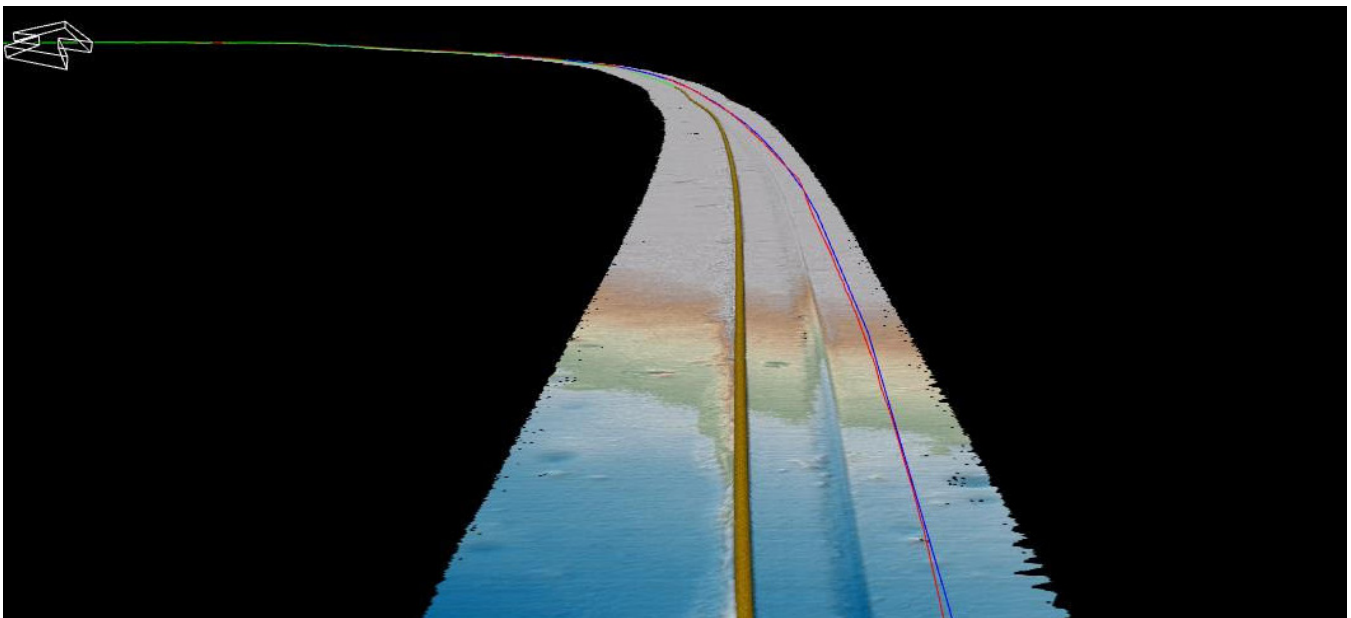


Oceaneering Survey Solution Enables Client to Assess Deepwater Pipeline Integrity

ROV-based, high-specification out-of-straightness survey provides high-accuracy data



Project Overview

In early 2019, a major client in Angola required high-specification, high-resolution, ROV-based pipeline surveys of their deepwater pipelines. The project was executed in water depths of 6,562 ft (2000m) and addressed pipelines with diameters from 12 to 16 inches. Due to the high pressure and high temperature of the product within the pipelines, thermal expansion and lateral buckling are common in field concerns. Surveys previously completed on the pipelines did not yield the high-accuracy data the client had expected and required, thus a new approach was proposed by Oceaneering.

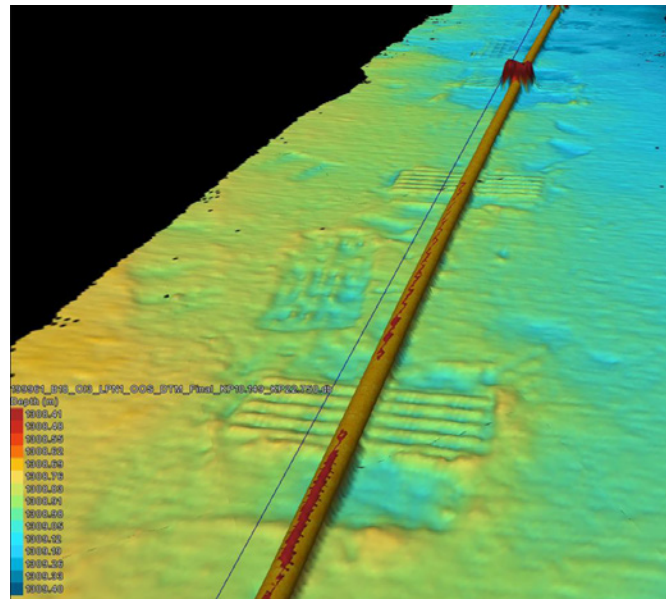
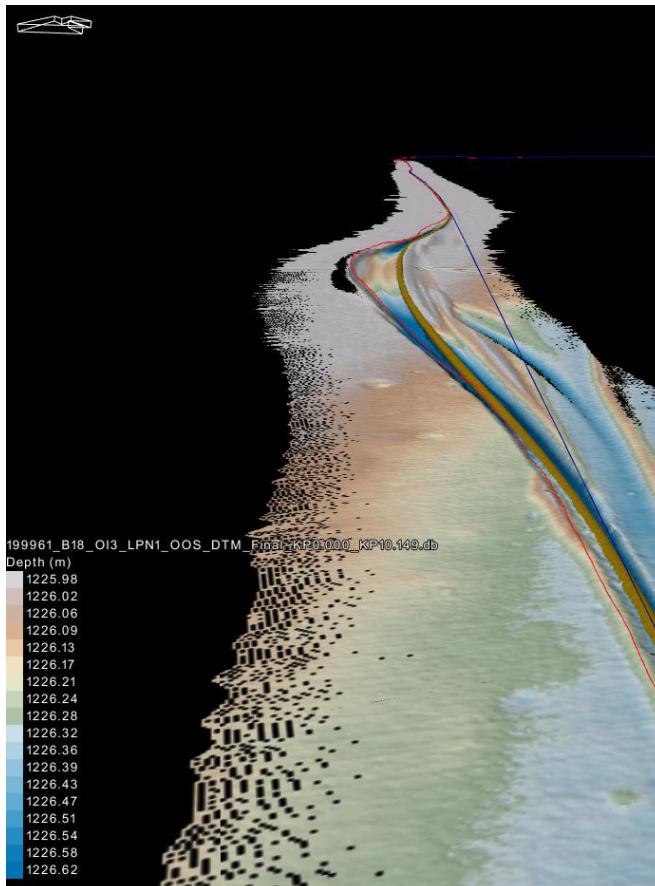
Issues

Lateral buckling of production pipelines, if untreated over a long period, can lead to pipeline damage and, ultimately, pipeline shutdown. Early detection of lateral buckling ensures that mitigation methods can be implemented and pipeline shutdown avoided. This particular client had a pipeline out of straightness (OOS) survey accuracy requirement of $\pm 2.5\text{cm}$.

The Oceaneering Solution

The Oceaneering team is well versed and experienced in completing high-specification survey operations. Our ability to support technical work scopes in remote regions is our specialty and

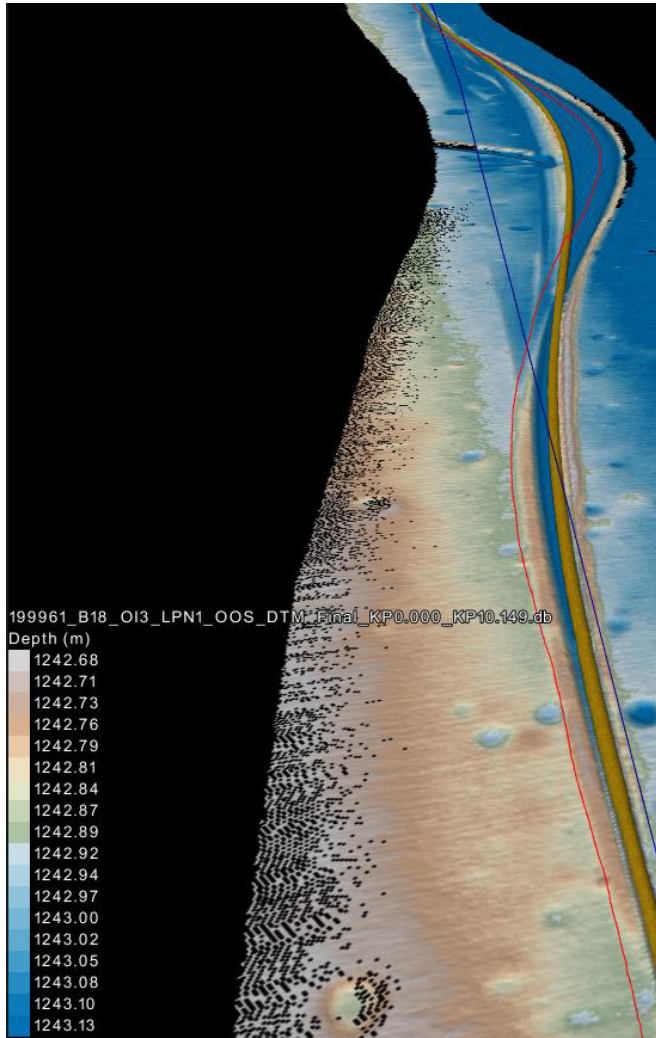
our experienced survey staff, highly-skilled surveyors and engineers, and support bases strategically located worldwide enabled us to meet the resource requirements for the project. In order to meet the project's requirements, Oceaneering delivered an integrated solution including vessel support provided



by *Ocean Intervention III* and use of the Oceaneering Millennium® Plus ROV. Project pre-engineering and pre-planning included the selection of the highest quality sensors available, including a multibeam echosounder (MBES) and an inertial navigation system (INS). The detailed mounting of these survey sensors, along with peripheral sensors, was critically planned.

Execution Plan

Oceaneering was contracted by the client on a multi-year inspection, maintenance, and repair (IMR) contract. Project planning,



comprising client kick-off, procedure compilation, equipment procurement, and pre-testing commenced in January. Procedure review and client acceptance and equipment dispatch to the project location occurred through April. Project mobilization and execution was completed in June and July with project reporting finalized in August.

Equipment Highlights

A full Oceaneering solution, from vessel to ROV and equipment bracketry to survey

services was provided. State-of-the-art MBES and best-in-class INS solutions were deployed along with peripheral systems. Skilled Oceaneering personnel were responsible for the full system integration and commissioning on the ROV, with data flow and data management controlled via industry software by an experienced Oceaneering team.

Results

The client was provided with survey results far superior to those generated by previous surveys and that exceeded their expectations. Comments were made on the level of accuracy and quality of the Oceaneering-provided results.

Project Highlights

A strong solution for ROV positioning was used, whereby ROV INS data was initially processed using proprietary INS post-processing software. This not only improved on the integrity and accuracy of the data, but enabled quicker processing of the combined data set during the post processing and reporting phase of the project.

The client was highly-impressed with not only the positioning solution that delivered a high caliber result but also the level of continuity in the Oceaneering team who had experience in previous regional inspections. Overall, the client benefited from a more robust integrity program with superior results that enabled a far better understanding of the pipeline integrity in a highly cost-effective and efficient manner.



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