for students studying for a Bachelor's degree in Technology (BUT).

- Production of a documentary report on hydrogen at the CCTVI by three high school students from Lycée Grandmont in Tours as part of a class project. Number of people present : around 30



- Four-hour training session for 12 students in BUT GEII, EME (electricity and energy management) course entitled “Hydrogen energy: production, storage, and use.”



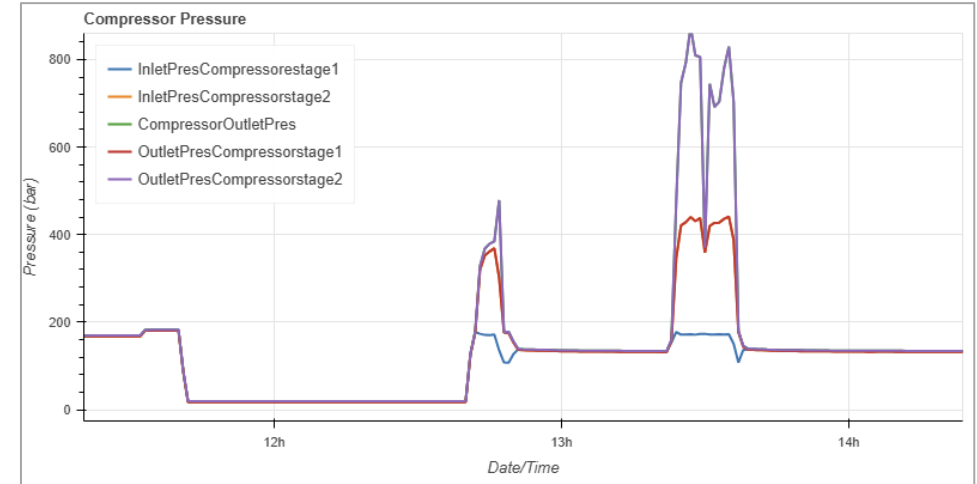
THANK YOU FOR YOUR PARTICIPATION



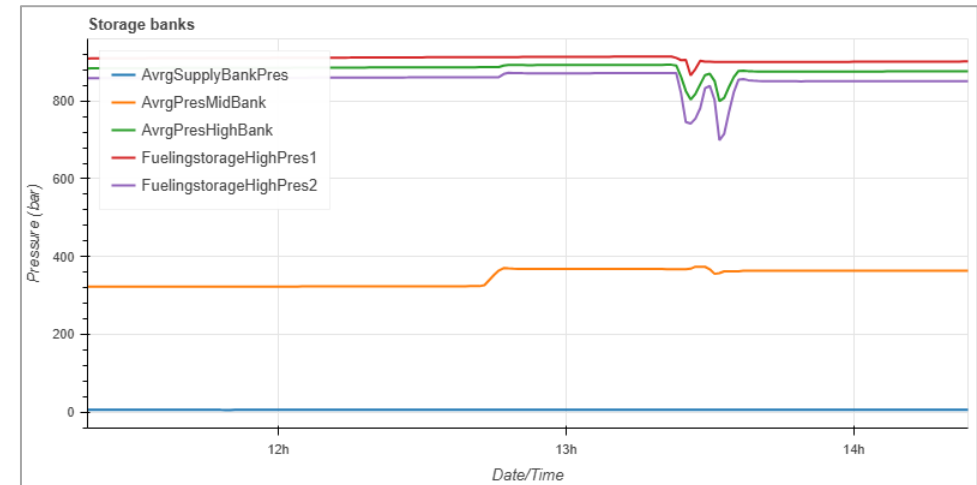
FINAL EVENT – COSMHYC DEMO

EIFER, Techno-economic insights on the demonstration phase and the innovative compression solution

- The technical feasibility of the integration and operation of the compression solution within the HRS infrastructure was demonstrated!
- A monitoring system was developed and integrated for each compressor allowed the collection of data of different nature:
 - HRS operation data
 - FCEV refueling data
 - HRS reliability
 - Mass and volume flows of hydrogen and hydraulic systems
- The data collected during this period was stored in a designated database, which facilitated subsequent analysis of the performance of the HRS and the metal hydride compressor.



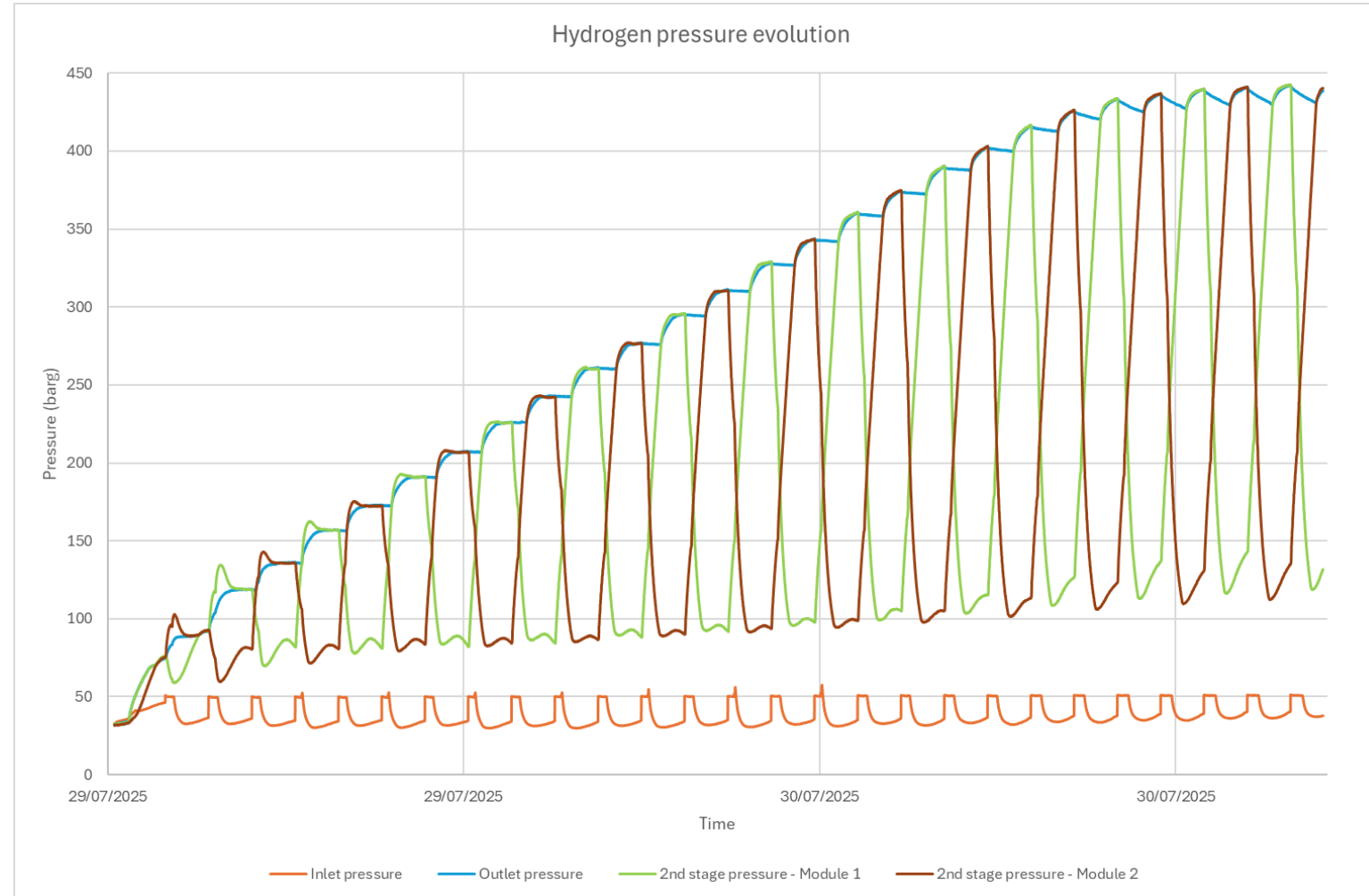
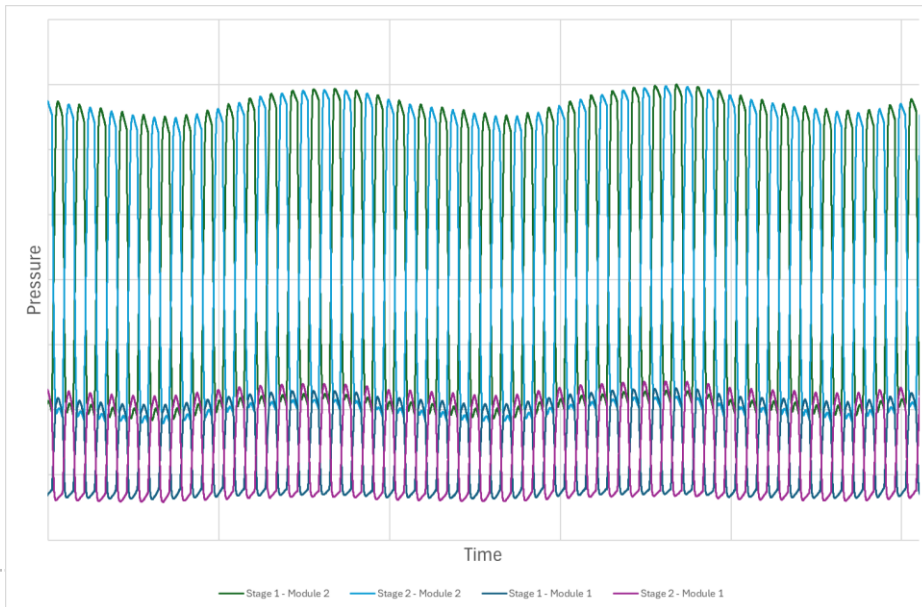
Mechanical compressor performance. Pressure records.



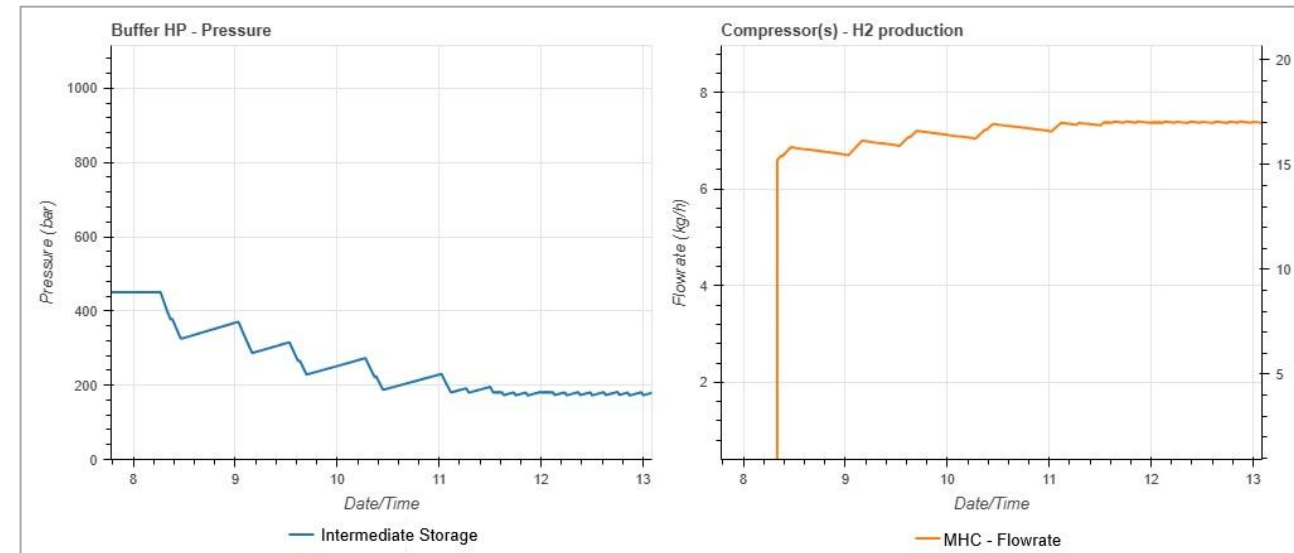
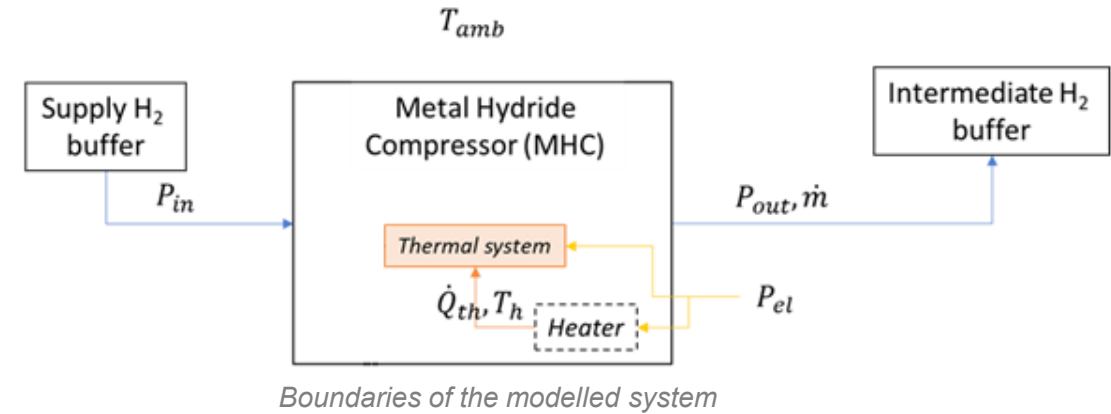
Pressure distribution of filling storage banks.

Successful results !

- > 1500 kg of H₂ compressed
- Mass flow up to 250 kg/day
- > 4600h of availability
- Constant performances



- The data collected from the demonstration phase allowed the definition of a first-approach model for the Metal Hydride Compressor
- Definition of the boundaries of the system and identification of the key parameters that impact the performance of the MHC
 - Power requirement
 - Mass flow
 - Outlet pressure
 - ...
- The relation between the outlet pressure and the mass flow was demonstrated and transferred into the model.
- Once the MHC was modelled, the innovative compression solution was integrated into an existing virtual tool to extrapolate its performance into a complete HRS.
- The utilization of such tool facilitates the assessment of the technology performance under dynamic simulations and contributes to decision-making processes of new projects.

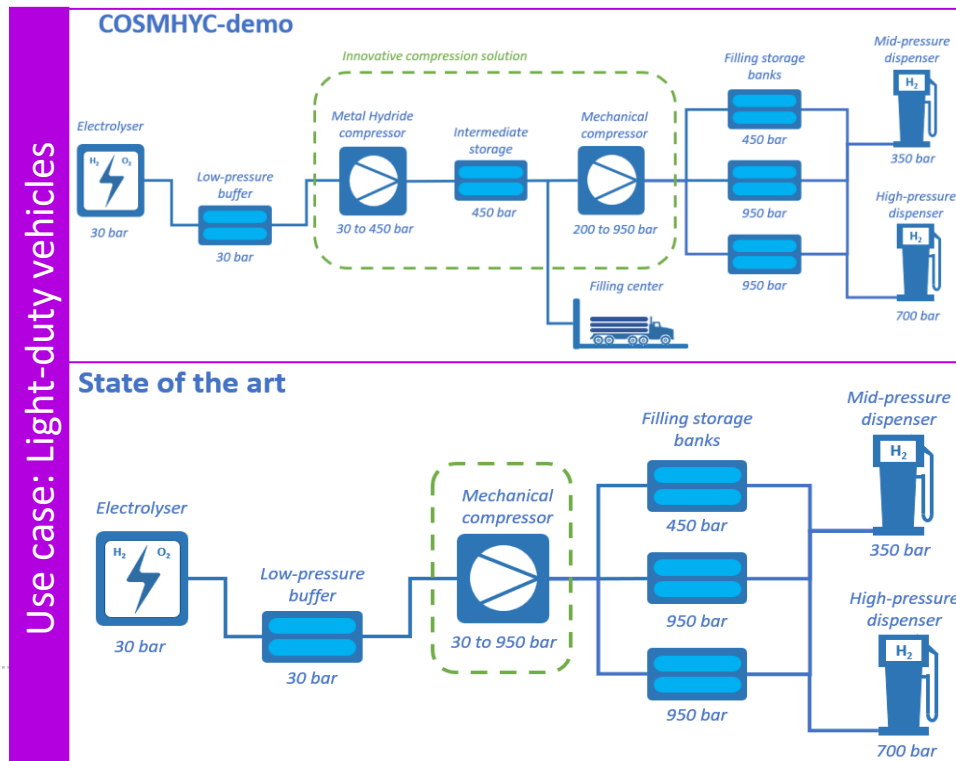


Simulated performance curve of the MHC within the COSMHYC demo HRS

The techno-economic evaluation for the COSMHYC-DEMO project includes:

Cost estimation, energy consumption, and scale-up analysis for the innovative compression solution proposed by COSMHYC DEMO, with the following main assumptions:

- Series production of 50 units/year for both compressors (i.e., metal hydride and mechanical compressors)
- Comparison of different configurations and capacities for HRS depending on the final demand (i.e., light-duty vehicles and heavy-duty vehicles)
- Although the analysis covers the overall Hydrogen Refueling Station, the focus of it lies on the compression stage



Preliminary results indicate:

- ❖ Quality strong savings in the maintenance and operating costs in the COSMHYC solution compared with the state of the art.
- ❖ Economic benefits on the energy consumption when an external heat source is available.
- ❖ A Life cycle analysis was carried out comparing the MHC and MC technologies. Given the low electricity consumption and the potential consumption of heat without environmental impact (waste heat), the MH compressor results in having lower impact during the operation phase.

**Final figures are still under internal validation and will be available on the Cosmhydc-demo website*

- Throughout the project, the consortium invested strong efforts to communicate about the project at fairs, exhibitions, conferences, and at dedicated events at the demonstration site
- Exchanges with the advisory led to interesting discussions and even to new projects!
- Topic of compression remains very relevant today as shown by strong interest in the project and the innovative solution



IEA HYDROGEN TCP & HY-FCELL AWARDS!



Clean Hydrogen Partnership

46.977 Follower:innen
1 Monat • Bearbeitet •

We are very proud that the **COSMHYC project series**, funded by the **Clean Hydrogen Partnership**, has been recognized with 2nd place in the IEA Hydrogen TCP Award of Excellence! 🏆

This achievement highlights the expertise and dedication of the consortium in developing cutting-edge hydrogen compression technology — from prototypes to a real hydrogen refuelling station.

Congratulations to all project partners for this milestone! 🎉

#hydrogen #hydrogentechnologies #hydrogencompression #fuelcells
COSMHYC project series



<https://lnkd.in/gYz2xUbJ>

Übersetzung anzeigen



hy-fcell – International Expo and Conference

6.567 Follower:innen
2 Tage • Bearbeitet •

hy-fcell Award 2025 - ceremony 🏆

Congratulations to the winners of the hy-fcell Award 2025! 🎉

Their innovations drive the transition towards a sustainable hydrogen economy.

Today at hy-fcell, they received their well-deserved prizes on stage.

👉 Swipe through the slides to view the winners of the different categories:

Category Research & Development: **Deutsches Zentrum für Luft-und Raumfahrt e.V.** with **Aalto University** & **GRILLO Chemicals GmbH**

Category Products & Markets: **EIFHYTEC**

Category Start-up: **Electrogenos**

#hyfcell #Hydrogen #FuelCell #award

Übersetzung anzeigen



Next Steps

- Further scale-up of the technology
- New use-cases beyond mobility
- Replication opportunities
- New Clean Hydrogen Project currently ongoing: www.hygher.eu



HIGH PRESSURE HYDROGEN VALUE CHAIN

PARTNERS

