

Oceaneering Completes Umbilical and Hardware Project Scope

Manufacturing expertise ensures quick turnaround delivery for client



Project Overview

In July 2022, Oceaneering's Manufactured Products site in Rosyth completed the umbilical package and associated hardware for Phase 1 of a gas field development project. The project's scope included the design and manufacture of 30 km of umbilicals and

20 umbilical termination assemblies (UTAs). Oceaneering also completed the refurbishment of eight reels used to transport the umbilicals. The result of a fast-track tender, the manufacturing of all deliverables was completed in a compressed schedule of just 15 months.

Challenges

Oceaneering project teams based in the UK, US, and India worked closely with and complemented client project teams in Malaysia, Turkey, France, and the UK.

The customer's primary focus was placed on safety and quality. They were, however, under a tight schedule for delivery of first gas on time, which was identified as a major milestone. All parties worked diligently to ensure this aspect of overall project scope did not deviate from the end client's targeted deadline.

A critical deliverable in Oceaneering's scope of work were the UTAs as the hardware was being manufactured in Houston and shipped to Rosyth for integration into the complete umbilical package. Houston was the natural choice for the manufacturing of the project's 20 UTAs as the facility has dedicated super duplex welding lines suitable for volume manufacture, enabling repeatable and high-quality welding. The interface between the Manufactured Product sites and teams in both Rosyth and Houston was pivotal to success.

Supplier selection, especially when considering the steel tubes included in the umbilical cross section, was also a key factor. Early upfront selection of a supplier prior to contract award meant that all tubing was delivered to Rosyth within six months, making it available for over sheathing prior to umbilical layup.

There were also additional challenges in relation to the subsea hardware material

selection due to the environmental conditions present in the Black Sea. Thanks to Oceaneering's engineering team and our strong supplier relationships, we were able to select appropriate materials and coatings that were suitable for the environment while also overcoming limitations on availability during a global pandemic.



The Oceaneering Solution

An execution plan was devised to split the scope within the Oceaneering team, utilizing global expertise and knowledge.

- » The umbilical package, including manufacture, termination, and assembled product factory acceptance testing was completed in Rosyth.
- » Manufacturing of the UTAs and mudmats was completed in Houston.

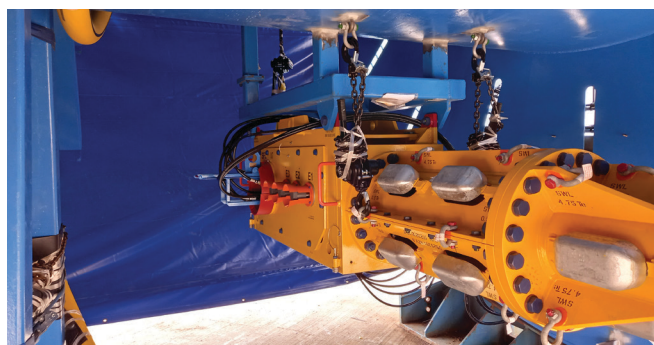
Project teams at both sites managed the distinct work scopes, but also regularly collaborated to reduce and simplify interfaces.

UTA fabrication was prioritized for delivery and integration into the umbilical package.

One of the most critical and potentially biggest risks to the project was umbilical termination, particularly tie in welding. With 180 welds to be conducted across 20 UTAs, a mitigation plan was put into action. This one plan, actioned jointly by Houston and Rosyth, ensured not only schedule attainment but an unprecedented termination weld success rate of 96.7%. Termination welding for each UTA took approximately 36 hours including non-destructive examination of the welds.

The Rosyth facility focused on and ensured that parallel activities that would have meaningful schedule benefit could be performed. Critically, the umbilical factory acceptance testing (FAT) was parallel resourced so while one completed umbilical was being filled with fluid a second was able to be pressure tested. As the work progressed, multiple technician

teams were engaged, one to prepare an umbilical for welding while a second was completing an umbilical termination assembly prior to final tie up of the umbilicals to reels. FAT took approximately four days and final assembly six days (100 days for the umbilical package back-to-back), so parallel activity in the right areas was critical in achieving the contract deadline.



Collaboration between the various teams and a can-do culture defined the successful outcome of this project. This included short targeted daily meetings between the various team members from projects, engineering, manufacturing, procurement, and quality to ensure there were no issues preventing progress.

Execution Plan

Oceaneering was awarded the contract in early April 2021. The scope included a single umbilical cross section design that integrated:

276.5 km of supplier-delivered super duplex steel tube

90km of electric cable (gas and water blocked) for 1.5kV DC operation manufactured in house at Rosyth.

The 30km of umbilicals were manufactured in 15 months. The site also completed the refurbishment of eight reels (9.2m and 10.4m) to meet the client's requirements. Using refurbishment in lieu of procuring project-specific reels ensured we were able to meet the project's deadline.

The umbilical design underwent API 17E testing at the Testing, Qualification, and Reliability Facility in Rosyth.

The project's hardware was supplied by Oceaneering's Manufactured Products division in Houston. Twenty UTAs were manufactured and shipped for termination onto the umbilicals at the Rosyth facility. The UTAs included one free issued Hydraulic (9 way) MQC plate and three free issued Electrical Connectors. Upon completion of termination of the umbilical to a UTA at either end, the completed umbilicals were put through standard FAT.

The umbilicals and terminated hardware will be loaded onto the customer's vessel from quayside in Rosyth in mid to late August 2022, marking the culmination of

15 months of work. The project's mudmats will be manufactured in Houston and shipped directly to the field in two batches (July and August).



Results

The project demonstrated the site's ability to meet a challenging deadline and meet the contractual ready for loadout date of the 1st of July 2022 while upholding ambitious standards. Achieving a high weld pass rate on both the umbilical components and hardware was essential to maintain costs and schedule and the team executed the process with exceptional success.

Oceaneering's commitment to working as a team will enable the client to meet their project delivery goals in a quick turnaround scenario. It is anticipated that installation will progress in line with the schedule defined by Oceaneering's client and the end client will now be able to achieve a first gas target in Q1 2023.