Cladtek MLP in operation Mero 1 FPSO for ultra-deep dynamic riser flowline service

The Mero field has been in pre-production with the Pioneiro de Libra FPSO, which produces 50,000 barrels of oil per day, since 2017. FPSO Guanabara, the first definitive production system installed in the Petrobras-operated Mero field in the Santos Basin pre-salt, has begun oil and gas production offshore Brazil. There are plans to deploy three additional FPSOs at the Mero field.

Cladtek delivered Mechanically Lined Pipes of 6" and 8" and has successfully installed for the Mero 1 Project in Brazil, the first full MLP deployment for ultra-deep dynamic riser flowline service. The pipes used in the fabrication of the rigid riser and flowline system for interconnecting 13 wells (6 production wells and 7 water alternate gas injection wells), to be installed in the pre-salt field Mero 1, which is part of the giant Libra reservoir.

Risers are used to connect subsea field developments to offshore production facilities, such as FPSOs or Semi-Submersibles. Similar to flowlines, risers have several uses; in production, injection or export risers. Some risers are designed for alternating service, hence risers transport various fluids from full well fluids including any corrosive elements such as CO2 and H2S through to injection chemicals and stabilized oil and gas for export. Risers are often insulated for flow assurance, and can be either rigid or flexible.

The majority of deepwater fields have traditionally been developed using flexible risers. However, rigid riser solutions today offer a more reliable and cost-effective solution that lasts the life of the subsea field. Cladtek's MLP can be used in various offshore fields as rigid risers. Most recently, it is being used in the Mero-1 pre-salt field in the Santos basin at a water depth of 2,100 meters in a steel lazy wave riser configuration. This will be the deepest water application for any MLP. Dynamic risers in high-pressure, high temperature (HP/HT) service in deep water is considered the most demanding subsea application.

Project Overview

TechnipFMC - The Mero field is an ultra-deepwater oilfield situated approximately 180km offshore Rio de Janeiro in the Libra block, Brazil. In 2019, Cladtek was awarded a major contract of nearly 100km of Mechanically Lined Pipes of 6" and 8" for the Mero 1 Project in Brazil. Exploration and development of Brazil's presalt layer began nearly a decade ago in and around the Tupi field, with first production in 2008. Further exploration revealed hydrocarbon deposits in the presalt layer in the Santos, Campos, and Espirito Santo basins. Following Tupi, pilot projects began production in the Lula and Sapinhoa fields in 2009 and 2010, respectively (EIA, 2015). Mero is the Brazilian oil giant's third-largest pre-salt oil field after Búzios and Tupi. The project was installed after a 10-year hiatus from the previous Petrobras clad riser projects in the presalt, which was a technology, used as an alternative to clad pipelines. As project progressed, it served as both a "green field plant" for Cladtek and a "green field spoolbase" for TFMC in Brazil (Açu, Rio de Janeiro). Following such a long period of inactivity, project teams representing all stakeholders were specially mobilized for this purpose.

Challenges and success

CLADTEK has undergone an intensive, two-year prequalification program with the LIBRA consortium (PETROBRAS, TOTAL, SHELL, CNOOC, CNPC) and TechnipFMC, including full-scale simulations of its pipe installation and operational fitness-for-service, in order to secure this project. During the execution of the project, this testing program was repeated with MLP manufactured in our new mill, and it was again a resounding success. To ensure the quality of this MLP, Cladtek has implemented a state-of-the-art Direct Radiography / DRT system capable of simultaneously radiographing both ends of the pipe with high sensitivity and productivity.

Cladtek MLP in operation Mero 1 FPSO for ultra-deep dynamic riser flowline service

In support to "Green Field Plant", beginning our operation with 60 employees and eventually reaching +600 – the unique MLP Manufactured invested in Brazil and enabling factors that increase a country's manufacturing competitiveness, technology and employment success. Over 92 percent of our employees globally (99 percent in our operations in Brazil) are nationals. Through the Cladtek Academy program, students and the local community can receive technical and soft skill training. To meet Petrobras' commitment to deliver MLP, new facilities have been built, and steps have been taken to develop new processes and procedures, recruit and train new employees, and streamline manufacturing. The new plant's readiness has been planned from the purchase of equipment to the optimum layout and meeting the schedule.

The project began manufacturing MLP in Cladtek Brazil from the fourth quarter of 2019 and completed delivery of first pipe installed in 2021. Following an intensive period of planning and during the operations involving management and logistics between the United States, Batam, and Brazil. The strategy of combining the capabilities of the two manufacturing plants resulted in the successful completion of the project.

Mero 1 risers follow an innovative concept, using Mechanically Lined Pipes from platform to seabed, whilst installed by Reel-Lay. Pipeline design counts with the liner stiffness to counter its tendency to "wrinkle" during installation – as opposed to pressurized installation previously used. Refinements in pipe-end design during project execution caused a part of the MLP scope carried out with the application of additional CRA reinforcement on top of the transition from clad to liner. This preventive action further guarantees no such feature will occur during installation, as validated during full-scale validations. Cladtek patented MLP process comprises of GTAW process of weld overlay ends secures and seals the liners while also providing a mechanism to enhance tolerance of the pipe ends to an exacting standard of roundness. The liner is hydrostatically expanded after the end is sealed to create interference fit. Cladtek´s process restricts expansion to the elastic range, preventing detrimental changes to the dimensional or mechanical properties of the carbon steel outer pipe.

Furthermore, the project faced technical challenges such as HTHP conditions, ultra-deep waters of 2100m depth, and the presence of sour service (CO2/SSC), stringent tolerances and acceptance criteria. Additional engineering and technical alignment between parties was required during execution to ensure pipeline integrity. Despite the challenges and uncertainties posed by the COVID situation, the team remained collaborative and committed to ensuring safety, quality, and integrity.

About Us

We provide clients globally with complete welding solutions covering advanced cladding, machining, fabrication and testing capabilities for various piping components, surface and critical subsea wellhead components, from concept procurement of material, free issue through to completion, with a highly skilled professional team working together, using industry gained experience.

Cladtek has three manufacturing facilities located in Batam, Indonesia, Rio De Janeiro, Brazil and Dammam, Saudi Arabia. We had built a record of success of overcoming challenges since 2003 when the company was founded. The main one was rapidly expanding manufacturing capacity and capabilities both in Saudi Arabia and and Brazil. From humble beginnings 20 years ago, Cladtek products are now in service around the globe with some of the world's largest and most respected organizations including ADNOC Group, Aramco, Chevron, Exxon, Petrobras, and Shell. With the continuous innovation in our products, Cladtek is now the world's largest supplier of weld overlay Corrosion Resistant Alloy (CRA) pipe today and a leading supplier of CRA mechanically lined pipe (MLP).

Cladtek MLP in operation Mero 1 FPSO for ultra-deep dynamic riser flowline service

Photos

Cladtek Brasil Manufacturing

Cladtek MLP in operation Mero 1 FPSO for ultra-deep dynamic riser flowline service

Cladtek Brasil Manufacturing Plant

Cladtek MLP in operation Mero 1 FPSO for ultra-deep dynamic riser flowline service

Liner bundled carefully packed for shipment to Brasil

Cladtek MLP in operation Mero 1 FPSO for ultra-deep dynamic riser flowline service

Storage

Cladtek MLP in operation Mero 1 FPSO for ultra-deep dynamic riser flowline service

Social Media Short Version:

Title: Cladtek MLP in operation Mero 1 FPSO for ultra-deep dynamic riser flowline service

Cladtek delivered 96km of 6" and 8" MLP for Brazil's Mero 1 Project in 2021, the first full MLP deployment for ultra-deep dynamic riser flowline service. The pipes used in the rigid riser and flowline system to connect 13 wells (6 production wells and 7 water alternate gas injection wells) in the pre-salt field Mero 1, part of the Libra reservoir. Mero 1 is the first pre-salt project to use Mechanically Lined Pipe from top to bottom of the riser section, including the fatigue sensitive sections.

Mero 1 risers follow an innovative concept, using Mechanically Lined Pipes from platform to seabed, whilst installed by Reel-Lay. Pipeline design counts with the liner stiffness to counter its tendency to “wrinkle” during installation – as opposed to pressurized installation previously used. Refinements in pipe-end design during project execution caused a part of the MLP scope carried out with the application of additional CRA reinforcement on top of the transition from clad to liner. This preventive action further guarantees no such feature will occur during installation, as validated during full-scale validations.

The team faced technical challenges such as HTHP conditions, ultra-deep waters (2100m), sour service (CO2/SSC), stringent tolerances and acceptance criteria, and additional engineering and technical alignment between parties to ensure pipeline integrity. Despite the challenges and uncertainties posed by the COVID situation, the team remained collaborative and committed to ensuring safety, quality, and integrity.