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The 80t capacity Perdido synthetic traction winch with 3300m of 60mm Samson Quantum-12 rope.

Fiber flexes deepwater muscle

Long used in deepwater mooring, synthetic ropes are increasingly being employed in deepwater heavy lift operations.

Russell McCulley talks to Samson's Dennis Sherman and Offspring International director Dave Rowley about the technology advances that are changing techniques, and attitudes.



‘Our approach has been, let’s design a rope that can be used on existing equipment so that you don’t have to design a new winch. That’s very attractive to the industry.’
Dennis Sherman, Samson



A pair of recent deepwater Gulf of Mexico projects put the spotlight on the heavylift capabilities of synthetic ropes: Shell’s Perdido spar, which Samson Rope Technologies, partnering with Logan Winch, outfitted with a traction winch and 9200ft synthetic winch line for seafloor installation in 8000ft water depths; and Petrobras’ Cascade-Chinook FPSO development, where Technip used Samson-manufactured synthetic slings and a ‘wet handshake’ to transfer two pumping stations and two manifolds from a barge to the *Deep Blue* offshore construction vessel’s moonpool A&R winch.

The wider use of synthetic ropes in operations traditionally done with wire rope reflects industry’s greater confidence in synthetic technology. But Dennis Sherman, Samson’s technical sales director for offshore, still runs into resistance. ‘The industry doesn’t understand synthetics,’ he says. ‘I spend a lot of time educating end users and attending industry events.’ Companies that focus on business in the Gulf of Mexico have been more receptive, he says, partly out of necessity.

‘Wire has been used for years’ for heavy lifts, Sherman says. ‘But exploration and production is taking place in depths where wire is no longer efficient. Not only do you have the weight of the wire, but the machinery to haul the package and all that weight – the machine’s much bigger, it takes up more deck space on the vessel. The hydraulic power unit becomes much larger; it has to be, to generate the torque to drive that weight. So operators are looking at synthetic solutions to replace those wires.’

Dave Rowley, of Offspring International – which acts as worldwide sales and marketing agent for Lankhorst Ropes’ offshore division – says the choice comes down to lighter ropes or much larger vessels to accommodate deepwater lift systems.

‘If you look at the typical heavylift crane, they’re [equipped with] multi-sheave steel wire rope,’ he says. ‘So if you want to lower a product to 2000 or 3000m, not only have you got to have a huge length of wire rope. The main issue is the weight. The crane will use up too much of its capacity

supporting its own length of wire rope. And you’ll need a bigger vessel on the surface to support it.’

While synthetic ropes have made more inroads in the mooring market than in heavylift, Rowley says, the evolution of deepwater field development will hasten wider industry adoption.

‘As you go into the deeper and deeper water, there will be more hub type facilities with a centralized, large processing plant and more and more satellite subsea completions,’ he says. ‘All of these satellites will need modules and subsea elements lowered down and placed on the seabed,’ a task that will increasingly fall to synthetic rope systems.

At greater depths, ‘wire becomes incredibly inefficient,’ says Sherman. ‘Wire has an effective breaking length – at a certain point, it will break from its own weight.’ High performance synthetics such as high modulus polyethylene (HPME), on the other hand, are ‘weightless in water,’ he says. Operators can increase the depth capacity without increasing the size or weight of lifting equipment. ‘It just makes for a much more efficient system,’ he says.

Synthetic ropes have been used in heavylift for many years, Sherman says, but mostly for engineered lifts: that is, ‘one-off’ operations for which the rope is specifically designed, then discarded or downgraded for lesser applications once the job is finished.

‘What’s come to light in the last couple of years is the need to have warranty surveyors really address synthetic rope heavylift slings,’ he says. ‘Round slings have been around for years, webbing slings, rope slings.’ But classification societies tend to use wire rope criteria to rate synthetic products, Sherman says. ‘DNV throws a couple of different material factors in – for splice efficiency, for UV degradation – which is all well and good when you’re looking at manilas and nylons. But when you get into these high-performance fibers, there are splice factors, and things of that nature. But UV degradation and the loss of integrity from getting wet are not an issue.’

Current guidelines for marine heavylift do not take into account the efficiency

LankoFirst

First Subsea and Offspring International, the worldwide agent for the offshore division of Lankhorst Ropes, have introduced the LankoFirst series of fiber rope connectors for deepwater moorings that the companies say are stronger, lighter, smaller and more efficient than current plate links and thimbles. The device was designed to be safely and easily installed offshore, either vertically or horizontally.

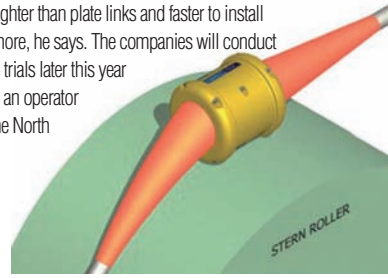
Different versions of the LankoFirst can be used for fiber rope to fiber rope, fiber rope to wire rope, and fiber rope to chain connections. The connector is available with a clam-style connector, with spliced fiber rope enclosed in a clam shell case; a snap version for joining fiber rope to fiber rope, where the ropes are integrated with the connector during rope manufacture and simply snapped together offshore; and a link connector, for rope-to-rope connection where spliced ropes are integrated with female

clevis head and male padeye connectors during manufacture and a pin connection offshore.

The new product was designed to address concerns with the integrity and efficiency of deepwater mooring connections, says Dave Rowley of Offspring International.

'There have been issues with shackles in particular,' he says. 'There were a number of high-profile failures due to poor heat treatment, quality control, and so on. Shackles went out of favor and plate links took their place.'

The LankoFirst connector is designed to be lighter than plate links and faster to install offshore, he says. The companies will conduct field trials later this year with an operator in the North Sea.



of the newer fibers used in synthetic ropes. 'But the wheels are in motion to address these new materials,' he says. 'There's very little knowledge about new materials in rope slings. We've taken it upon ourselves to implement our own testing program, to talk about D:D ratios' – the ratio between the diameters of the rope and the object it bends around – 'and splice efficiencies and length adjustment. So (classification organizations and regulators) not only want to address the safety factors in large rope slings, they also want to certify them for repetitive use.'

For the Perdido spar, Samson crafted a 9200ft continuous length of its 60mm Quantum-12 rope, which combines the Dyneema brand of ultra-high molecular weight polyethylene with Samson's DPX fiber. Incorporating the DPX product into the line doubled the Dyneema surface coefficient of friction from 0.04-0.06 to 0.10-0.12, Sherman says. 'It's the first time Shell has used a system like that, and they had no choice,' he says. 'They have limited deck space on the spar, and they had to set the winch out on a

cantilever deck, so they had to reduce the footprint of the winch. And they had to use synthetic [rope] to get into 9000ft of water.'

The Logan Industries winch 'has several patented design characteristics that are specific to synthetics but operates much like a traditional traction winch. Our approach has been, let's design a rope that can be used on existing equipment so that you don't have to design a new winch. That's very attractive to the industry because they don't have to spend millions on a new piece of equipment,' Sherman says.

'This is plausible in limited-use equipment like riser pull-in and turret pull-in winches. Heavy use winches and synthetics will have to incorporate special features to accommodate synthetics – for example, monitoring, cooling, sheave profile.'

At the Cascade-Chinook development, in 8200ft water depths in Walker Ridge blocks 206 and 469, Technip opted for the wet handshake method to transfer the subsea equipment, using ROVs to make the transfer from the crane to *Deep Blue's*

A&R winch in the water column. The weight and rigidity of wire slings would have presented rigging and handling issues; working with Technip, Samson Ropes distributor Southwest Ocean Services fabricated 16 slings for the operation from Samson's AmSteel-Blue product, a buoyant Dyneema fiber rope. The 88mm diameter slings were spliced into 50m grommets and equipped with chafe gear and two small-diameter ROV handling grommets with a polypropylene rod to enable ROV manipulation inserted into the eye section of each small grommet.

The wet handshakes, conducted August 2009, took place 100m below the moonpool. The slings were inspected, proof loaded and recertified at Southwest Ocean Services' Houston facility and returned to Technip to be reused in future installations.

Synthetics, Sherman says, enabled shorter handling time and could be done safely with a smaller crew than wire slings. 'Our big focus is heavy lift slings and deepwater lifting and lowering,' he says. 'That's where our expertise is.' **OE**



Seaway Heavy Lifting's Stanislav Yudin employed heavy lift slings made of Samson's 144mm diameter AmSteel-Blue to install 140 monopiles for the Greater Gabbard wind farm development in the North Sea.



For the Cascade-Chinook subsea hardware installation program in the deepwater Gulf of Mexico, Technip's Deep Blue used lifting slings (inset) fabricated by SWOS using Samson's AmSteel-Blue rope.