CDTI-NEDO online Joint Workshop on Hydrogen Technology
- Green Hydrogen Production & Mobility -

High-Pressure Hydrogen Compression Technology: Key to the New Energy Economy?

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Hiperbaric
HIGH PRESSURE TECHNOLOGIES

HIPERBARIC - Who are we?

- ✓ Hiperbaric is a company with more than 20 years of experience leading the High-Pressure Processing Technology worldwide.
- ✓ Turnover above 50 M €
- ✓ Team of more than 120 employees. More than 60% engineers and 10 PhD
- ✓ We have participated in more than 20 R&D projects, investing over 18 M €

HIPERBARIC – Our Values

- ✓ We keep confident in our values, that have led us to our current situation and granted us the international reputation that we held nowadays.

- ✓ **Mission:** satisfy our customers requirements with reliability to commercialize healthy foods, focusing on the development of the human team.

- ✓ **Vision:** to be the reference provider worldwide on High Pressure Technology machines.

- ✓ **Values:** we are oriented towards our customers, with reliability and trust. We keep with enthusiasm, commitment, initiative, teamwork, austerity and clarity

HIPERBARIC High Pressure Technologies
Products, services, technologies of the company

- ✓ **HPP Technology**
  - Isostatic pressure application at 6000 bar.
  - Enhances self-life of foods with high content of water.
  - Avoids the use of any chemical or heat treatment, preserving its taste properties.
  - First world development of HPP-Bulk technology for processing food products with HPP but without plastic packaging.
- ✓ **Hot Isostatic Pressing**
  - Isostatic pressure and temperature at 2000 bar and 1400 ºC
  - Heat-treatment ideal for additive manufacturing technology as a post processing technology to increase mechanical properties of parts made by Additive Manufacturing.
- ✓ **Hydrogen Gas Compression**
  - Compression from 20 bar up to 1000 bar
  - Mass flow over 20 kg/hour.

HIPERBARIC High Pressure Technologies
Hydrogen compression

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✓ Why do we compress hydrogen?

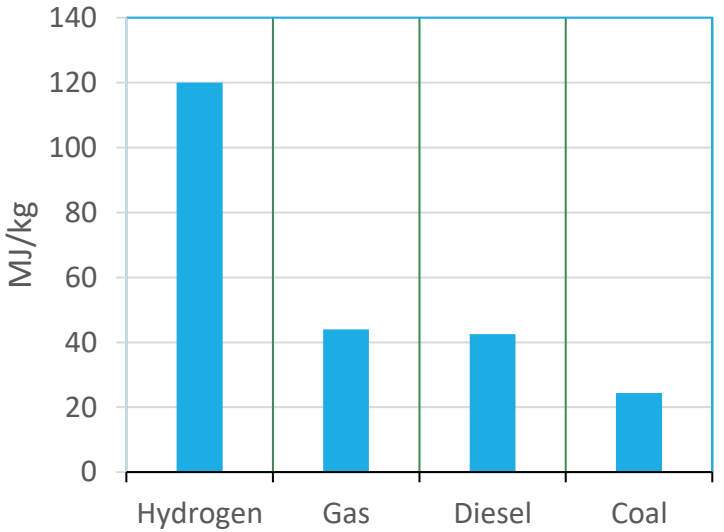
Hydrogen has the highest heat power per kg of all the know fuels

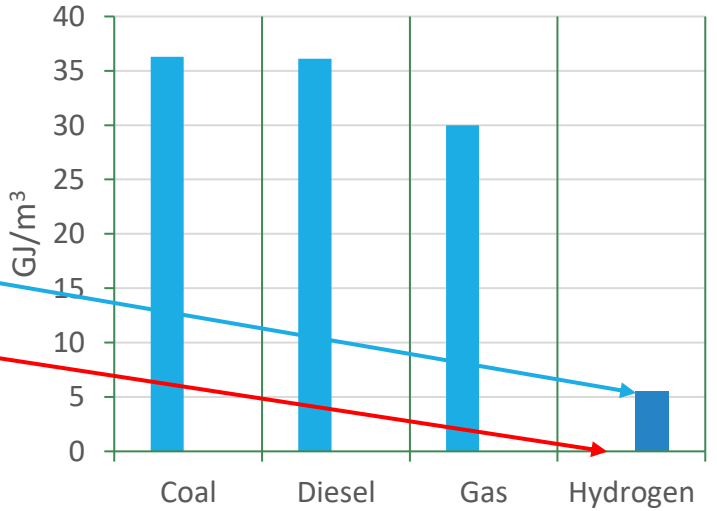
Hydrogen:	120	MJ/kg
Gas:	44	MJ/kg
Diesel:	42,5	MJ/kg
Coal:	24,4	MJ/kg

Unfortunately, at amospheric pressure and 25ºC, the energetic values are change drastically:

Hydrogen (900 bar)	5,5	GJ/m^3
Hydrogen gas:	9,84	MJ/m^3
Gas:	30	GJ/m^3
Diesel:	36,1	GJ/m^3
Coal:	36,6	GJ/m^3

Heat power comparison





HIPERBARIC High Pressure Technologies
Hydrogen compression

- ✓ **The core of the compressor is the multiplier**
  - It turns the hydraulic pressure (300 bar) into hydrogen pressure (1000 bar).
  - Long stroke (500 mm) to optimize mass flow and energy consumption and heat exchange.
  - Physical separation between fluids to ensure the oil-free operation of the compressor.
- ✓ **Hydraulic system**
  - New hydraulic technology that avoids excess of oil reservoir and reduces overheating.
  - Optimal balance between power-flow requirements.
- ✓ **Safety**
  - Concern over the safety requirements for civil operation.
  - Self-diagnosis of hydrogen leaks and constant air renovation.

HIPERBARIC High Pressure Technologies
Hydrogen compression

- ✓ Two multiplier models
  - Model 1: from [40,200] bar to 1000 bar.
  - Model 2: from [20,40] bar to 500 bar.
- ✓ Compact compression unit (*plug and play* concept)
  - It gathers the hydraulic, cooling and safety systems.
  - It can be customized with different multipliers. It adapts to many different projects.
- ✓ Ready to plug into hydrogen refuelling stations.
  - Civil transport
  - Industry and hydrogen transport service.

Ideas for a Japan – Spain collaboration

- ✓ Hydrogen use for civil transport
  - Hiperbaric is ready to lead the transition from the fossil fuels to hydrogen energy system, developing the refuelling infrastructure needed to supply power to the new generation of vehicles.
  - In Spain, the current vision in the short-term is to provide medium size examples of hydrogen supply chains, from generation to final use.
    - For this project, Spain is ready to deploy its compression technology
    - Japan could spread its vehicle industry, developed to work with hydrogen.
  - On the mid-term vision, a collaboration between both countries could be reciprocal, working on the installation of the refuelling stations and providing the transport solution for the civil public in both countries.

Ideas for a Japan – Spain collaboration

- ✓ Hydrogen use for industry
  - Autonomous systems of compressed hydrogen and fuel-cells could start as demonstrative industrial power plants.
  - The hydrogen industry has to grow in terms of mass production if it is to be compared with the current scale-energy industries based on fossil and nuclear fuels.
  - Both countries can be benefit if work together on first small and medium industry projects.

Thanks for your attention!

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