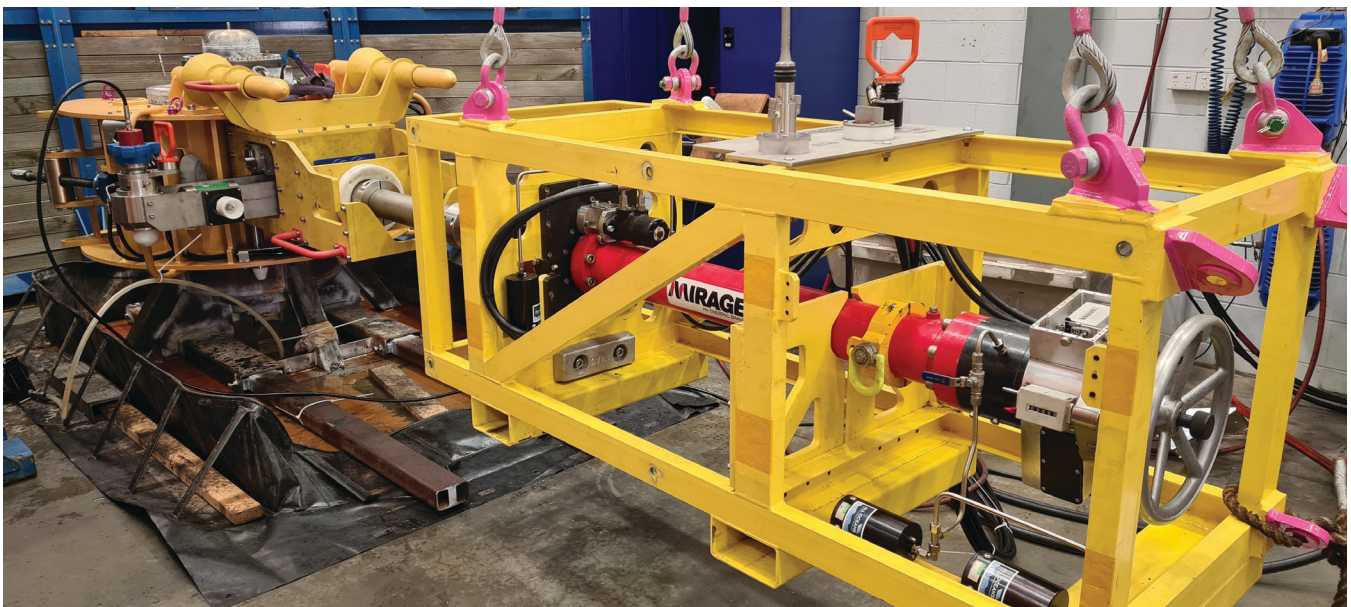


Oceaneering Develops Industry-First ROV Based Approach to Complete Annular Abandonment

ROV multistring hot tapping reduces risk and cost associated with annuli venting and cement remediation



Project Overview

In 2021, Oceaneering was tasked by a major operator in Southeast Asia to develop an ROV-based solution to mitigate annular gas and avoid HSE risks in their wellhead severance campaign. By leveraging extensive global experience and combining field proven technologies, a Western Australian based

team designed, built, and operated an ROV-based annular access methodology based on multi-string hot tapping in a world-first operation. The operator was able to eliminate HSE risks, traditionally required jack-up rigs with specialized equipment, and the need to complete a saturation diving campaign.

Challenge

The operator had more than 120 plugged exploration wells, in waters up to 85m depth, that required wellhead severance below mudline per decommissioning obligations. A well survey discovered evidence of gas in the various annuli of 35 of the wells which would complicate severance and introduce additional HSE risk. Many of the wells had multiple annuli. The wellheads could not be safely severed until the annular gas was remediated by venting and cementing.



The Oceaneering Solution

With a focus on safety and reducing risk, the operator requested that Oceaneering develop a vessel-based ROV multi-string hot tapping solution that could be used to gain controlled access to each annulus, remediate the gas, and inject cement. This solution avoided the HSE risk of divers in the water and eliminated the need for a jack-up rig with specialized pressure control equipment.

Oceaneering's two decades worth of experience in relieving annular pressure in multistring wellheads using our Pressure Annular Relief (PAR) Tool was foundational in developing this innovative, ROV-based approach.

Execution Plan

Oceaneering developed a suite of equipment for this industry-first approach in an expedited 20-week timeline, from initiation to project completion. The project's primary activity, including the design and manufacture of the majority of the suite's hardware, was completed at Oceaneering's state-of-the-art facilities in Perth, Australia. The Perth-based team was able to modify off-the-shelf hardware, use innovative design, and leverage positive vendor relationships to overcome pandemic-related supply chain challenges. Discrete items used to complete the suite were deployed from Oceaneering sites in the United Kingdom, Kuala Lumpur, Houston, and Angola. Once fully assembled in Perth, the hardware underwent a full testing program prior to being shipped to Thailand.

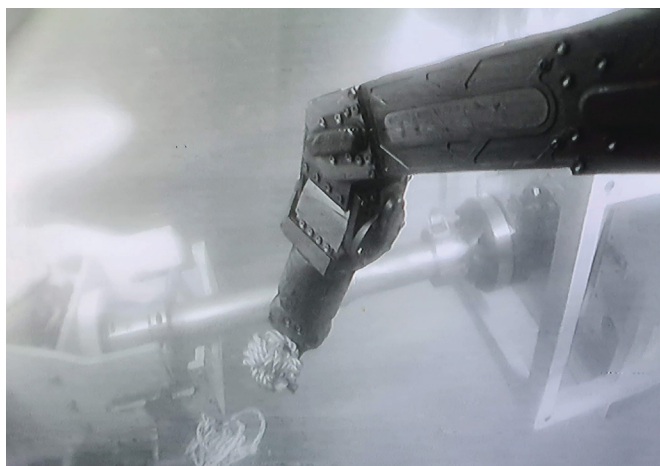


Equipment

The equipment suite consisted of:

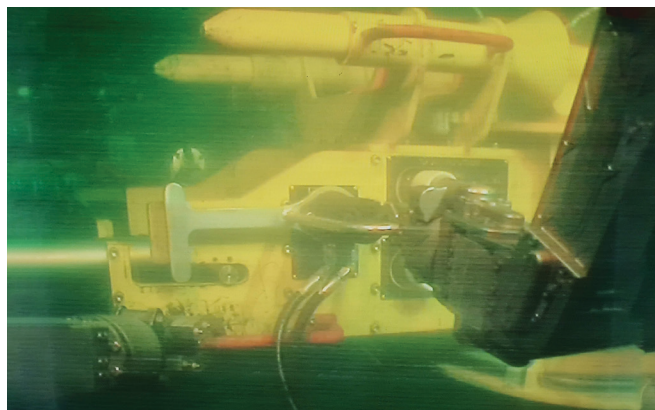
- » Wellhead Clamp with Hang Off Collar: Provided a secure mount onto the wellhead for the tooling. The hang off collar prevented the vessel from being connected to the wellhead and set the drill height. It was removable, leaving the wellhead clamp in place, so wellhead connectors could be used.

- » PAR Tool: The tool is a CNC drill with force, torque, and position feedback used for drilling through the wellhead and cement to the next tubular as well as spot facing the target tubular. Precise control and sensitive feedback indicated if the tool was drilling through cement, steel, or water/gas. The tool did not rely on set distances and compensated and detected centralizer fins, eccentric casing, or joints.



- » Sealing Assembly: Connected to the wellhead clamp and pressed a sealing nose against the spot face made by the PAR Tool. The sealing assembly had a double block and bleed setup with API6D valves. The back of the sealing assembly included an Oceaneering® Grayloc® remote clamp for connection to the hot tap or a downline.
- » Hot Tap Machine: The machine was ROV controlled and connected to the sealing assembly, forming a closed and pressure tested volume against the tubular. The drill extended through the sealing assembly and drilled a hole into the target annulus while maintaining a pressure barrier. The hot tap drill was removed by retracting the drill shaft and closing the valves on the sealing assembly

- » Downline and Reeler with Mid-Line Breakaway: Provided the conduit from surface equipment, such as gas busters and cementing equipment, to the annulus via the sealing assembly. The mid-line breakaway was tethered to the wellhead with a dead-man cable and could close valves and break away in the event of a vessel run off, preventing uncontrolled release or damage to the equipment.
- » Contingency Plugs: In the event we were unable to get good injectivity on the well and unable to remediate the annulus, Oceaneering developed a set of plugs that could be installed by the Hot Tap Machine under pressure as a barrier until a workover rig could be scheduled to intervene.



Results

Our ROV-based solution enabled the customer to avoid major HSE risks and benefit from a more cost and time efficient means of remediating annuli prior to wellhead severance.

Oceaneering's multi-string hot tapping suite was approximately remediated 14 wells over three months, requiring 60% of the time and 40% of the day rate of a jack-up rig. This avoided additional risk and costs associated with both rig and saturation diving campaigns.



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