

Hydrogen Storage

Driving Energy Transformation



HEXAGON

Rick Rashilla

H2@Scale Fuel Cell Truck Powertrain Activity Presentation

Jul 31 2018

Hexagon business areas

LOW-PRESSURE LPG

LPG CYLINDERS



HIGH-PRESSURE CNG & H2

MOBILE PIPELINE®



HYDROGEN PRODUCTS



LIGHT-DUTY VEHICLES



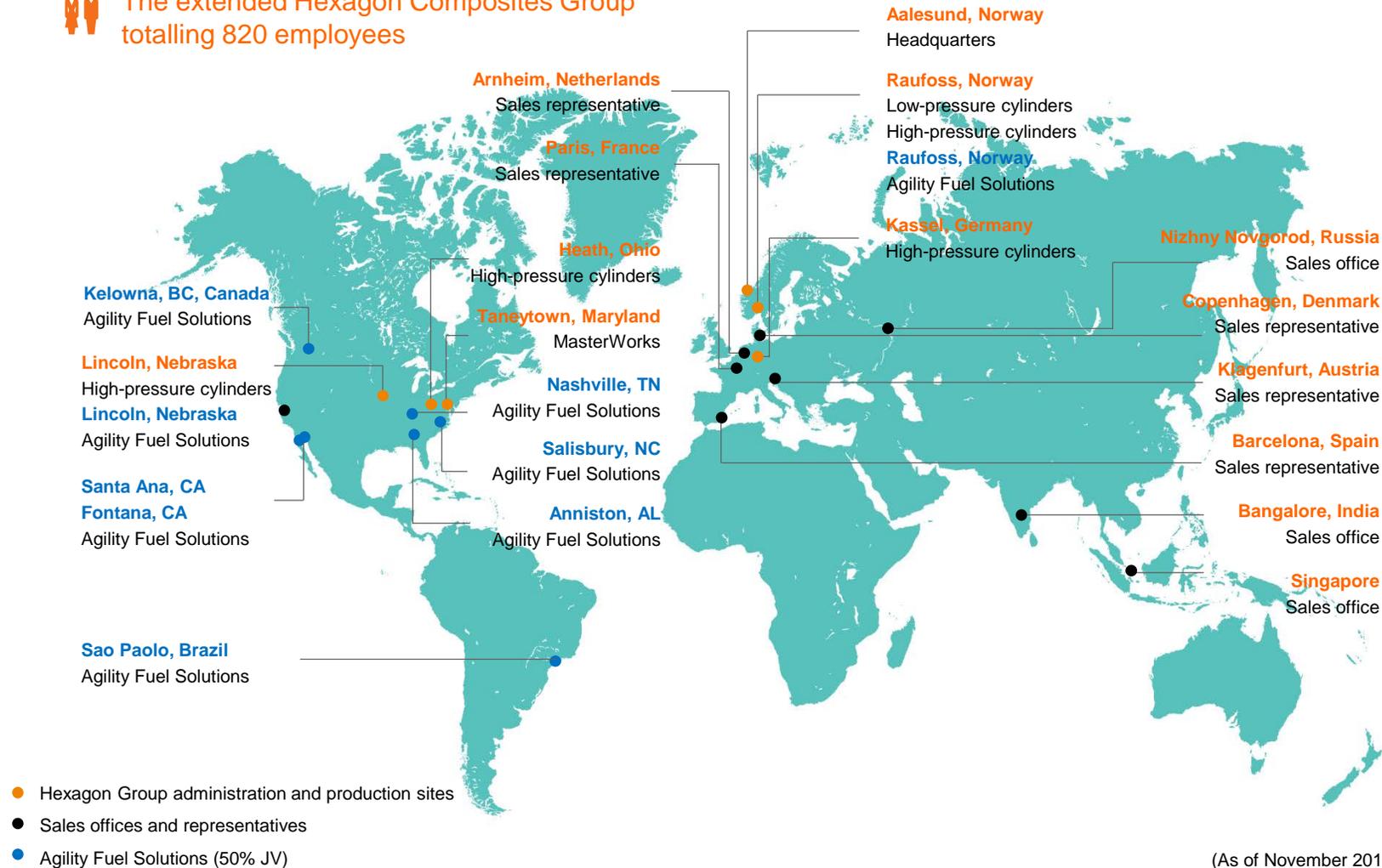
AGILITY FUEL SOLUTIONS (50%)

HEAVY-DUTY VEHICLES



Global geographical footprint

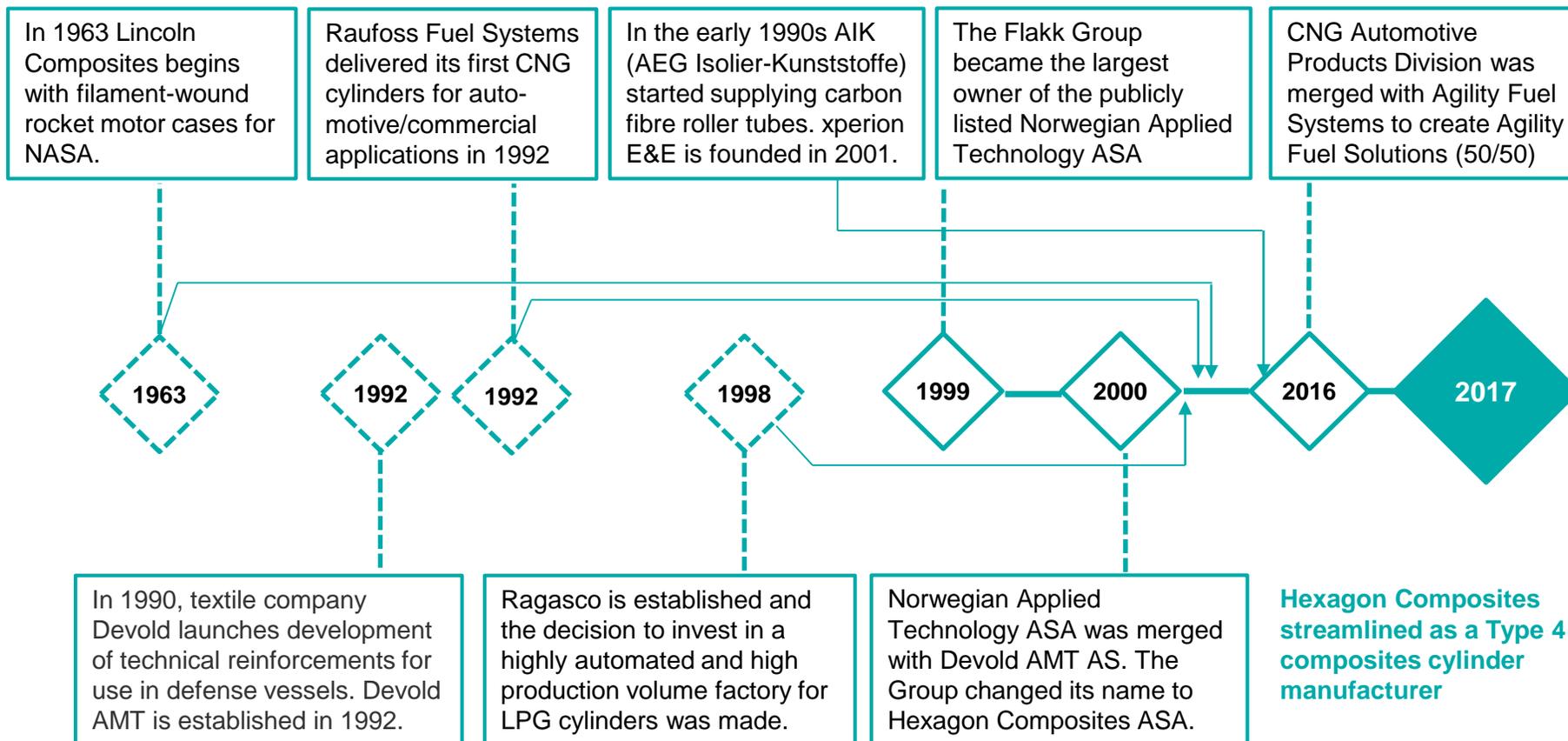
 The extended Hexagon Composites Group totalling 820 employees



(As of November 2017)



Leading since 1963





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Our value proposition

Why hydrogen?

- Plentiful and efficient by-product of excess renewable energy
- Fast refuel
- Transportable outside the grid



Hydro



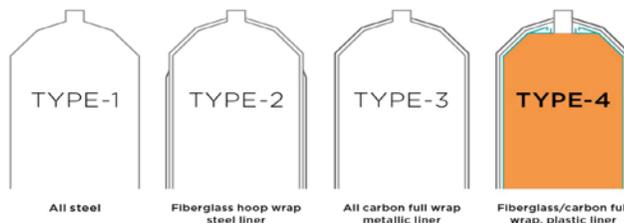
Wind



Solar

Why Type 4 cylinders?

- Light, strong and long lasting
- All OEMs prefer Type 4 – Toyota developed & deployed their own
- Plastic materials resist cyclic fatigue = great under pressure vs. metal



Why Hexagon?

- Decades of Type 4 production and technical leadership
 - Tiny H₂ molecule requires technical excellence
 - Best in class winding rate = lower capex
- Lowest material cost input
 - Fiber by the ton
 - Resin by the barrel
 - Plastic pellets by the tote



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Composite Cylinder Type 4 – Safe and proven track record

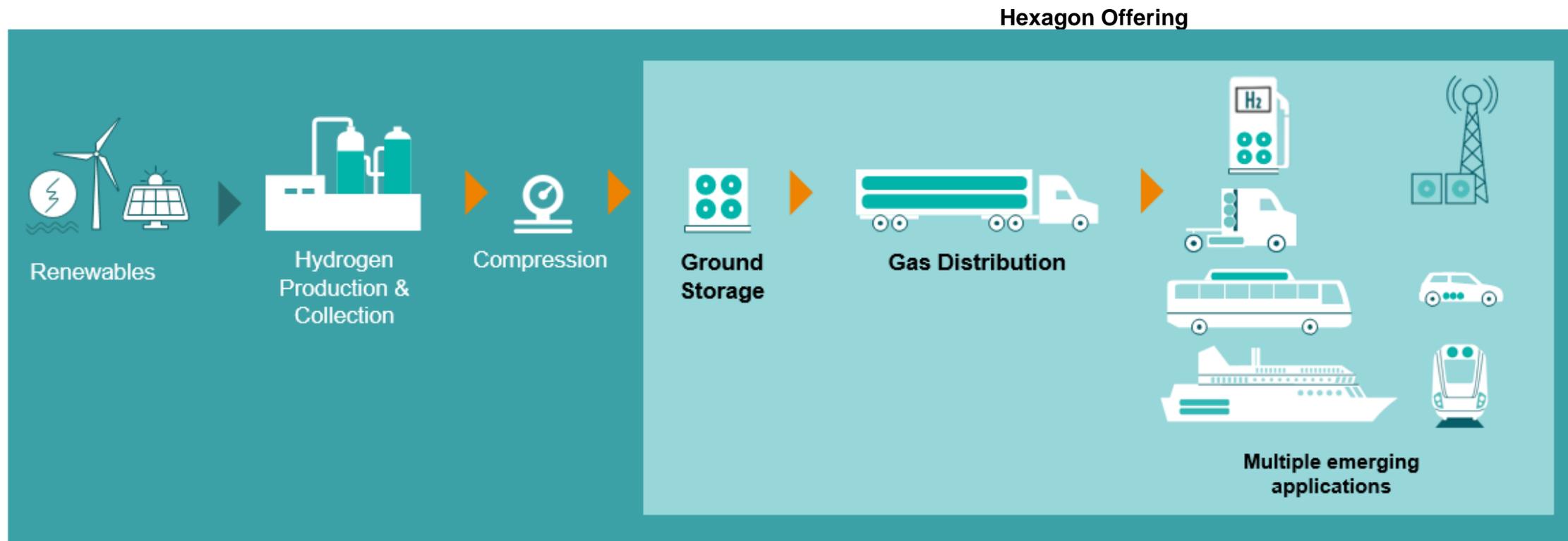
- Storing hydrogen at high pressure requires sophisticated technology and experience
 - Hexagon has manufactured nearly 0.5 million high pressure tanks and more than 11 million Type 4 propane tanks
- Hexagon’s proprietary software and approach to tank design meet the highest industry standards, e.g., at global car manufacturers
 - Made of light weight plastic materials that do not corrode
 - Passed extreme temperature testing
 - Patented “metal to plastic” interface surpasses regulatory requirements
 - The only Type 4 tank producer that combines technical success with significant manufacturing capacity





Hexagon is well positioned across the Hydrogen value chain

- Hexagon is currently offering composite Hydrogen tanks for a wide range of applications





DELIVERING ENERGY SOLUTIONS

Hexagon Composites delivers safe and innovative solutions for a cleaner energy future

We are adapting our leading composite pressure vessel technology for a wide range of mobility and storage applications





gas distribution products



- High-capacity, cost-effective transportation and storage solutions
- **TITAN™** ideal for businesses that require a large consumption of gas at a high flow rate, but are not currently served by pipeline
- **SMARTSTORE™** ideal for areas where large containers are not permitted, storage space is limited, and surrounding roads have restricted load conditions
- **TUFFSHELL® Ground Storage** ideal for natural gas filling stations with small footprint or weight restrictions

The flexible DOT solution for US/CAN

- 20ft ISO container
- Capacity adjustable to customer demands
- Full capacity on 25 MPa = 415 kg Hydrogen



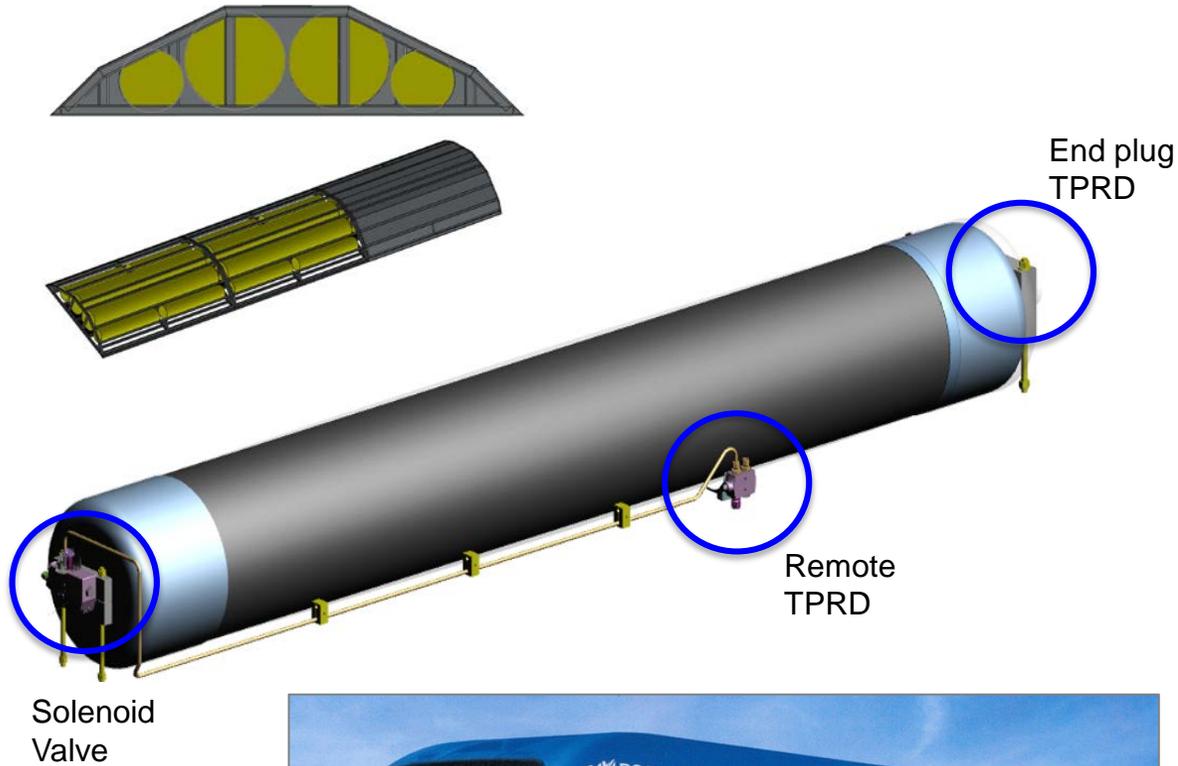
The ADR solution for Europe

- Fast exchange of container modules
- Capacity adjustable to customer demands – range from 10ft to 45ft
- Different options on pressure – 25MPa – 30MPa – 50MPa.
- Full capacity range from 160 kg to 1085 kg.





Hydrogen Bus cylinder – @35MPa – roof top mounting



- Allows rooftop assembly

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Heavy Duty Vehicles

- Toyota truck project
 - Deliveries made

- Asko/Scania – Grocery Wholesaler truck. Norway
 - Expected to start operation in 2018



TITAN[®] XL The Heaviest of Heavy Duty

The bulk transportation solution for US/CAN

- Our Mobile Pipeline[®] also for use with Hydrogen
- DOT approval already in place



40ft TITAN[®] module with full capacity at
25 MPa = 875 kg Hydrogen

Tare weight 19 280 kg



TITAN[®] h2 tanks suitable in boats and cruise vessels

- **Hydrogen electric ship**

- Flexible solutions
- Suitable for short-sea

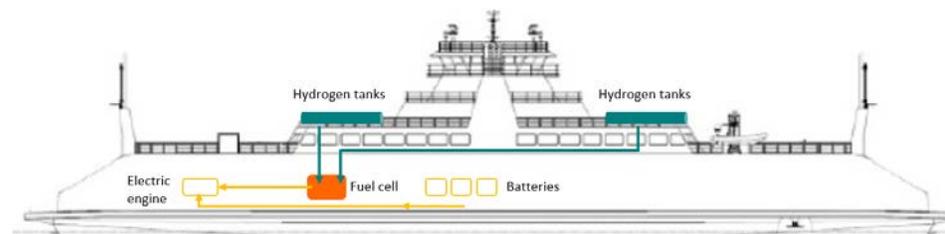
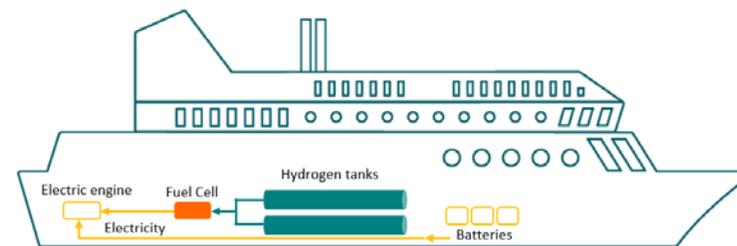
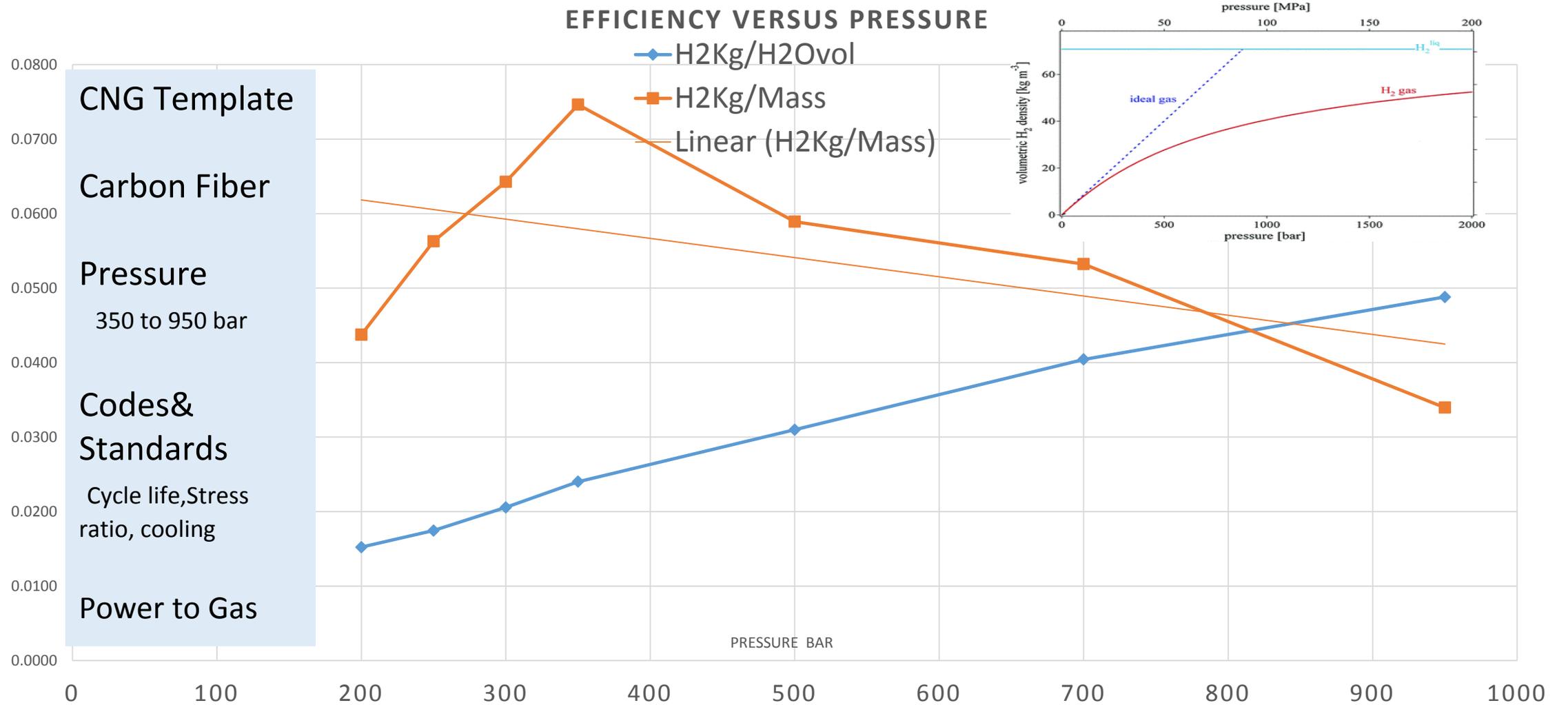


Photo: GKP7H2/Brodrene Aa



H2 Storage Challenge





Thank you for your attention!

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