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NEW ENERGIES CASE STUDY

100% CO_2 CERTIFIED FLUOROPOLYMERS FOR CARBON CAPTURE & STORAGE APPLICATIONS

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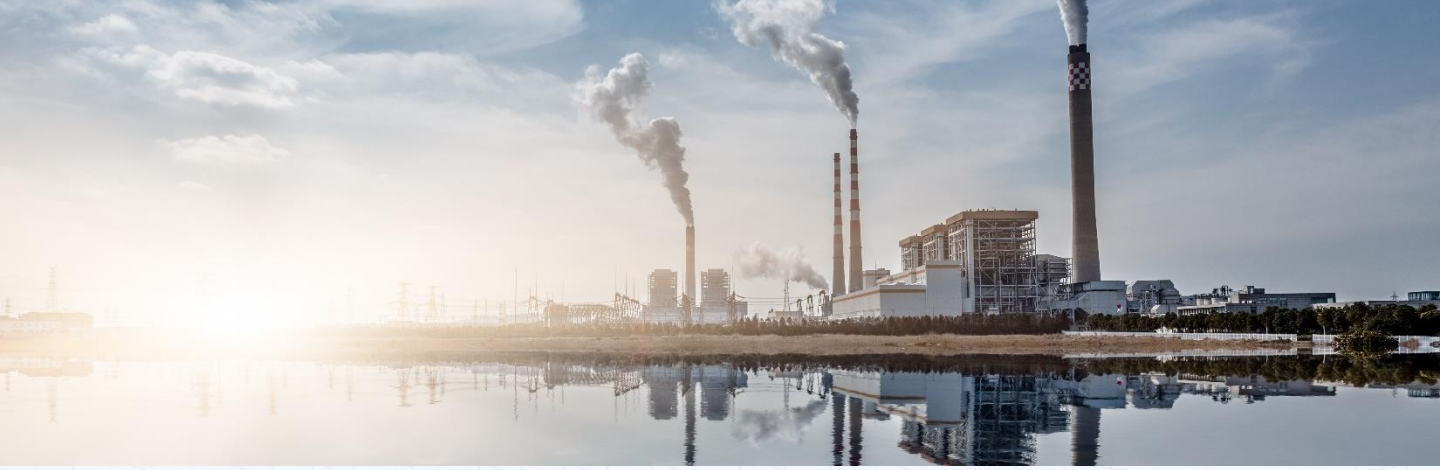

OMNISEAL® SPRING-ENERGIZED SEALS

100% CO_2 Certified Fluoropolymers For Carbon Capture & Storage Applications

Christophe Valdenaire January 2022

NEW ENERGIES CCS 100% CO_2 WELLHEADS, VALVES & TRANSFER SYSTEMS

Environment

Because Carbon Capture & Storage (CCS) can achieve significant carbon dioxide (CO_2) emission reductions, this process is considered a key and viable option within the portfolio of approaches required to reduce greenhouse gas (CHG) emissions. CCS involves three major steps; capturing CO_2 at the source, compressing it for transportation; and then injecting into a deep reservoir at a carefully selected and safe site for permanent storage. In the capture process, the CO_2 is separated from other gases produced at large, industrial process facilities or in a Blue Hydrogen process with Steam Methane Reforming (SMR). In the transport stage, the separated CO_2 is compressed for onshore (pipelines, trucks and rail) or offshore (ships) transport. Ship transportation of liquid CO_2 can be an alternative option for many regions of the world. In the storage process, the CO_2 is injected into deep underground rock formations, usually at depths of one kilometer or more.

Challenge

CO_2 is considered non-corrosive in dry condition; however, presence of “impurities” (water, H2S, or MEG) could affect metal and non-metallic materials. In 100% CO_2 conditions, elastomers are susceptible to swelling and changes in physical properties due to absorption of the dense phase of CO_2. With fluoropolymer PTFE-based materials, CO_2 has been shown through immersion testing to have a limited impact on multiple physical properties (creep resistance, crystallinity, sorption, and swelling)..

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Using 100% CO_2 certified fluoropolymer materials ensure superior lifetime & reliability

Solution

In partnership with an Energy major, the Omniseal Solutions' technical team collaborated on a 100% CO_2 certification campaign of several of our proprietary fluoropolymer materials that consisted of a bespoke immersion testing in compliance with the pass/fail criteria of NORSOK M-710, Edition 3.

The following are the selected materials used in testing:

1. Fluoroloy® A02, A10, A16, A19, 21 - Proprietary Custom PTFE
2. Fluoroloy® A20 - Proprietary Custom FEP
3. Fluoroloy® A08 - Proprietary Ekonol-Filled PTFE
4. Fluoroloy® A09 - Proprietary Custom UHMW-PE
5. Meldin® 5301 - Proprietary Custom PEEK

The following are the test conditions: 100% CO_2, 345 bar [5000 psi], -46 / RT / 97°C / 127°C, up to 56 days (the selected pressure / temperature conditions ensure testing in liquid and super-critical CO_2). The result was EVERY selected material successfully passed the NORSOK M-710, Edition 3 acceptance criteria, proving that these materials are a better option compared to standard elastomers.

Benefits

- Superior lifetime compared to elastomers
- Reduced downtime and improved reliability even in subsea environment
- Third-party material certificates available upon request
- Our design engineering team can customize Omniseal® spring-energized seals that cope with the most extreme operating conditions of Capture, Transport and Storage applications

Specifications

Volume	• +5 / -1%
Tensile Strength	• ±50%
Elongation	• ±50%
Modulus	• ±50%
Visual	• No dissolution, cracking, blistering or deformation

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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 material 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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