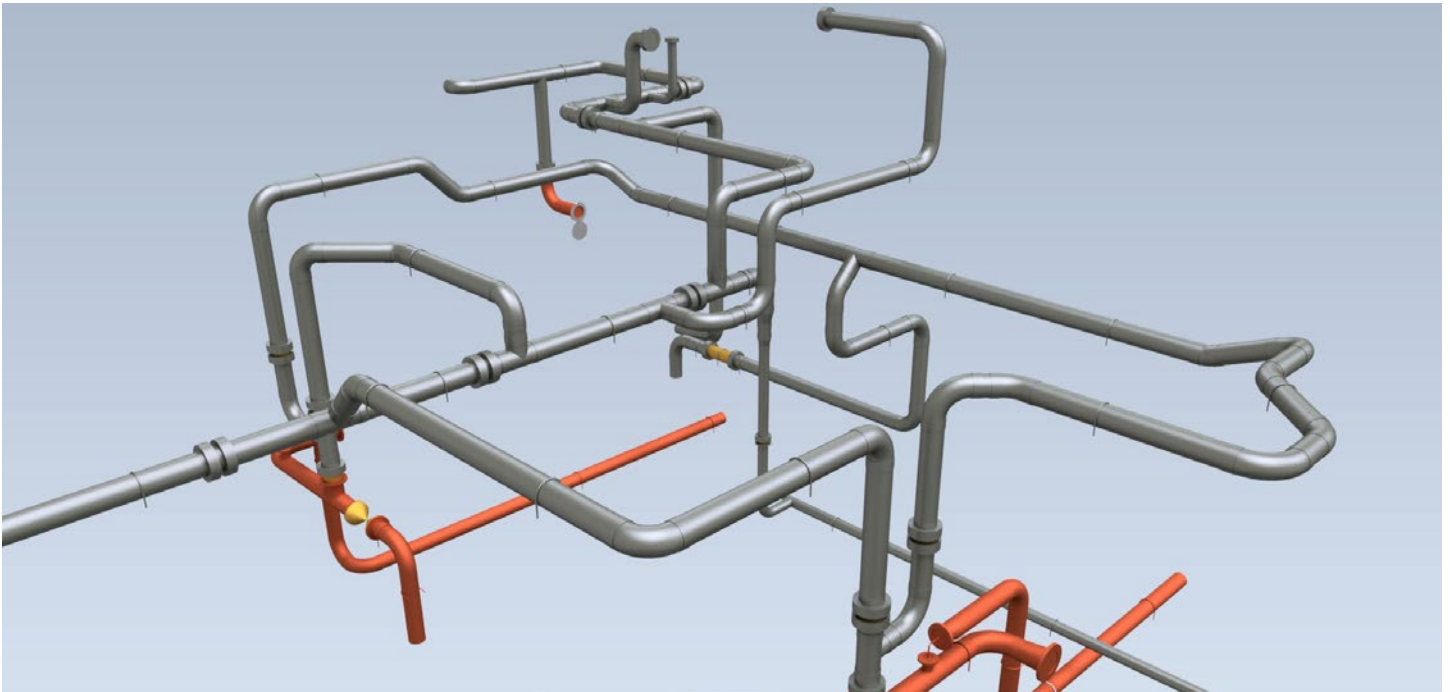


Investigations extend life of Bondstrand GRE firewater system on UK North Sea platform



An adhesive-bonded glass-reinforced epoxy (GRE) joint in the firewater pump failed after 27 years of service, exceeding its 20-year design life. The operator tasked NOV to provide a detailed investigation and testing plan to determine the probable cause of the firewater system failure.

Solution

We conducted various simulation analyses, physical testing, and document reviews to identify the probable cause of failure as well as provide life extension recommendations for the existing firewater and seawater systems. Initial findings from close visual inspection of three spools indicated inadequate surface preparation of the adhesive-bonded joint.

Following a request from the end user to verify the design suitability for a 45-year service life - effectively providing a life extension of another 17 years - we conducted Caesar II stress analysis against a 45-year design envelope, incorporating a hydraulic analysis providing out-of-balance forces to determine the suitability of the current installation configuration and

making recommendations to support types and functions where necessary in accordance with ISO14692.

After repairing and reconfiguring the three spools, we carried out two hydrostatic pressure tests at 150% of the product rating—30 bar—to confirm if there were any more leaks and two short-term burst tests to determine that the specimen complies with the minimum burst of four times the design pressure—64 bar.

Additional testing included 36 differential scanning calorimetry tests of adhesive to determine glass transition temperature, 23 lap shear tests to determine the shear strength of the bonded joints, and Barcol hardness tests.

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Results

The results of testing confirmed that the reconfigured joints of the Bondstrand™ firewater system were safe, durable, and reliable, providing the operator with confidence that the system was suitable for ongoing use and did not require replacement.

After concluding the work on the firewater system, the operator retained us to review and provide life extension recommendations for the entire GRE seawater piping systems on the platform. This preventative maintenance will extend the lifespan of the equipment, lower maintenance costs, and reduce downtime.

Scope of works

- Three spools reconfigured to conduct two hydrostatic tests and two short-term burst tests
- Multiple differential scanning calorimetry tests
- Multiple lap shear tests
- 24 construction pack reviews, including more than 8,000 pages of documentation
- Stress analysis of the existing firewater system and recommendations for life extension

OPEX benefits

- Reduce maintenance costs
- Proven durability
- Enhanced safety
- Excellent corrosion resistance