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BEYOND
the boundaries of possible

SPACE CASE STUDY
LAUNCH VEHICLE LARGE FUEL TANK

SAINT-GOBAIN

OMNISEAL® SPRING-ENERGIZED SEALS

Launch Vehicle Fuel Tank

Kha Le January 2025

SPACE & DEFENSE LEAKAGE CONTROL CRYOGENIC

Environment

Launch vehicles are most often propelled using fluids with liquid oxygen being the most common oxidizer and fuel being liquid hydrogen or kerosene and most recently liquid methane. All these fluids (except kerosene) are commonly stored at cryogenic temperatures.

Sealing is critical when liquid oxygen or hydrogen are involved since they are easily ignitable. Any small amount of leakage can create a hazardous situation, which can lead to a potential explosion of the whole launch system. Leakage requirements are therefore quite stringent.

Challenge

With the combination of cryogenic temperatures, large size and strict leakage requirements, at such extremes sealing becomes challenging!

Fluids are stored in very large tanks that are part of launch vehicles, which need to reach GEO (Geostationary Orbit) or further; therefore, the rocket engine needs a significant amount of fuel to be able to fly until its final destination. These large tanks require seals that are equally large in size typically between 1 and 2 meters or even larger.

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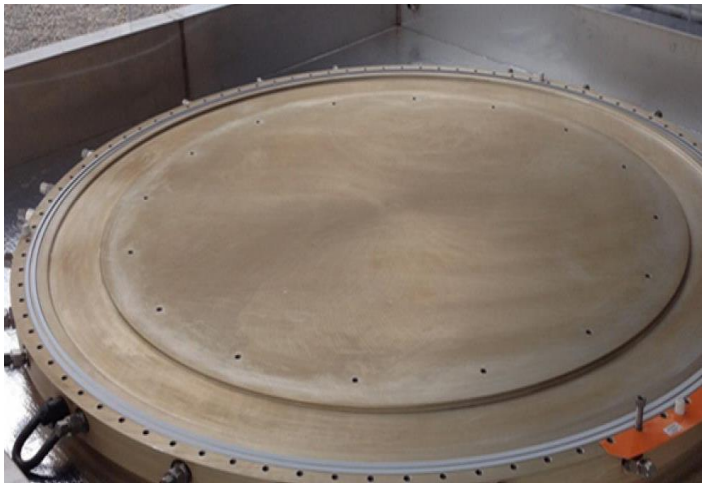
Solution

Omniseal® RACO® spring-energized seal is a proven solution for this challenging application.

This large diameter seal has been qualified in many NASA space programs for the past 60 years, meeting the precise leakage requirement of this tank application in the range of $10^{-2}/10^{-3}$ sccs.



Big Seal, Big Benefit!

Benefits

- Available in large diameter sizes
- High spring force grants excellent leakage performance even at cryogenic temperatures
- Excellent seal surface finish for cryogenic sealing
- Sealing solution cleanliness in oxygen service per IEST-STDCC1246

Specifications

Solution	• Omniseal® RACO® Spring-Energized Seal
Area	• Main/Upper Stage LOX/LH2 Tank Sump
Material	• Fluoroloy® A01
Precision part	• Custom Spring-Energized Manhole Cover Face Seal
	• Media: Liquid Oxygen
Technical details	• Temperature:-253°C to +38°C (-423°F to +100°F)
	• Motion: Static
	• Pressure: Few hundred psi (15 to 20 bar)
	• Counter face: 2195 Aluminium Alloy

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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*.

About the Author

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