



Gaining insight through engineering expertise, cutting-edge sensor technology, and data analytics: Mitigating riser self-trenching

This case study highlights the collaboration between an independent oil & gas company, and 4Subsea, a provider of advanced digital monitoring solutions and analytics, to address lateral riser motions at the seabed. Engineering expertise was essential in interpreting the collected riser motion- and current data and conducting detailed analyses to identify the cause of the riser motions.

Unexpected flexible riser motions were observed during ROV inspections, and traditional dynamic analyses were unable to explain these. Therefore, it was decided to introduce SMS Motion™ sensor mounted on the riser in the critical zone, as well as installation of a current profiler near the riser touch-down.

This provided the possibility to build a digital twin and compare observed and modelled riser motions including platform excursions, wave and current induced forces, and seabed interaction.

THE QUICK OVERVIEW

WHAT: Analyse lateral riser motions in the touchdown area, causing self-trenching, in relation to environmental conditions to gain an understanding of the riser motions and propose mitigating actions.

WHERE: North Sea

HOW: The riser motions were monitored by a 4Subsea SMS Motion™ sensor. The current was monitored by a current profiler. The data was analyzed, and findings were adopted in an extensive simulation study.

WHY: Understanding riser movements.

CHALLENGES

Since installation, the risers at the considered site in the North Sea have experienced unexpected lateral motions at the seabed, causing self-trenching of the risers. The self-trenching has raised concerns about the risk of contact with subsea structures, production shut-down, and the potential for leakage or burst.

OBJECTIVE

The primary goal of the project is to understand the riser motions through sensor data analysis and numerical model simulations. The insight gained through analysis enables mitigation and helps to enable continued safe operations.

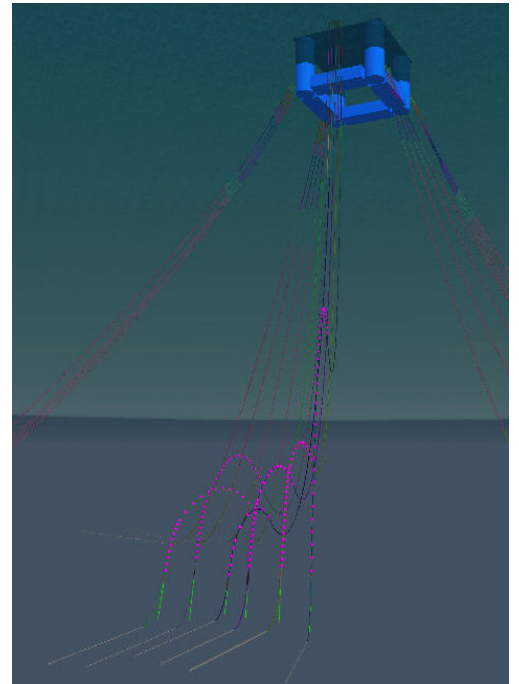
SOLUTION

To better understand the riser motions, 4Subsea's engineers deployed a 4Subsea SMS Motion™ sensor on the riser near the touch-down area, aiming to capture the lateral riser motions. A current profiler was positioned on the seabed to monitor currents at varying depths in the area. The measurement campaign lasted 10 months, providing vast amounts of data that established a solid foundation for analysis.

Leveraging data from an additional motion sensor located further up on the riser, weather data, platform motion data and production data, a dedicated team of engineers from 4Subsea conducted a correlation and causation analysis. The analysis results were used to impose riser motions in a comprehensive numerical simulation study.

CONCLUSION

This case highlights the value of seamless end-to-end collaboration—from sensors and instrumentation to domain expertise and engineering. Working closely with the Client and leveraging a robust data foundation, 4Subsea's team were able to deliver a comprehensive understanding of the observed riser motions. This collaboration demonstrates how a strong, analytical approach enables proactive



4Subsea provides technology and services that optimize energy production from subsea oil & gas fields and offshore wind farms. By combining domain expertise with data analytics, we extend asset lifetimes, lower costs, and improve project designs.

Founded in 2007, 4Subsea serves major energy operators and leading subsea equipment suppliers. Headquartered in Asker, Norway, we have offices in Bergen, Kristiansand, Stavanger, Rio de Janeiro, and Aberdeen. 4Subsea is part of the Subsea 7 Group.

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