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Offshore industry

NORTH SEA INNOVATION

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GLOBAL FABRICATION CHALLENGES

Shell's Perdido Spar features a winch system developed by Doedijns Group International (DGI). The system handles subsea equipment servicing and replacement procedures with payloads up to 43t without vessel support.

Photo courtesy of Shell International Ltd.

WINCH & ROPE SOLUTIONS

Going Deep with Design

SERVICING SUBSEA EQUIPMENT AT DEPTHS OF ALMOST 3,000 METRES NORMALLY REQUIRES CHARTERED SUPPORT VESSELS WITH EXPENSIVE AHC SUBSEA HOISTING GEAR. HOWEVER, DOEDIJNS GROUP INTERNATIONAL (DGI) PROVED AN EFFICIENT ALTERNATIVE WITH their winch system on Shell's Perdido Spar. The system handles subsea equipment servicing and replacement procedures with payloads up to 43t without vessel support. Offshore Industry's Tom Scott spoke to Martijn Schols, Doedijns Business Development Manager, to see how they successfully tackled the challenge.

Photo courtesy of Doedijns

The Perdido Spar in the Gulf of Mexico is the world's deepest direct vertical access spar and is operated by Shell on behalf of partners BP and Chevron. The operation is well known in the offshore world – in fact Executive Editor Dennis Vinkoert covered the story in the very first issue of Offshore Industry back in 2008. At peak production, it gathers and processes up to 100,000 bpd of oil equivalent a day, and 5.6 million m^3 of gas from three fields within a 48km radius.

Design Dilemmas

There are 22 direct vertical access wells from the spar, with an additional thirteen tiebacks from subsea completions. Such extensive equipment must be changed out and serviced at regular intervals. Rather than deploying offshore service vessels to the remote development at great expense, the Perdido Spar's design required a winch system to allow the platform to service the subsea equipment itself. The winch would be used to lower subsea equipment to the seabed and back up if required. Detailed subsea operations, namely connections, >>

> *The system is supplied with weights to keep the free end of the rope tight upon retrieval.*

could be carried out with use of an ROV. "A traditional steel wire rope long enough to reach down to 2,925m would weigh almost 40t," explains Mr Schols. "This, combined with a 43t payload, would double the necessary lifting capacity of the winch." This would considerably increase the size of the winch and therefore necessitate significant structural modifications to the spar.

Superior Rope

To solve this tricky problem, designers selected a traction winch system using much lighter fibre rope. Logan Industries, part of Netherlands-based DGI, were responsible for the winch from concept design all the way to installation. Samson provided the rope know-how – they supplied a continuous length of 60mm diameter Quantum 12 rope. This combines Dyneema-75 and Samson's DPX fibre in a patented construction resulting in a rope with the strength of Dyneema-75 but exhibiting a higher friction coefficient and superior abrasion and cut resistance. This high performance rope has a break strength of 240t and yet weighs 85 percent less than wire rope of a similar size and length, thus greatly reducing deck loading and space requirements. As it is neutrally buoyant it adds no extra weight to the payload – allowing the winch to work at full capacity regardless of depth. The design of the rope goes hand in hand with the design of the winch whose system controls and functions are powered by a dedicated hydraulic power unit. The rope storage reel is driven by a hydraulic motor and planetary gear reducer in conjunction with a bullgear. The traction winch drum has rope parallel grooving with the drums offset for proper reeving and spooling.

Passing the Test

The driven drum consists of independent sheaves for the rope to lie in. The number of grooves is based on the tractive effort required for a single drum drive with the other traction roll sheaves acting as an idler sheaf assembly. The idler roll has independent groove sections like sheaves to allow the rope to pre-stretch and float as much as possible with minimal slippage. On the Perdido Spar, the turn down sheaf has been placed next to the traction winch and the rope path takes it directly down to the water so that items can be picked up from a vessel and directly deployed subsea.

Photo courtesy of Shell International Ltd.

Photo courtesy of Doedijns

The turn down sheaf has a load pin that measures load being picked up or lowered, line count, speed and direction.
Mr Schols continues, "Because normal operation involves paying out with a load and coming up unloaded, the system is supplied with weights to keep the free end of the rope tight upon retrieval." Since its installation, the winch has made over 300 runs down to the seabed for subsea installation and decommissioning purposes. Still using its first rope, a 'pull to failure' test was recently carried out – this showed that the rope is still at its original breaking strength.

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