

# Oceaneering Supports Major Operator with Bespoke Anti-Vibration Clamp

**Engineered solution mitigates riser fatigue for the duration of the installation's design life**

## Project Overview

A global operator approached Oceaneering with an engineering challenge on four risers offshore Angola in December 2021. Risers on the operator's installation were subjected to vibration, affecting their overall operating life. Working with the operator, Oceaneering designed, manufactured, tested, and installed a bespoke solution that addressed vibration, ensuring safe operation.

## Challenge

The vibration negatively impacted the risers' overall lifespan. The client and Oceaneering collaborated on a similar project in 2017, the learnings from which were leveraged to meet this project's ambitious timeline.

The client wanted to use a single design on all four risers without interrupting production or affecting any surrounding structures and set a tight period for delivery of nine months after front-end, engineering and design (FEED) concluded. The interfaces for the ROV-installed anti-vibration clamp were complex and required precise load calculations and survey information.

Another challenge was the deployment of the hardware. The clamps were to be installed 137 m deep in water depths exceeding 1000 m. Multiple



scenarios were reviewed to determine the method that posed the least amount of risk to safety and operations.

The functional design specification (FDS) was continually updated through the process as assumptions were confirmed and elements evaluated.

## The Oceaneering Solution

The client wanted to use a past design from the 2017 project, as far as practicable. Leveraging previous engineering, Oceaneering expedited clamp delivery without compromising on functionality or overlooking any unique design considerations specific to this project.

Oceaneering established project teams in Angola and Norway and collaborated with the client weekly to meet project objectives. In addition to the design and manufacture of the clamps, Oceaneering detailed a testing regime to confirm the functionality.

## Execution Plan

The FEED phase, conducted from March-April 2022, incorporated client information and lessons learned. The FEED study delivered a concept solution, including a visual representation of the clamp.

The project team and client established and contributed to a comprehensive clarification log and risk register throughout the project, addressing key considerations.

- » Access and interfaces
- » Drawings and surveys
- » The complex nature of the subsea infrastructure
- » Installation load limitations
- » Clamping requirements

The design chosen included a four-screw mechanism function that was controlled by three methods. Prior to manufacturing, ROV personnel were also involved in evaluating the design and installation procedures.

Final engineering was completed in May 2022. A comprehensive review of the design, installation process, and risks was conducted.

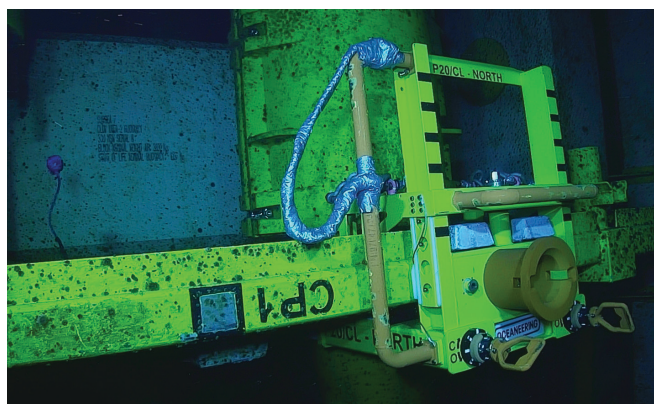
Manufacturing followed in September with factory acceptance testing (FAT) and client-witnessed site

integration testing (SIT) taking place in October at Oceaneering's facility in Stavanger, Norway.

The clamps were shipped from Stavanger to Angola, enabling the client to use local facilities to mobilize the hardware to the offshore location.

## Challenge

While a thorough review of risks and design was completed, an issue with bolt strength arose and was addressed before hardware integration. This intervention was supported by Oceaneering's state-of-the-art manufacturing facilities in Angola and verified for suitability before the clamps were shipped offshore for installation.



## Results / Benefits

This collaborative approach resulted in an anti-vibration clamp design that met the project requirements for an ROV-operable solution that connected the vulnerable risers to a rigid structure subsea.

Oceaneering had a 10-day window to complete installation in December 2022. The clamps were installed successfully, on time, and without incident. The team completed the installation in less time than anticipated due to planning and evaluating potential challenges ahead of time.

Post-installation surveys confirmed there were no subsequent vibration, and the client now has reassurance that the site can safely reach its initial design life, remaining operational through 2034.