Achievements

• Built and operated two *proof-of-concept* MH-compressors
• 5,000 hours of operation demonstrated
• Cost reduction program completed
• New design ideally suited for e.g.:
  – Industries
  – RE/H₂
  – Bottling of hydrogen
• TRL: 8-9

Unique metal hydride competence
The HYMEHC technology

Unique features of using thermal energy

• Almost no moving parts (valves)
  Low maintenance cost
  High safety

• Silent/vibration less

• Flexible installation
  (can be wall mounted, etc.)

• Guaranteed gas purity (impurities are trapped by the metal powder)

• Utilization of waste heat
  • Almost no energy cost
  • Access to geothermal resources
HYMEHC-5

- Capacity: 5 Nm³/h
- Input pressure: 6 bar
- Output pressure: 200 bar
- 2-stage compressor system

HYMEHC-10

- Capacity: 10 Nm³/h
- Input pressure: 10 bar
- Output pressure: 200 bar
- 2-stage compressor system
Vessel with metal hydride powder inside has a larger hydrogen capacity than an empty vessel...!
Put simple:
By means of a HYMEHC-system from HYSTORSYS low pressure hydrogen gas is transformed into high pressure hydrogen gas by periodically heating/cooling of the metal hydride vessels.
By means of a HYMEHC-system from HYSTORSYS low pressure hydrogen gas is transformed into high pressure hydrogen gas by periodically heating/cooling of the metal hydride vessels.

Put simple:

Thermal Hydrogen Compression
Improvements

Proof-of-concept

• Solid-state device
  • Low maintenance cost
  • High safety

• Silent/vibrationless

• Guaranteed gas purity

• Utilization of waste heat / thermal energy resources

New design

Learning

• Lower investment cost

• More compact system

• Lower heating fluid temperature requirements

• Ease of maintenance
Applications – Example 1

**INDUSTRIAL HYDROGEN APPLICATIONS**

On-site H₂ production / backup solution – Principle drawing

- **Utility power**
- **Water electrolysis**
  - The industrial process is continuously fed H₂ directly from the water electrolyser
  - A small part of the H₂ feed is compressed and stored for later use exploiting only thermal energy (e.g., available as waste heat)
- **Pressurised H₂ storage**
  - The industrial process is fed H₂ from the storage only when needed
- **Hot water**
  - Industry
    - Chemical
    - Electronics
    - Food & beverage
    - Glass
    - Metal
    - ...
Applications – Example 2

STAND-ALONE HYDROGEN POWER APPLICATIONS
Renewable (e.g., wind/solar) H₂ power system – Principle drawing

Renewable energy

- Wind turbine
- Water heater
- Electrolyser
- HYMEHC-04 Expandable
- Pressurised H₂ storage (150-200 bar)
- Fuel cell

Electricity
Hydrogen
Hot water
Potential usage – Customers

• Industrial applications
  - Bottling onsite, utilizing waste heat from the industrial process, almost no use of electricity

• Storing H₂ from e.g., wind or solar installations

• First stage compression at refueling stations
  - e.g., HyNor Lillestrøm

• In combination with high-temperature fuel cells

• Bottling of H₂

• Reforming of H₂ – waste heat available

• Other
Conclusion

• Proof-of-concept – completed successfully
• R&D activities have proved and improved the technology
• Important partnerships in place – but interested to expand
• HYSTORSYS is *ready* for market deliveries

→ Providing a unique way of compressing hydrogen ←
HYSTORSYS AS

Postal: P.O.Box 45, NO-2027, Kjeller, Norway
Visit: Instituttveien 18, NO-2007 Kjeller
Email: post@hystorsys.no
Web: www.hystorsys.no

a

and

THE BLUE MOVE FOR A GREEN ECONOMY

Interreg
Öresund-Kattegat-Skagerrak
European Regional Development Fund
EUROPEAN UNION

and

NORSK INNOVASJONSKAPITAL
Managed by Televenture

company