Case study

Expertise: Advisory

Industries: Manufacturing, Industrial Manufacturing, Renewable Energy

Simulating and verifying deep-sea electrical enclosures

CONSAT Engineering

Overview of the partnership

Partners: Aker Solutions and Consat Engineering

Objective: To practically verify the thermal performance of compressor station enclosures in deep-sea environments – ensuring full functionality throughout their entire operational lifetime.

Placing multi-storey electrical enclosures packed with electronics on the seabed at a depth of 1,000 metres leaves no room for error. In 2022, Consat Engineering conducted a full-scale test verification in collaboration with Aker Solutions and FS Dynamics – a project where the technical precision required matched that of a space mission.

Aker Solutions needed to ensure their subsea electrical enclosures would operate flawlessly under extreme conditions – with no possibility of service or repair. Consat Engineering developed a unique test environment to verify FS Dynamics' thermal models – laying the foundation for a multi-billion project on the ocean floor.

A pragmatic partner

Aker Solutions is supplying equipment to Chevron, which is constructing a compressor station in a vast natural gas field off the coast of Australia. The assignment reached Consat via colleagues at FS Dynamics, part of the Netgroup network. For Aker Solutions, the key objective was to ensure that the heat development within the compressor station's electrical enclosures could be reliably modelled and verified.

Consat took full responsibility for designing and executing the test setup – from concept to implementation.

"We had to build it from scratch – there was no spec."

Martin Hogander, Consat Engineering

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Challenge

Aker Solutions needed to ensure that thermal development inside hermetically sealed subsea enclosures could be predicted and controlled – without room for error.

Solution

Consat Engineering built a scaled test setup simulating all relevant conditions, which successfully verified the theoretical models.

The challenge

Aker Solutions was developing advanced motor and control electronics for gas compressors to be installed on the seabed. The environment is extreme – cold, remote and entirely inaccessible. FS Dynamics provided theoretical models of the internal heat distribution. Consat's task: to prove them right through hands-on testing.

The solution

Consat built a scaled-down but realistic test setup, featuring a custom-made stainless steel tank filled with dry air and aluminium cubes equipped with heating elements to simulate actual heat loads. Around the tank, a water jacket circulated ice-cold water to mimic the cold deep-sea conditions.

The setup included:

- Specially coated interior walls with measured paint thickness and emissivity
- Rheostat-controlled heating elements for precise power input
- High-accuracy temperature sensors
- Measurement and logging across ten detailed test scenarios

Each test required 3.5 hours to stabilise. A total of five tonnes of ice were used during the project.

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Key outcomes

- The test confirmed the accuracy of FS Dynamics' simulation models
- Aker Solutions could design enclosures with the correct dimensions and performance
- The project met the highest technical and documentation standards
- The work received strong recognition from end customer Chevron

Summary

- Aker Solutions needed to validate electronics intended for extreme environments
- FS Dynamics modelled the thermal environment; Consat verified it through full-scale testing
- A realistic and data-rich test setup was built and executed by Consat
- The result: a reliable foundation for decision-making – and a very satisfied customer

The result

FS Dynamics could confirm that their thermal model was accurate – enabling Aker Solutions to precisely dimension the enclosures with confidence in their long-term performance. At a final review with Chevron, the team was praised for delivering "the same quality as the enclosures going to the seabed."

"We had never seen documentation requirements at this level before. But in the end, it became a source of great pride – they were truly impressed."

Lars-Åke Johansson, Consat Engineering

Value-driven innovations

Consat Engineering delivered not only technical excellence but also speed and adaptability. The project was conducted under intense time pressure, with strict documentation and HSE requirements at every step. With the test setup in place, Consat could simulate temperature, humidity, and heat dissipation in a controlled and reproducible way – offering insights well beyond this single project.

"They said it matched the same quality as the actual enclosures being installed on the seabed – that says it all," notes Martin Hogander.

Contact us

Interested in learning how we can support your operations with test verification and complex technical problem-solving? Contact us today – we're happy to tell you more.

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