



NEW ENERGIES CASE STUDY

100% CO₂ CERTIFIED
POLYMERS FOR CARBON
CAPTURE & STORAGE APPLICATIONS





OMNISEAL® SPRING-ENERGIZED SEALS

100% CO₂ Certified Polymers For Carbon Capture & Storage Applications

Christophe Valdenaire January 2022

NEW ENERGIES CCS 100% CO₂ WELLHEADS, VALVES & TRANSFER SYSTEMS

Environment

Because Carbon Capture & Storage (CCS) can achieve significant carbon dioxide (CO₂) 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 CO₂ 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 CO₂ 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 CO₂ is compressed for onshore (pipelines, trucks and rail) or offshore (ships) transport. Ship transportation of liquid CO₂ can be an alternative option for many regions of the world. In the storage process, the CO₂ is injected into deep underground rock formations, usually at depths of one kilometer or more.

Challenge

CO₂ is considered non-corrosive in dry condition; however, presence of “impurities” (water, H₂S, or MEG) could affect metal and non-metallic materials. In 100% CO₂ conditions, elastomers are susceptible to swelling and changes in physical properties due to absorption of the dense phase of CO₂. With polymer PTFE-based materials, CO₂ has been shown through immersion testing to have a limited impact on multiple physical properties (creep resistance, crystallinity, sorption, and swelling)..



Omniseal Solutions
SAINT-GOBAIN



Using 100% CO₂
certified
materials ensure
superior lifetime &
reliability

Solution

In partnership with an Energy major, the Omniseal Solutions' technical team collaborated on a 100% CO₂ 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. A02, A10, A16, A19, 21 - Proprietary Custom PTFE
2. A20 - Proprietary Custom FEP
3. A08 - Proprietary Ekonol-Filled PTFE
4. A09 - Proprietary Custom UHMW-PE
5. Meldin® 5301 - Proprietary Custom PEEK

The following are the test conditions: 100% CO₂, 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 CO₂). 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 |



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

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