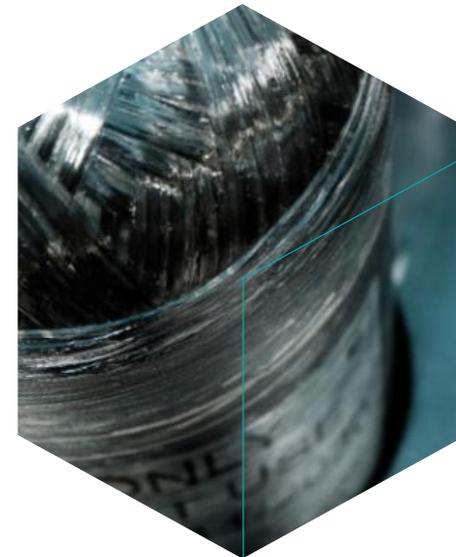
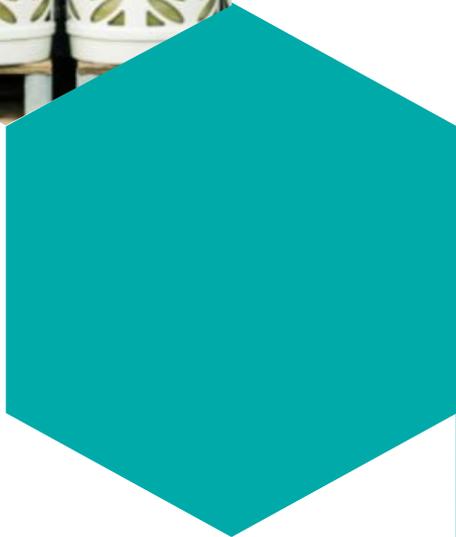


Driving Energy Transformation

Hexagon Purus
and



Rick Rashilla JAN 2020
SVP Research and Development

Hexagon

900 employees; USA, Canada, Germany, Norway; hexagongroup.com



HEXAGON

HEXAGON RAGASCO



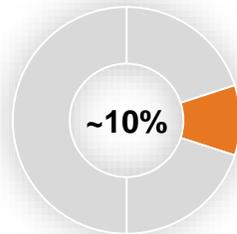
LPG



HEXAGON PURUS



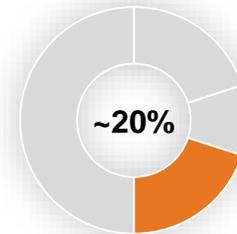
Hydrogen & CNG/Biogas Light-Duty Vehicles



MOBILE PIPELINE®



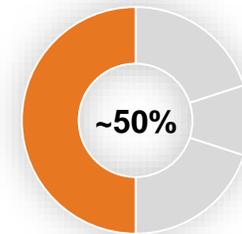
Gas Transportation



Agility® fuel solutions



Medium and Heavy-Duty Vehicles



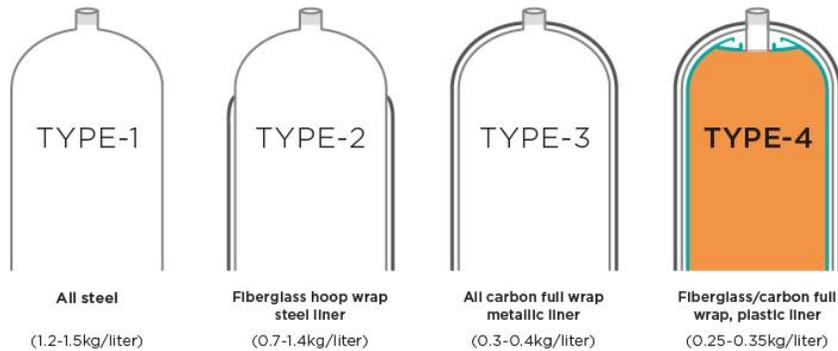
c. share of pro-forma revenue before Group eliminations

Leading Type 4 pressure cylinder technology since 1963

The heart of our storage and transport solutions



HEXAGON



Type 4
Low-pressure
cylinder LPG



Type 4
High-pressure cylinder
CNG, biogas & H2

LEAK-FREE

Precision-machined valve interface ensures leak free operation

LIGHTWEIGHT

Lightweight reduces vehicle mass and enhances handling and drivability

NON-CORROSIVE

Polymer liner is corrosion free

GOOD FATIGUE STRENGTH

High-strength carbon fiber and/or glass fiber construction reduces impact damage and fatigue

Delivered 500,000 high-pressure vehicle cylinders and 15 million low-pressure cylinders

We enable mobility and storage solutions

For alternative fuels - Hydrogen, biogas/RNG and natural gas



HEXAGON

		Fuel & Energy sources
<p>Automotive</p> <p>Fuel cylinders for light-duty vehicles, transit buses, refuse trucks and heavy-duty trucks</p>		<p>Hydrogen Biogas/ RNG Compressed natural gas (CNG)</p>
<p>Mobile Pipelines</p> <p>Storage and transportation cylinders and modules for off-pipeline applications</p>		<p>Hydrogen Biogas/ RNG Compressed natural gas (CNG)</p>
<p>Marine & Rail</p> <p>Fuel and storage cylinders for marine and rail</p>		<p>Hydrogen Biogas/ RNG Compressed natural gas (CNG)</p>
<p>Ground storage</p> <p>Cylinders for ground storage</p>		<p>Hydrogen</p>
<p>Household and leisure</p> <p>LPG cylinders for leisure activities, household and industrial applications</p>		<p>LPG (Propane and Butane)</p>

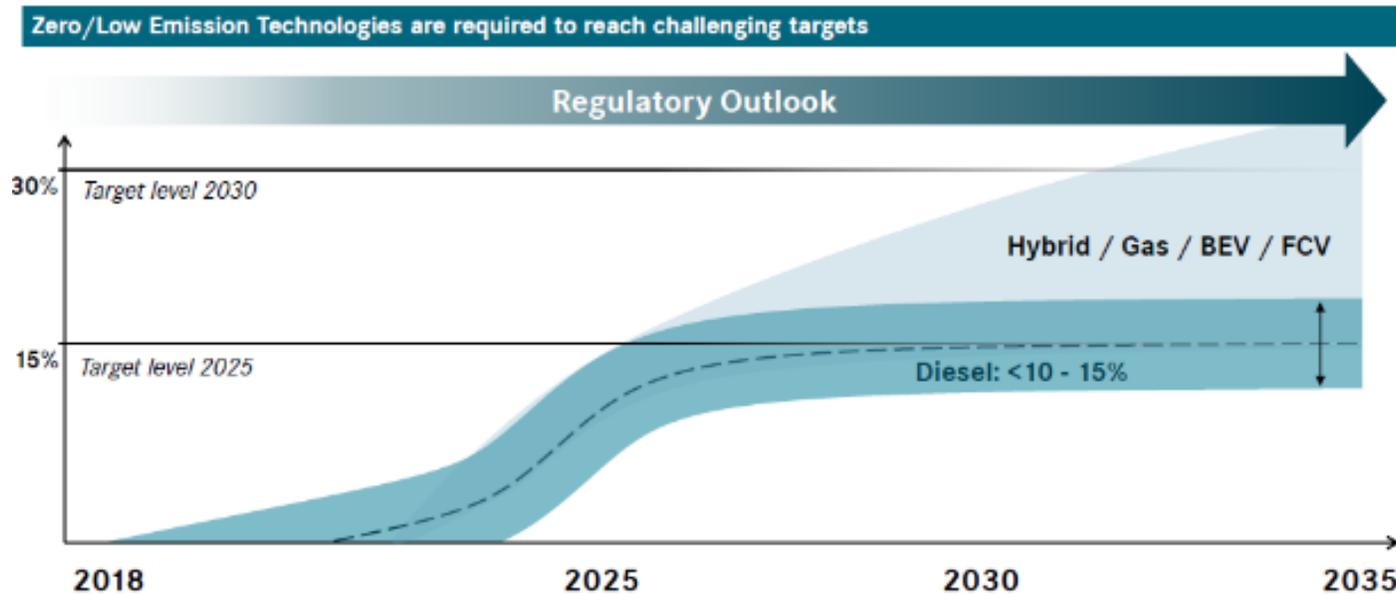
Emission reduction is a global target

For example.....

New CO₂ Regulation (EU) 2019/1242

- Truck focus - Regulation in force as of Aug 14, 2019
- CO₂ reference period: July 2019 through June 2020
 - From 2025 onwards: 15% reduction
 - From 2030 onwards: 30% reduction

• This workshop helps all user countries



CNG and Hydrogen IMPROVE THESE SYSTEMS AND CYLINDERS



HEXAGON

- Global Bus systems
 - Longitudinal mounted
 - Transfer mounted
 - Back of Cab mounted
- Back Of Cab or Side Mount Truck systems
 - North America
 - Europe
 - Asia
- Gas Transportation
 - Intermodal containers
 - Truck Chassis mounts





Challenges to growth in CNG and H2

Cost, Health Monitoring, Regulatory alignment

- Cost reduction during the launch phase = *approved business case*
 - Infrastructure for refueling and moving gas needs subsidies
 - Reduce Fuel Cost
 - “Free” Fuel Cost in LDV’s removes competitive pressure
 - Little downward movement
 - But most HD/MD demands are “private” fill
 - Tax reduction for “clean fuels” leads to zero emission
- Carbon Fiber price competition works
 - Fiber factories will benefit from special tax & investment treatment for N America expansion in fiber and precursor production



Challenges to growth in CNG and H2

Cost, Health Monitoring, Regulatory alignment

- Health Monitoring can assure safety and least cost products
 - Would benefit from DOE funded projects to reduce component cost and validate inspection techniques for tanks and valve/TPRD systems

- Regulatory alignment – thru task force action
 - Country- USA, Canada, peculiar rules for many Asia locales
 - Continent- EU sets a good example but EC-79 to be replaced w/R134
 - Industry- align the differences in PED, TPED, ASME and local law
 - Technology- (tank vs. system, stress ratio reduction for carbon only)

- And two practical reminders for the truck and bus fuel system engineer
 - 350 Bar is a cost effective solution
 - Standardized tank sizes and mounting systems lead to efficiency



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CLEAN ENERGY SOLUTIONS FOR A WIDE RANGE OF APPLICATIONS

- CNG Light-Duty Vehicles
- Hydrogen
 - H2 Automotive
 - H2 Distribution
 - H2 Ground Storage
 - H2 Marine
 - H2 Rail
 - Backup Power



Driving Energy Transformation



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