



NEW ENERGIES CASE STUDY

100% NH₃ CERTIFIED THERMOPLASTICS FOR SAFE AMMONIA TRANSFER





OMNISEAL® SPRING-ENERGIZED SEALS

100% NH₃ Certified Thermoplastics for Safe Ammonia Transfer

Christophe Valdenaire July 2025

CARBON-FREE ENERGY PROVEN DURABILITY RELIABILITY

Environment

Today, ammonia is mainly used to produce nitrogen-based fertilizers. However, this resource has the potential of decarbonization in that it has no carbon atoms in its chemical formula, NH₃. It can have a low-carbon supply chain when produced from blue hydrogen made with natural gas in conjunction with carbon capture and storage (CCS), or zero emissions when made from green hydrogen produced with renewable electricity. Most ammonia is currently used where it is produced, with just 10% traded between regions, primarily transported on small or medium gas carriers.

Green ammonia, in liquid form, is a carbon-free and readily dispatchable hydrogen carrier, allowing the cost-effective storage and distribution of large quantities of renewable energy. According to the Committee on Climate Change, it “currently appears that converting hydrogen to ammonia as a means of transporting it over long distances would have lower costs than transporting it as hydrogen”. The IEA suggests that for several regions, hydrogen imports in the form of ammonia could be cheaper than domestic production. Maritime transport handles around 80% of global trade by volume, making it imperative for the global economy. However, maritime vessels currently run predominantly on energy-dense heavy fuel oils, which is responsible for around 2.9% of global anthropogenic greenhouse gas emissions. Recently, the International Maritime Organization has converged on green ammonia as a likely candidate for long-haul maritime transport and several manufacturers have announced commercialization of ammonia-fueled maritime vessels by 2025–2030.

Challenge

The adoption of ammonia as a hydrogen carrier or as a fuel for maritime sector comes with inherent risks, including toxicity, flammability, and corrosiveness. Numerous existing regulations and codes categorize ammonia as a toxic chemical with relatively low permissible concentrations. Thus, the risk of ammonia leakage cannot be overlooked when developing new transfer solutions.



Solution

To proactively contribute to the safety effort required in the development of decarbonized ammonia and in partnership with major players, Omniseal Solutions conducted a complete thermoplastic materials testing program, ranging from aging to tribological characterization. This resulted in opportunities with valves, pumps and transfer equipment customers, providing them with reliable and durable sealing solutions.

The following are the selected materials:

- Fluoroloy® A02, A16, A19, A21, A27 (Proprietary Custom PTFE)
- Fluoroloy® A28 (Proprietary Custom UHMW-PE)
- Meldin® 5301 (Proprietary Custom PEEK)
- Ageing test conditions compliant with Norsok M-710, Edition 3, and ISO 23936-1:2022

Soak Media	100% Ammonia
Soak Temperatures / Pressures	-46°C (±3°C) 9 bar – Liquid phase
	25°C (±3°C) 9 bar – Gas phase
	82°C (±3°C) 60 bar – Liquid phase
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). In addition, pin-on-plate tribological testing was performed on the same thermoplastic materials in 100% liquid ammonia to characterize their coefficient of friction and wear mechanisms.

Media	100% Liquid Ammonia
Temperature	Ambient
Applied Load	400 N
Stroke / Speed	25 mm / 1.0 Hz
Duration	14 hours

Based on the composition of each tested material, the behavior of wear and the ranking of each material is in line with expectations and not impacted by liquid ammonia. Also, the measured CoF is considered very well within the expectations.

Technology Advantages

- Bespoke seal designs to handle large range of dynamic applications
- Proven chemical resistance and tribological properties
- Multiple material options 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.

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 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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