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NEW ENERGIES CASE STUDY

HYDROGEN PIPELINE TRANSPORTS & 100% H_2 CERTIFIED THERMOPLASTICS (IN ACCORDANCE WITH API 6D, ANNEX M)

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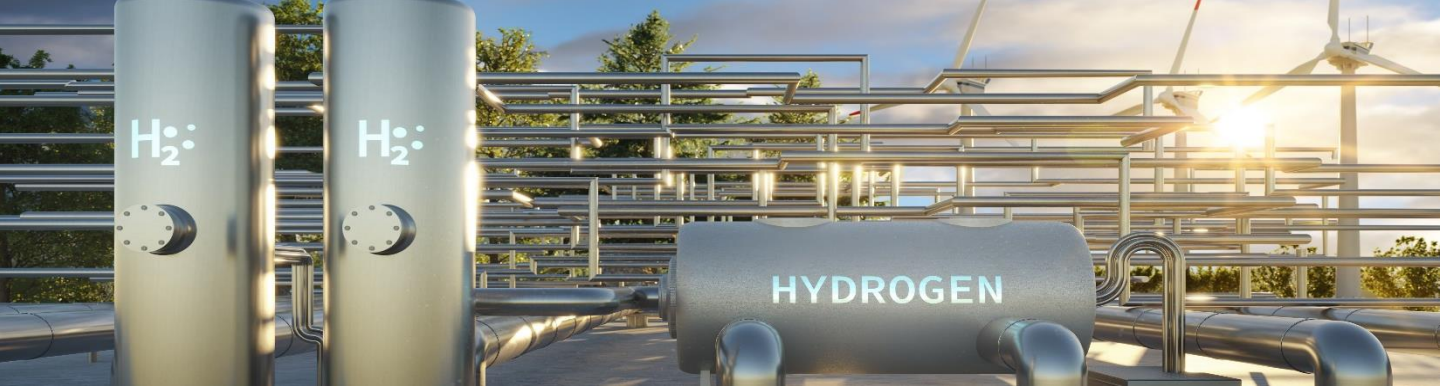

OMNISEAL® SPRING-ENERGIZED SEALS

Hydrogen Pipeline Transports & 100% H_2 Certified Thermoplastics (In Accordance With API 6D, Annex M)

Christopher Valdenaire April 2026

CARBON-FREE ENERGY PROVEN DURABILITY RELIABILITY

Environment

There are approximately 5,000 km (3,100 miles) of hydrogen pipelines in operation worldwide (according to IEA, 2023). Their use is primarily in hydrogen-demanding industries such as petroleum refineries and chemical plants, relied upon as a mature and cost-effective method of moving high-volume, continuous flows of hydrogen gas safely and efficiently.

Since the world is transitioning to sustainable energy solutions, hydrogen is emerging as one of the key components of this clean energy landscape. As a result, the expected planned expansion of hydrogen production capacities requires an additional hydrogen gas pipeline network to ensure safe transportation from production facilities to end-users or storage sites.

Challenge

The use of existing natural gas pipelines for hydrogen transport - whether through blending hydrogen with natural gas or through dedicated hydrogen pipelines - presents a variety of technical challenges, especially concerning material compatibility and sealing performance. As a much smaller molecule than natural gas, hydrogen requires careful consideration in its transport infrastructure. The following are two key challenges specific to selecting sealing solutions in these critical systems:

1. Permeation Risks: Due to its small molecular size, hydrogen poses a higher risk of permeating through seals, i.e., leakage from joints, seals, and pumps. To reliably mitigate leakage, it is vital to use sealing materials with low permeability.

2. Material Degradation: Hydrogen embrittlement can progressively weaken metal components and cause structural failures. It is recommended that you select sealing components that can resist hydrogen penetration and degradation to uphold pipeline integrity and performance.

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Solution

Through co-engineering and collaborating with many valve industry partners, Omniseal Solutions participates in technical committees that are establishing new regulations for hydrogen valves. As a result of the growing trends and expectations, Omniseal Solutions decided to launch a new ageing test on seven of its proprietary Fluoroloy® and Innoloy® materials in full compliance with the newly developed Annex M of the API Specification 6D.

The following are the selected materials and conditions:

- Fluoroloy® A01, A02, A08, A19, A41 (Proprietary Custom PTFE)
- Innoloy® G30 (Proprietary Custom PEEK)
- Ageing test conditions compliant with ISO 23936-1:2022

Soak Media	100% Hydrogen
Soak Pressure	42 MPa [420 bar / 6091 psi]
Soak Temperature	175°C, 190°C, 205°C
Soak Durations	7, 14, 28, 42, and 56 days

According to these test results, all selected materials successfully passed the acceptance criteria for tensile properties, mass and volume change (third-party certificates are available upon request).

Technology Advantages

- Fluoroloy® and Innoloy® thermoplastic materials do not degrade even in extreme conditions such as being exposed with pressure-temperature cycling
- Polymer materials are resistant to Rapid Gas Decompression (RGD)
- Third-party material certificate available upon request
- Our design engineering team can customize Omniseal® spring-energized seals to precisely fit your valve dimensions
- Stem sealing solutions are compliant with Low Fugitive Emission requirement ISO 15848-1
- Multiple material options are available, including PFAS-Free*

*PFAS-Free here means we do not intentionally add PFAS material in the product, but does not exclude the possibility of traces, as these materials are common in the environment.

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Design Expertise & Tailor-made Solutions for Your Critical Applications

Omniseal Solutions is a global engineering leader with over 65 years of historical legacy, relentlessly dedicated to the design and manufacture of precision sealing and wear and friction control solutions that protect critical applications in the most demanding environments and passionately driven to push Beyond the Boundaries of Possible.

Contact Our Expert

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