



Setting new standards in HP/HT technology and testing in North Sea Culzean project

The Culzean project team obtained outstanding results using Blue® Max and Blue® Heavy Wall connections, along with Dopeless® technology and Rig Direct® services.

Summary

The Culzean field is located 145 miles east of Aberdeen city, in the challenging waters of the North Sea. This development raises high expectations for the region as, by 2020-2021, it could provide 5% of the United Kingdom's gas demand and achieve a production rate of 400-500 million standard cubic feet of gas per day.

Maersk Oil, purchased by Total in 2018, took on the challenge of drilling technically complex wells in this HP/HT (High pressure/High temperature) environment while minimizing risks and ensuring reliable results. To achieve this, the operator chose TenarisHydril Blue® Max connections and TenarisHydril Blue® Heavy Wall connections, Dopeless® technology and Rig Direct® services.

With the support of Tenaris products and services, over 2,200 joints were run in double stands with a Right First Time (RFT) make-up value of 99.6%. In addition, the Culzean project team minimized the environmental footprint of the operation thanks to the use of Dopeless® technology.

Challenges

Extreme downhole conditions

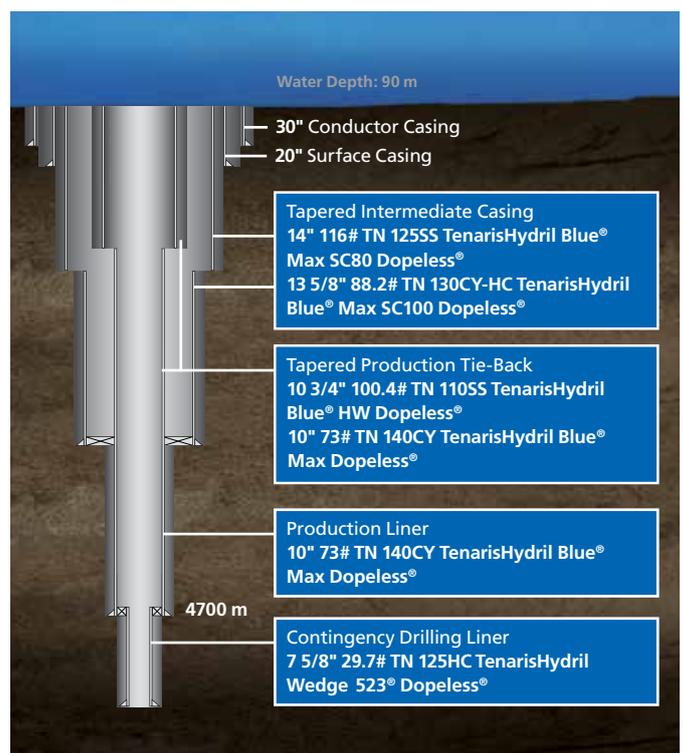
Culzean uses a 12-slot wellhead platform to drill in 90-meter-deep waters to production zones located about 4,500 meters below the sea level, where the BHP (bottom hole pressure) is around 13,500 psi and the BHT (bottom hole temperature) stands at about 180° C. Facing such difficult downhole conditions, the wells required reliable solutions able to minimize risks and promote efficient operations.

The Culzean field has an extremely narrow drilling window at the top of the main reservoir, where reservoir pressure lied on a regional "broken seal" rock strength line. To maximize gas production volumes, the Culzean project team needed to drill the wells close enough to the reservoir crest, using specific heavy, ultra-high strength, sour service tubulars.

The extreme loads found in HP/HT conditions increase the threat of corrosion, and the Culzean field showed high partial pressures

PROJECT PROFILE

Operator Total (Maersk Oil)	Products highlighted <ul style="list-style-type: none"> TenarisHydril Blue® Max TenarisHydril Blue® Heavy Wall Dopeless® technology
Location North Sea, Scotland	Services provided <ul style="list-style-type: none"> Technical consulting services Pipe management services Pipe Wall Thickness Segregation Full scale testing Field services PipeTracer® Technology
Well HP/HT Offshore	



of H₂S and CO₂. To face this combination of high pressure and corrosion, a well design with heavy-wall sour-service materials, carefully distributed in specific sections of the strings, was required. This also allowed for casing wear tools not to be used on drill pipe tool joints for drilling the subsequent sections, complying with the Managed Pressure Drilling (MPD) equipment requirements.

Solutions

Reliability and strength

The Culzean project team chose 14" TN 125SS TenarisHydril Blue® Max SC80 and 13 5/8" TN 130CY-HC TenarisHydril Blue® Max SC100 connections in the Intermediate Casing tapered section, along with 10 3/4" TN 110SS TenarisHydril Blue® Heavy Wall and 10" TN 140CY TenarisHydril Blue® Max connections in the Production Casing section. To improve running times, the operator took on the challenge of running the connections in double stands.

Wall thickness segregation was also required in 3 ranges of minimum measured wall thickness; 90-92.5%, 92.5-95%, and >95%; in order to allow engineers to maximize the casing ratings under internal pressure loads and thereby provide an increased drill through wear allowance. This compares to the standard 87.5% API 5CT and 90% typical HP/HT requirement.

Controlling that the correct wall thickness ranges of tubulars were placed in the appropriate section of the well was achieved through the use of Tenaris PipeTracer® technology; a unique tracking and traceability system that allows operators to identify products in the yard and on-site with mobile devices. The system can be loaded with data specific to each pipe, such as wall thickness banding or measured length to create a digital tally, and can thus act as a quality control measure, while bringing an element of digitization to OCTG running.

Dope-free benefits

Dopeless® technology is a dry multifunctional coating applied at Tenaris mills in a fully automatic process that guarantees that the exact amount of lubricant is applied to each connection. This solution reduces the risk of make-up problems, produces offshore savings in the total pipe cost and decreases the environmental impact of the operations. The absence of thread compounds at the rig site also ensures HSE benefits, promoting the safety of the personnel.

Stringent verifications

A series of rigorous tests were conducted on the products in the specific conditions of the Culzean field.

Tenaris carried out combined load sealability testing on the connections for this project under the most demanding testing conditions available in the industry (API RP 5C5), with special

requirements such as mechanical properties and pipe geometries selected to assure that 95% Test Load Envelope exceeds 100% pipe body or connection VME. The materials successfully passed a complete pre-qualification testing that included SSC tests (FPBT & NACE Method A) at different combinations of pH, ppH2S and temperature.

Tenaris also implemented an industry-first testing program for the Blue® Max and Blue® Heavy Wall connections threaded on the hangers, manufactured with Corrosion Resistance Alloys (CRAs) and coated with Dopeless® technology. These connections are critical because they are subject to the highest mechanical loads and differential pressure. The results showed the robustness of the Blue® Max and Blue® Heavy Wall connections and the value added by the Dopeless® solution.

Rig Direct® service model

Due to the complexity of the products, the testing requirements and the challenging delivery dates, multiple manufacturing and testing centers were involved, requiring expert coordination from the local and global teams to ensure seamless execution.

Tenaris offered a wide array of expert services for every step of the operation, from Pipe Management Services and PipeTracer® to Technical and Field Services Support. Tenaris provided dedicated Field Services specialists at the rig site to support running operations, promote operational safety and optimize running times.

Results

Reliability in HP/HT conditions

In spite of the challenging conditions, the Culzean project team successfully ran double stands of 2,200 joints of TenarisHydril Blue® Max and Blue® Heavy Wall Dopeless® connections, with a Right First Time (RFT) value of 99.6%.

The use of Dopeless® technology resulted in an increased robustness during the make-up in stands, with one double joint weighing up to 4.25 metric tons. In addition to the operational benefits, the dope free coating offered important HSE advantages. Total managed to save approximately 326 kg of storage compounds, 306 kg of running compounds and 73,950 liters of water in this stage of the Culzean project.

Tenaris was able to deliver the products on time to the field, meeting the stringent technical specifications required by the challenging project - thanks to its Rig Direct® service model.

Working in partnership with Maersk Oil & subsequently, Total, the Culzean project is a new step in Tenaris' long standing commitment with oil and gas companies that operate in the challenging conditions of the North Sea.



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