



Omniseal Solutions
SAINT-GOBAIN

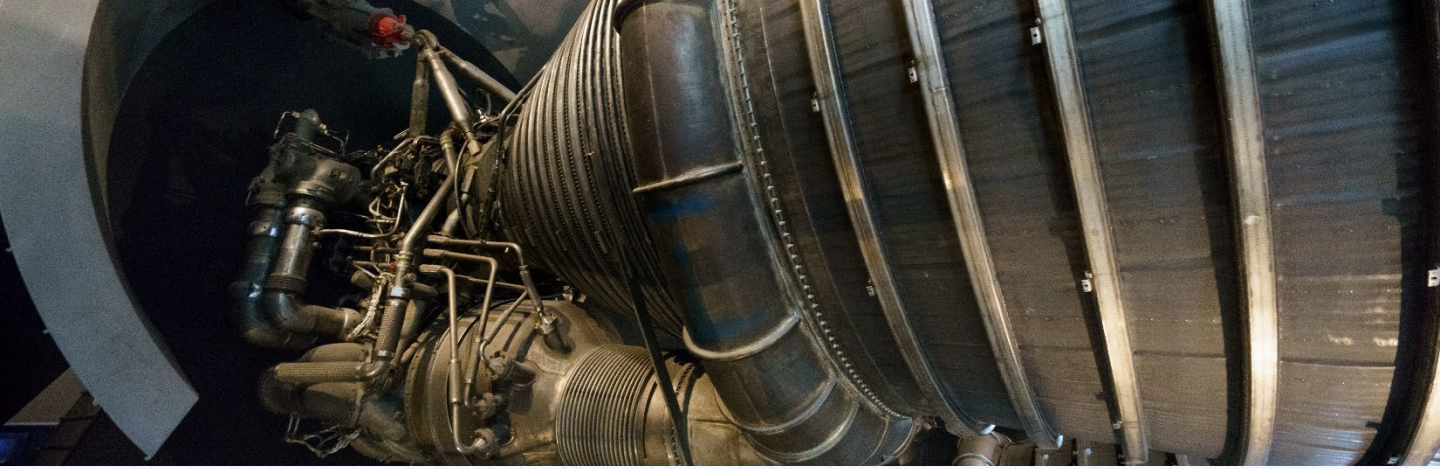
BEYOND
the boundaries of possible



SPACE CASE STUDY

LAUNCH VEHICLE ENGINE TURBOPUMP





OMNISEAL® SPRING-ENERGIZED METAL C-SEALS

Launch Vehicle Engine Turbopump

Chiara Repetto June 2022

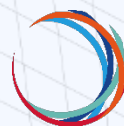
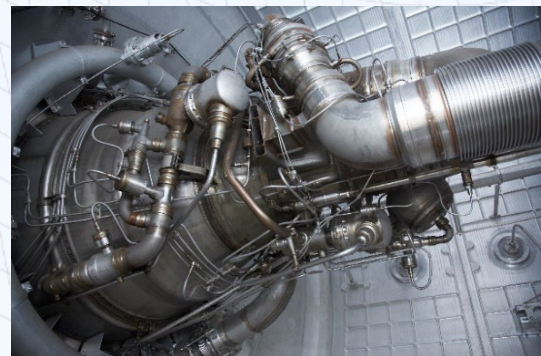
SPACE LEAKAGE CONTROL HIGH TEMPERATURE HIGH PRESSURE

Environment

A launch vehicle uses a turbopump that is driven by a hot gas turbine. Due to high levels of horsepower, RPM, flow rates and pressures in this system, specific design features, materials, and fabrication methods must be used to ensure high performance as well as space flight levels of reliability. For static sealing applications in this area, metal seals are used to prevent leakage of a fluid through a joint that has no relative motion of the mating surfaces.

Challenge

The sealing element is a complex and challenging component in the engine turbopump system, with hundreds of different seals such as metal seals being used for critical functionality. Typically, there is one pump for the fuel with hydrogen liquid or gas, and a second pump for the oxidizer with oxygen. All these liquids or gasses will then come together in the combustion chamber, which requires the highest level of efficient sealing. The lack of sealing control could cause improper operation or loss of hydrogen, leading to a potential fire or explosion. There may also be a loss of turbopump power, which means an aborted mission.



Omniseal Solutions
SAINT-GOBAIN



Solution

Omniseal® spring-energized metal C-Seal is a proven solution for this challenging application.

The seal has been used in many space programs for several decades, meeting the precise leakage requirement of this turbopump application in the range of 10^{-5} sccs.

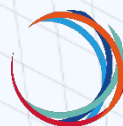
Metal C-Seals ensure superior leakage performance, which ensures the stability of your turbopump operation.

Benefits

- Meets demanding leak rate
- Low load/high spring back requirements

Specifications

Solution	• Omniseal® Spring-Energized Metal C-Seal
Area	• Engine
Material	• Inconel® 718 with silver plating & gold flash coating
Precision part	• Custom Spring-Energized Turbopump Metal Seal
Technical details	• Media: H ₂ , O ₂ • Temperature: Hot gas, 600°K • Leakage requirement: 10^{-5} sccs • Motion: Static • Pressure: 145 psi (10 bar) • Diameters: Between 150 & 450 mm



Omniseal Solutions
SAINT-GOBAIN

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 material solutions that protect critical applications in the most demanding environments and passionately driven to push *Beyond the Boundaries of Possible*.



About the Author

Chiara Repetto

Market Manager - Space

Vimercate, MB, Italy

+39 039 657 8900

chiara.repetto@saint-gobain.com

Omniseal Solutions™
help@omniseal-solutions.com
www.omniseal-solutions.com