CASE STUDY

OLYMPUS TLP TOW-OUT

Shell's First Use of Synthetic Rigging Results in Operational and HSSE Benefits

SWOS

PROJECT OVERVIEW

Transporting monolithic structures over long distances is a major undertaking that calls for fully engineered solutions. Towing the Olympus TLP—Shell's newest and largest tension leg platform (TLP)—from the construction and integration yard in Ingleside, Texas to its new home in the Mars B field, more than 425 miles offshore in the Gulf of Mexico, was in planning for over two years. At more than 400 feet tall and weighing 120,000 tons, moving the platform is equivalent to moving a forty-story building that's nearly a city block square. To make matters more challenging, it was hurricane season in the Gulf of Mexico.

This was also the first time that synthetic lines were used exclusively to rig a tow-out and installation for one of Shell's projects.

Crowley tugs rigged for propulsion during the inland portion of the tow-out.

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THE STRONGEST NAME IN ROPE

Underway from the integration yards.

PHOTO CREDIT: MIKE POROO

Saturn Dynalene chafe protection installed at all bearing points.

The reduction in installation time was due to the simplicity of the connection—lugs vs. a padeye/shackle/shear pin system required by steel-wire rope. The total number of fittings was reduced, along with the elimination of additional steel-wire ropes required just to handle the fittings.

2 *The high visibility of the rigging lines offered an unexpected advantage.*

PHOTO CREDIT: MIKE POROO

THE SITUATION

The path to a decision to use synthetic lines had many tributaries, but throughout the process, Shell's commitment to safety in all its operations was apparent. With 16 different ropes required for the inshore tow-out, the offshore tow, and positioning when on-site, personnel handling issues were a major concern. The decision to use synthetics for the tow-out rigging allowed simplified connection points (lugs versus padeyes), eliminated heavy shackles and jewelry requiring additional lifting equipment for attachment, and the pinch-points that come with the process. Re-rigging with heavy connection hardware in calm seas is challenging enough. In the kind of heavy weather that the Gulf often encounters during hurricane season, the chances of potential delays or even injuries rises exponentially.

Synthetic lines were used for the critical inshore portion of the tow-out, as well as the offshore transport and the eventual positioning of the rig for installation. The result was faster, more efficient rigging and real benefits that eliminated health, safety, security, and environment (HSSE) exposure and operational considerations during design, fabrication, integration, transport, and installation of the platform. The reduction in installation time was due to the simplicity of the connection—lugs versus a padeye/shackle/shear pin system required by steel-wire rope. The total number of fittings was reduced, along with the elimination of additional steel-wire ropes required just to handle the fittings.

The rig's design also influenced the choice. The TLP's columns have limited space to accommodate additional hardware. The use of lugs and synthetic ropes rigged in a simple basket passed through the lugs required little additional space.

THE SOLUTION

Because the use of synthetics in this application was new to Shell's engineering team, they relied heavily on their selected vendors for information and assistance in selecting the highest integrity products, fabricated into the most efficient configurations to handle the requirements of the project.

Engineers from Shell and their installation and transportation contractor, Heerema, worked with Samson's master fabricating distributor in Houston, SWOS. Mike Poroo from SWOS handled the interface with Shell's engineering team and Heerema during the planning stages, coordinated the fabrication of all the lines, and was on hand for the installation and rigging prior to the tow-out. Samson's offshore technical sales engineer, Justin Gilmore assisted with appropriate line selection and design. Fabrication and testing of all the components was done at SWOS' Houston facility.

Gilmore reports, "SWOS was the key contributor to the success of this project. Shell leveraged the technical and fabrication expertise of SWOS from design to installation. With SWOS located in the heart of Houston, they are the perfect partner for projects in the Gulf. They inventory a big selection of our products, handle all of the custom fabrication and testing, and were on-site to get first-hand knowledge of how the ropes were going to be used and oversee the installation; ensuring the best possible outcome for Shell."

THE INSHORE TOW-OUT— NO ROOM FOR ERROR

The inshore portion of the tow-out was critical. At times, there were as little as nine meters of clearance in the channel from the Ingleside integration facility to open water. The channel transit required eight tugboats—two for propulsion, two for braking, and two for steering, plus two more on standby. The two propulsion tugs and the two steering tugs were tethered to the rig using wing lines fabricated from Samson Quantum-12, a 12-strand line made with 100% Dyneema® HMPE fiber with Samson's patented DPX™ technology incorporated into the surface strands. The line is designed to have an enhanced coefficient of friction for better grip on H-bitts and capstans. All lines were fabricated with an eye on each end, and protected from chafe with Samson's Saturn Dynalene. A sliding chafe sleeve of Samson DC Moor-Gard that could be easily moved along the line to the location of the lugs was also fitted to prevent chafe at the attachment points through the lugs.

Inshore rigging configuration.

Once the rig was clear of the channel and in open water, the tugs were repositioned in the offshore tow configuration. Again, an easy changeover without the need for additional equipment was critical. Rigging in open water can be challenging, but lightweight, high-performance synthetics that are easily handled by manpower alone made rigging changeovers quick and efficient.

The offshore portion of the tow-out.

THE OFFSHORE TOW

Once the rig was clear of the channel and in open water, the tugs were repositioned in the offshore tow configuration. Again, an easy changeover without the need for additional equipment was critical. Rigging in open water can be challenging, but lightweight, high-performance synthetics that are easily handled by manpower alone made rigging changeovers quick and efficient.

Four tugs were used for the offshore tow; three towing the rig astern using Samson Saturn-12, a 12-strand, 100% Dyneema® fiber line. Saturn-12 has the strength of steel-wire rope, along with a proprietary coating that significantly reduces both internal and external abrasion. The result is ultimate strength and reliability in a line that will outperform and outlast other lines with up to 20% longer service life in critical applications. These lines were rigged in advance, with two of them designed to double as a positioning bridle during anchoring and installation. These lines were also fabricated with an eye at each end, protected with Saturn Dynalene and a sliding sleeve of DC Moor-Gard to be positioned at the center of the line through the lug to protect from rotational abrasion caused by potential sea swells during the 10-day tow-out.

POSITIONING AND INSTALLATION

Arriving at the installation site, the four transport tugs were again repositioned; one at each of the four quadrants of the rig. Each was tethered by a positioning bridle fabricated from the same Saturn-12 construction as the offshore tow lines. The bridles were rigged prior to the tow-out. Since the Olympus platform is installed in relatively close proximity to the existing Mars platform, positioning operations were critical.

In each case, the lines were rigged quickly and efficiently by a minimum of crew and without additional handling equipment. Early engineering and design took into account using synthetic lines for the eventual tow-out and installation stages later in the process. That allowed standardization of the towing lugs and the ability to replace unique and complex one-off components required for steel-wire rope with a much simpler, yet robust, design.

SWOS' Mike Poroo reports on another benefit to using lightweight, high visibility synthetic lines for the positioning portion of the project, "An unanticipated advantage not covered in the report was explained to me during my last visit with Shell. They could look down from any point on the platform and clearly see the Saturn-12 lines while moving the platform into position. Wire rope would have been too dark in color and too far under water to see. This helped keep the vessels clear of the lines and helped prevent a tow-line from snagging on the preinstalled tendons/tension legs."

KEY BENEFITS

Samson's high-performance synthetic lines made with Dyneema® fiber are, size-for-size, as strong as wire rope with similar elongation characteristics, yet weigh 85% less and they float. The advantages include quick and easy rigging using only manpower in most cases, rather than heavy equipment. This results in safer worksites with fewer strain injuries from excessive weight, a significant reduction of potential pinch-points, and elimination of injuries from broken, "fish-hooked" strands common with wire rope. In addition, exposure to potentially dangerous situations with additional heavylift equipment and personnel was virtually eliminated.

SWOS and Samson representatives were on hand for the initial rigging for the tow-out. Each line in the system was purpose-built and fabricated to specification at SWOS' Houston facility. Each is tagged with a unique serial number and can be tracked using the Field ID database that maintains a full record of the lines' construction details, current certifications, and logistics.

With the installation now complete, the lines have been returned to the SWOS facility in Houston. They have been fully inspected, proof loaded, and recertified, and are being stored in controlled conditions, ready for use on the next Shell project.

Positioning the rig for installation.

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MIKE POROO, *SWOS*

Olympus TLP and AHV during installation; positioning bridles visible from rig.

In this case, an offshore project worth more than $1 billion was delivered and positioned safely for installation with a significant savings in time. In addition, there were no safety issues to personnel or damage to the rig itself in the process.

OLYMPUS TLP STATS:
HEIGHT: Over 400 ft.
WEIGHT: 120,000 tons

DISTANCE: 425 miles (during hurricane season)

Final position in close proximity to the existing Mars platform

SATURN-12 POSITIONING BRIDLES & OFFSHORE TOW LINES
3 inch (72 mm) diameter
749,000 lb minimum break strength
377 metric ton ISO 2307 strength

OCEAN CLASS TUGS
146 feet (44.5 meters) long
150 metric ton bollard pull

QUANTUM-12 WING LINES
1-3/4 inch (44 mm) diameter
239,000 lb minimum break strength
120 metric ton ISO 2307 strength

HSSE BENEFITS

In addition to the operational efficiencies of using Samson high-performance synthetic lines for tow-out, the switch from wire was consistent with the design philosophy that proven, safe solutions are better than designing one-off, complex solutions. Transitioning to synthetic lines for tow-outs and installations furthers the aim of achieving Goal Zero, a program that captures the belief that they can operate without fatalities or significant incidents despite the often difficult conditions. Lightweight, high-strength synthetic ropes have been proven to significantly eliminate weight-related injuries as well as handling injuries while reducing operational times.

CHALLENGES ENCOUNTERED

Since the platform connections had been designed to accommodate synthetics, the attachment points had been engineered from the start. The connections to tugs from two different tug operators—Crowley and Signet—were only a little more problematic. Crowley was supplying two brand new ocean-going tugs that were placed in service just prior to the tow-out. This would be their first operation. Signet provided four tugs. Each had different configurations of deck hardware and equipment to account for in designing the connection from the tug's tow wire to the synthetics attached to the platform.

THE RESULTS

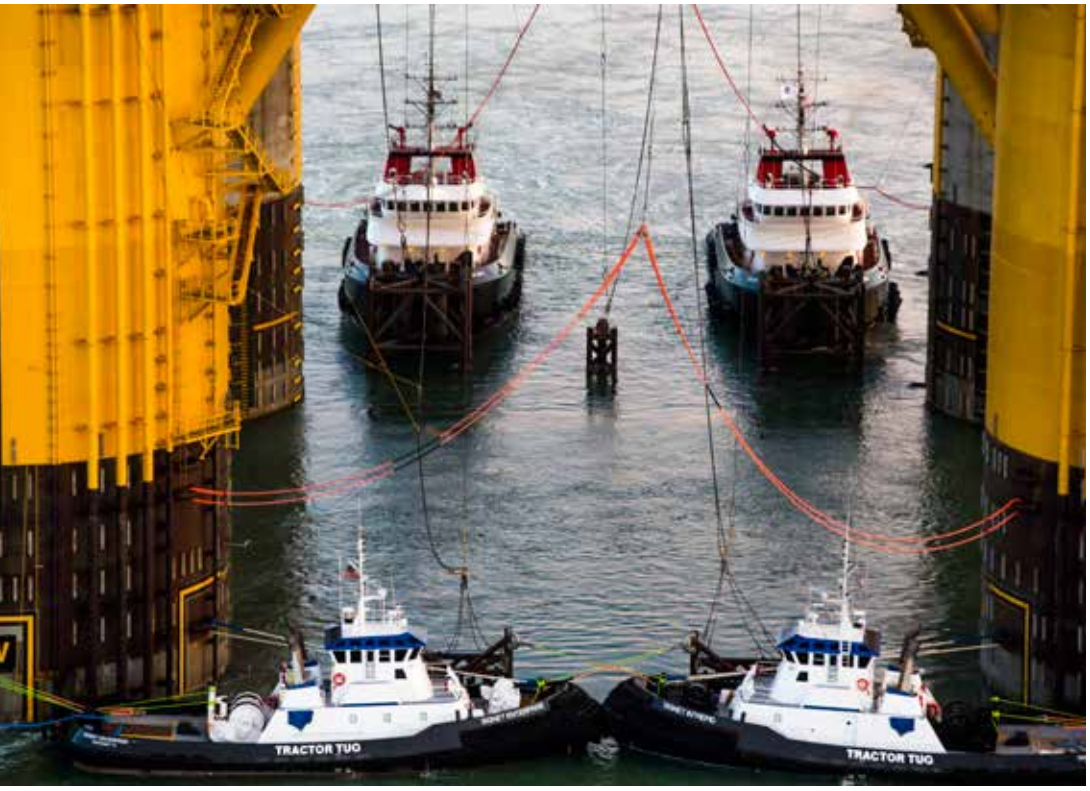
In this case, an offshore project worth more than $1 billion was delivered and positioned safely for installation with a significant savings in time. In addition, there were no safety issues to personnel or damage to the rig itself in the process.

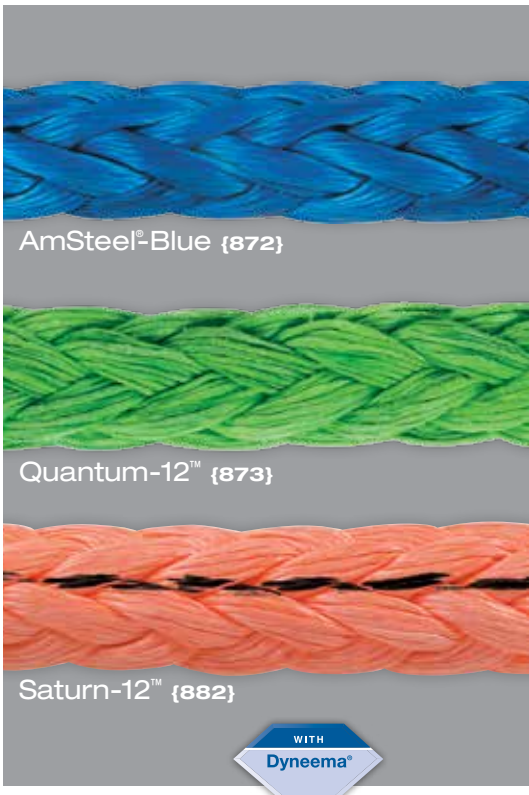
THE SAMSON ADVANTAGE

In the case of the Olympus TLP tow-out, SWOS and Samson engineers brought not only superior products to the project, but also the full knowledge-base Samson has developed over its 135-year history. A history of manufacturing innovative cordage products that industries rely on for the biggest challenges. Products that can change the way critical work is done on the most complex projects. SWOS' expertise in dealing with the offshore industry's unique problems, combined with the test data and engineering expertise of Samson's Research and Development and Sales Engineering departments, help to produce the best outcomes.

More efficient operations, safer work environments, well-engineered products: it all adds up to a real, significant advantage on complex, demanding applications.

We call it The Samson Advantage.
Our customers call it peace of mind.





All photos by Tim Burdick Photography (Port Aransas, Texas) other than those noted on page 2.

FOR ADDITIONAL INFORMATION:
SamsonRope.com

We've put all our information here for easy downloading for anyone with access to the web. We think it is the best resource for information on high-performance synthetic ropes available anywhere.

- Rope specifications
- Product breakdowns by application and industry
- Technical bulletins
- Case studies
- Splicing instructions

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