

## 10 Material Solutions to Fuel Hydrogen Future

It's no secret that hydrogen economy is around the corner. More than 510 projects worth over \$110 billion (FDI+) have been announced globally, according to the Hydrogen Council!

### Is Equipment Ready for Hydrogen?

Most of the valves, compressors, electrolyzers, and other key equipment needed to produce, store, and transport hydrogen need significant upgrades to take on the biggest challenges presented by hydrogen:

- High permeability of hydrogen can cause sealing issues and metal embrittlement.
- Hydrogen's low lubricity can lead to wear and friction issues.
- Exposure to hydrogen and long-term pressure cycling is impacting polymers (fatigue, change in dimensional and mechanical properties...)
- Extractables and leachables in hydrogen can cause contamination of fuel cells.
- High impeller tip speed required to compress hydrogen with centrifugal compressors is barely achievable with metal.

### Greene Tweed Has Customers Covered – No Excuses, No Exceptions

With over 200 engineers working across three continents, Greene Tweed is ready with a range of high-performance elastomers, thermoplastics, composites, and engineered components that make machinery dependable, efficient, and safe in hydrogen power applications.

#### HERE ARE A FEW:



#### Fusion® 938

RGD-resistant FKM elastomer that demonstrates remarkable stability in demanding hydrogen environments at very high pressure.



#### EPM 893

RGD-resistant EPM compound specifically developed for low temperature hydrogen & CCUS applications down to -65°C/-85°F.



#### Arlon 3000XT®

The world's first cross-linked PEEK-based polymer is ideal for electrolyzers and fuel cells that need material solutions that can withstand challenges such as creep, chemical compatibility or degradation of mechanical properties at increased temperatures.



#### Arlon® 3160XT

Glass-filled cross-linked PEEK with exceptional creep resistance (20x better than glass-filled PEEK). Ideal for extreme pressure applications like valve seats or backup rings.

HERE ARE A FEW:



### Arlon® 3555XT Piston Rings

Lubricated cross-linked PEEK with enhanced tribological properties at extreme pressures and temperatures. Ideal for reciprocating compressor components like piston rings, rider bands and packing rings.



### Xycomp® Impeller

Lightweight composite impeller made from carbon-fiber reinforced thermoplastic composite with high strength-to-weight ratio. The third design iteration reached a tip speed limit of 688 m/s (47,800 RPM, Ø275mm).



### Avalon® 56

High-performance modified PTFE that is ideal for valve stem seals and valve seats in hydrogen services.



### MSE®

Unidirectional metallic spring energized PTFE contact seals suitable for hydrogen services. Spring helps keep robust seal for temperature and pressure cycling, with softer seal jackets able to seal small hydrogen molecules. A new design targeting liquid hydrogen applications is currently being patented.



### GT® Ring

'T'-shaped cross section elastomer with hydromechanically activated anti-extrusion rings that deliver excellent performance in hydrogen temperature and pressure cycling applications, with less demanding surface finish requirements than spring energized lip seals.



### V-Stacks

V-rings that keep fugitive emissions low to stay safe when working with hydrogen and are ideal for valve stem seals.

## About Greene Tweed

Greene Tweed is the manufacturer that meets critical industry demands with trusted performance. We engineer sealing solutions, connectors, and structural components to outperform and outlast in the world's harshest environments. For 160 years, we've served clients in upstream & downstream oil and gas, aerospace, defense, semiconductor, and other sectors with a custom, collaborative approach that delivers certainty for their crucial operations.

1 - Source: Hydrogen Council Global Hydrogen Compass 2025



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