

West of Shetland Umbilical Assessment

AS | MOSLEY
OFFSHORE SIMULATION

BACKGROUND

AS Mosley was requested to provide support in the planning of a well intervention campaign West of Shetland (WoS) using a riserless subsea wireline system, in water depths of approximately 500m. The environmental conditions west of Shetland can be extremely onerous and the riserless wireline system had never been used in the region.

CHALLENGE

The environmental conditions West of Shetland are some of the worst in the world with high currents and extreme sea states. For a riserless intervention system, the high currents are critical to the operability of the system. The riserless intervention system is controlled by umbilicals supported on compensated steel podlines tensioned from the vessel's main tower. The analysis determined that the umbilical and podline would payout excessively under the extreme currents WoS.

SOLUTION

In order to meet the challenges presented, AS Mosley undertook analysis to determine the required tensions on the podline to prevent excessive payout and moonpool contact. This was achieved by accounting for different levels of operability and the impact of drag enhancement due to VIV. However, it became clear that the existing tensioning system on the vessel was not capable of the high loads required to prevent payout and achieve reasonable operability. Therefore, AS Mosley provided support in the specification of a heave compensated winch to meet the requirements WoS – high tension and sufficient payout rates to match vessel heave. The new winch greatly improved operability.

RESULTS

Based on the results of analysis performed by AS Mosley, an appropriate winch was procured for subsea wireline operations WoS – under high current loading. Furthermore, AS Mosley provided operating tensions to the client combined with optimised limits for each stage of the operation. This allowed the campaign to be completed successfully in 2022.

Currents west of Shetland create significant challenges for heave compensated umbilicals.

This caused the compensator to stroke out overloading the podline anchor. The high currents would also pin the umbilical against the moonpool opening, causing failure via friction wearing away the umbilical's protective layers. Podline and umbilical payout as well as moonpool contact is further exacerbated by the high currents causing vortex induced vibration (VIV) on the umbilical, increasing drag.

The extra tension required to control the umbilical and podline placed significantly more load on the subsea control system at the anchor attachment point. Therefore, a global assessment of the system was performed to ensure that the extra tension would not overload the structure. The resultant component loads were reported to the client for detailed local analysis of the podline anchor points.

AS Mosley also carried out analysis to determine limits for each stage of the deployment, operation, and retrieval of the system, accounting for line payout, deflections and structural loads for a range of high currents.