CDI ENERGY PRODUCTS

CASE STUDY – AUGUST 2021

CDI Seal Stack Design Achieves Lloyds Accreditation for Critical HPHT North Sea Service

CDI ENERGY PRODUCTS®
A Michelin Group Company

PROBLEM IDENTIFIED

Location: Global Oil & Gas service provider's Testing and Accreditation Facility, Aberdeen, Scotland

Problem: UK Department of Energy restricted a global oil and gas service provider from servicing several gas wells on a North Sea installation, until the leak tight integrity of the 10" casing coupling was verified

Solution: CDI custom-designed a special high-pressure high-temperature (HPHT) seal stack to allow an annular HPHT gas pressure test on 10" VAM® Premium 73.9 Lbs/Linear Ft casing coupling[1]

The North Sea oil and gas production environment is known for its extreme challenges and its treacherous operating conditions. As detailed in the UK Economic Report (OGUK), estimates show that in 2050, UK oil and gas demand will still be around 65 MTOE, at least 30% of which will be met by production from the UK North Sea. With this understanding of the long-term outlook and impact, operators and service providers can better anticipate the demands of the industry. To meet these growing demands, operators must rely on accredited service companies and top-quality component providers to maximize production potential and drive a solid return on investment for North Sea fields. With so much potential and so much at stake, operators and service providers are increasingly focused on efficient operations, extended equipment lifecycles, and reliable critical components.

Three critical components integral to the success of a North Sea operation are conductor, casing, and tubing. With North Sea operations, there may be several hundred critical casing and tubing connections which must all meet the high-pressure high-temperature demands of the application environment.

[1] VAM® is a well-known production tubing and casing connection incorporating metal-to-metal sealing. The VAM connection is a widely used casing and tubing connection utilized on many North Sea applications.

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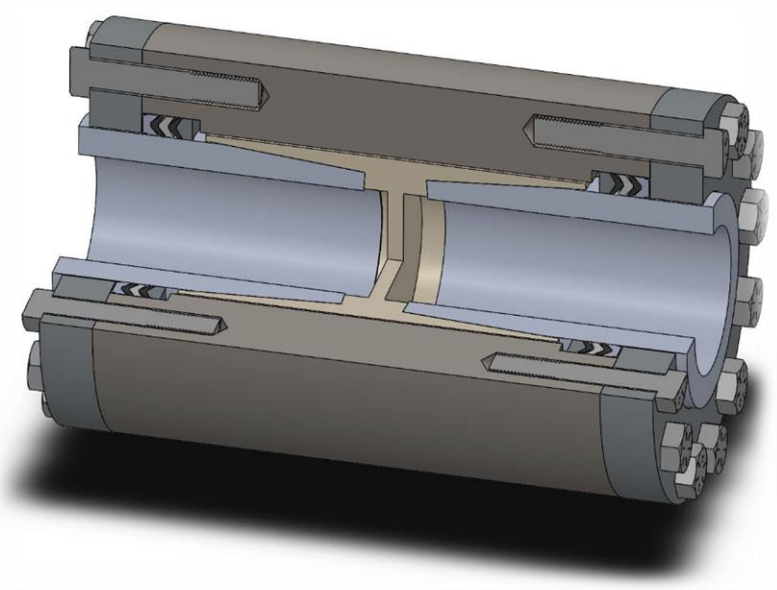
A major subsea service provider approached CDI to help them with a custom-designed test apparatus to achieve accreditation from Lloyds BV to provide high-level testing in the North Sea. The criteria included delivering a verifiable testing procedure to evaluate external pressure at elevated temperature with gas, and where the limit of the connection would be found during the failure tests at elevated temperature with oil.

Specifically, the casing connector integrity needed to be guaranteed by design or qualification, where the end user qualification criteria for the 10" 73.9 Lbs/ft VAM® premium connection required an annular pressure test of 15,000 psi at 325°C.

TECHNICAL SOLUTION

CDI utilized its detailed knowledge of high-temperature sealing materials and expertise in custom engineered component performance and functionality to assess a reliable solution. CDI Design Engineers evaluated the pressure and temperature demands and determined that a multi-material solution would deliver the most reliable solution. The CDI team utilised a combination of Aflas®, Graphite, aluminium-bronze and brass for the various components including vee rings, die-form pressure rings and cap ring, to achieve a sealing solution capable of meeting the extreme temperature range 50°C to 325°C. Where the Aflas® will provide sealing capability on rough surfaces, Graphite provides sealing capability and conformability on very high-temperature applications.

CDI'S MULTI-MATERIAL SOLUTION FOR CASING COUPLING ASSEMBLY CUSTOM DESIGNED FOR HPHT GAS PRESSURE TEST



STUDY RESULTS

The CDI sealing configuration was the only design to meet Lloyds' rigorous requirements for accreditation. As a result, the customer's Aberdeen location is now the only Oil and Gas Accreditation facility to successfully carry out this high-level critical testing. The impact of this accreditation drove a significant return for the end-user. Successful testing allowed CDI's customer to service all the operator's North Sea wells which utilised the 10" VAM® Premium 73.9 Lbs/Ft casing connection, thereby delivering a significant monetary impact and high upside production yield.

The successful qualification testing outlined above has yielded the equally critical testing of 5.5” size to 12,000 psi at 225°c in an identical configuration to the 10” application. The financial impact of this project translates to upwards of a +5-10 year increase in annual oil and gas production, a potential multi-million dollar return for the operator, while further supporting the UK energy demand.

OTHER APPLICATIONS

CDI is leveraging this multi-material solution to great success for other applications outside the North Sea. Currently, a similar multi-material solution is being used in critical valve stem sealing applications. CDI is currently evaluating the potential application for deep water managed pressure drilling operations.

FURTHER INFORMATION

To learn more, visit www.CDIProducts.com and contact us today.

- **In pursuit of Better Science, CDI’s team replaced a competitor’s machined components with materials more suited to the high-pressure high-temperature application requirements.**
- **In pursuit of Better Solutions, CDI’s team considered how this sealing solution would be assembled and handled by assembly technicians, and the resulting requirements to achieve the successful result for the High-Pressure High-Temperature conditions.**
- **In pursuit of Better Service, CDI’s Engineering group utilized long term design experience to propose a solution acceptable to the Qualification establishment, the End User, and the Certification authority.**