

Total Girassol Pipeline Repair System (PRS)



Client:
Total E&P Angola

Location:
Offshore Angola, Africa

Project Type:
Life-of-Field

The Girassol PRS, developed in-house by Subsea 7, represents another milestone in deepwater intervention which has the potential to be used in a range of Life-of-field applications. It further demonstrates the company's capabilities to provide complex design engineering services, efficiently manufacture and test specialist equipment, and provide safe and timely project management - as well as engineer effective life-of-field solutions in deepwater environments.

The workscope for this major pipeline repair project included the design, manufacture, testing and operation of a unique diverless pipeline repair system (PRS) to repair a damaged 12" water injection pipeline for Total's deepwater Girassol field, offshore Angola.

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Water depth

Up to 1,350m

Project Type

Life-of-Field

Date Awarded

December 2006

Date Completed

December 2009

Vessels/Spoolbases Utilised

Luanda spoolbase for PRS storage

Overview

This challenging project was successfully managed by Subsea 7 and further demonstrates the company's capabilities to provide complex design engineering services, efficiently manufacture and test specialist equipment, and provide safe and timely project management; as well as engineer effective life of field solutions in deep water environments.

The project was based on a technical design competition issued by Total for a pipeline repair system. The system was to be used on the repair of a damaged 12" water injection pipeline which ruptured approximately 3.5 km from the Girassol riser tower. Subsea 7 won the competition with a technically robust, operational and commercially viable solution and was awarded the contract in December 2006.

Subsea 7's winning PRS was a new concept, incorporating diverse technologies to allow the installation of the spool and associated equipment adjacent to the damaged section of pipe on the seabed. The damaged section is cut out and the pipe ends are lifted and shifted onto a structure directly above the spool ends. The pipe ends then have their coating removed, are cut to length, and lowered to align with the spool. The pipeline connectors are then carefully moved into position spanning the joint.

The majority of equipment used for the project was designed in-house by Subsea 7. The permanent PRS comprised: two large mud mats (17m x 12m), a 60m long spool deployment frame positioned across the mud mats, two end connection skids, a 36m long 12" spool piece and two mechanical connectors. A recoverable suite of tools, deployed by the vessel's crane, comprised: a pipe handling frame; connector installation tool; pipeline alignment clamp (all over 30te) and a pipeline recovery tool.

Additional tooling carried and operated by ROV included a coating removal tool, pipeline cutting tool, pipeline preparation tool and a pipeline alignment tool. Two interface skids, docked to the underside of the host ROVs, powered and controlled the tools. A 75kW deck testing system simulating the ROV and interface skids allowed the tools to be tested on the host vessel prior to deployment.

The project management team, based in Aberdeen, were responsible for the manufacture and testing of the PRS equipment. System engineering was carried out by Subsea 7's Global Remote Technology Group (RTG) in Aberdeen, supported by in-house specialist engineering services and centres of excellence, for example, pipeline analysis and geotechnical services. The design of the majority of the ROV operated tools was carried out by RTG as well as the design of the mudmats, SDF and spool.

The ROV tools were assembled and tested at Subsea 7's Greenwell facility in Aberdeen. The fabrication and assembly of the larger equipment items, followed by the successful System Integration Test (SIT) in June 2009, was carried out at a facility in Scotland. The equipment was then shipped to Luanda where it was successfully integrated with the locally manufactured grillage and spool. The equipment was subsequently mobilised on to the Total in-field intervention support vessel to carry out the repair. The repair operations comprised three separate vessel mobilisations and were completed in December 2009, verified by a successful hydrotest conducted from the FPSO. Subsea 7 also demonstrated its ability to safely manage all subsea operations onboard the Total vessel, using third party ROVs and crew. The unique combination of personnel on one vessel, all with vital roles to play, was accommodated by fostering team spirit to work together to get the job completed safely and successfully.

The PRS equipment, owned by Subsea 7, is currently stored at its base in Luanda in a state of readiness for future repair scenarios. The PRS also has the potential capacity, subject to further development, to be used for a range of pipeline diameters.