Turbo-EPX pulls in a riser.

CASE STUDY

JUBILEE WINCH LINES

Samson high-performance synthetics simplify winch design and reduce deck load

AmSteel®-Blue brings an anchor chain into its stopper.

THE STRONGEST NAME IN ROPE

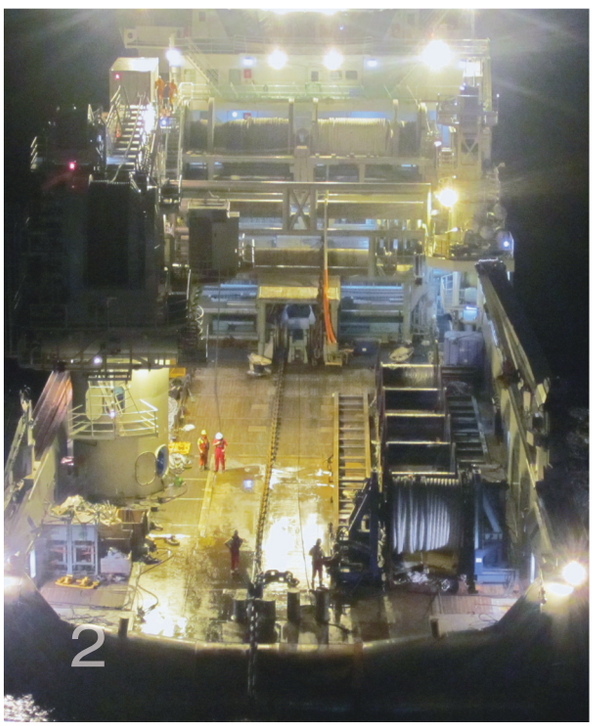
PROJECT OVERVIEW

The Jubilee field offshore of Ghana, West Africa, is estimated to hold 1.2 trillion cubic feet of gas and 1.8 billion barrels of crude oil in recoverable reserves, making it the second largest field in the world. First oil was produced in December 2010, after risers and umbilicals were installed from the seabed at depths of between 900 and 1,700 meters to the floating production, storage, and offloading FPSO Kwame Nkrumah, which successfully completed the fastest ever full-scale deepwater development. Instrumental in the 11-riser installation was Samson's synthetic rope Turbo-EPX™, but not before AmSteel®-Blue first assisted with mooring the FPSO.

Perspective of the winch and Turbo-EPX.

Because of the neutral buoyancy of ropes made with Dyneema,® Technip also had concerns that the rope would catch in the propellers of the construction vessel, which would approach very close to the FPSO when the risers were transferred. Samson put application engineers to work, developing a custom solution.

Turbo-EPX as it moves inside the I-tube.



THE SITUATION

SOFEC was in charge of the design and installation of the riser pull-in package for the Jubilee field development. The package would be used for two projects: the anchor-chain and riser installations. SOFEC was concerned about the limited room on the deck of the FPSO. The most efficient solution would be to use a small winch for the riser pull-in system. A synthetic rope solution would simplify the winch design and allow a smaller drum diameter to be used. The synthetic rope solution would also provide the additional benefit of reducing the size of the hydraulic power unit and the deck load. Having worked together for more than 20 years on similar projects, SOFEC contacted SWOS, Samson's Master Fabricating Distributor located in Houston, Texas, to discuss a synthetic rope solution for the pull-in lines.

THE ROPES

Samson synthetic ropes for offshore applications are made with Dyneema® fiber, which brings high-performance characteristics such as high strength, light weight, abrasion resistance, and neutral buoyancy to innovative rope constructions and coatings. While SOFEC was confident that Samson high-performance ropes would work well in both applications, the riser installation engineers at Technip were not so sure. Their top concern was the level of abrasion that the rope would be exposed to while under a maximum tension of 200 tons as it moved down the I-tube. Because of the neutral buoyancy of ropes made with Dyneema,® Technip also had concerns that the rope would catch in the propellers of the construction vessel, which would approach very close to the FPSO when the risers were transferred. Samson put application engineers to work developing a custom solution.

MEETS THE SPECS: TURBO-EPX™

SWOS and Samson engineers worked closely with SOFEC to understand all of the nuances of this particular project and equipment. It was determined that the best combination of equipment would be a split-drum winch with a working load limit of 350 tons, loaded with 350 meters of 5-5/8" (142 mm) diameter Turbo-EPX, which has a minimum breaking strength of 875 tons. Turbo-EPX is a unique jacketed construction with a 12-strand core strength member made with high-strength, low-stretch Dyneema® fiber. The jacket is made with polyester that grips the winch and hardware, and is abrasion resistant. To ensure that the rope would sink rapidly enough to avoid catching in the tugboat's propellers, a segmented-lead line was added to the center of the 12-strand braided core.
Once the customization and manufacture were complete, the line underwent extreme scrutiny. It was first break tested and witnessed by the American Bureau of Shipping (ABS). Then Technip, the project managers for the installation, commissioned a study by Bureau Veritas (BV), who found the rope to be more than adequate, with a factor of safety of 3:1.

With these certifying agencies' approval, Samson manufactured three Turbo-EPX lines for the Jubilee riser pull-in job. SOFEC planned to use one of the three Turbo-EPX lines for the anchor chain pull-in and tensioning line. This left one for the riser installation, and one for a back up.

SamsonRope.com

ENTER AMSTEEL®-BLUE

After further consideration of the anchor-chain pull-in job, SOFEC realized that the significant 5-5/8" diameter of the Turbo-EPX would cause the line to bear against the cast-steel sidewalls of the chain stopper's internal cavity. Again, SOFEC contacted SWOS, who recommended a smaller diameter AmSteel®Blue to pull-in the mooring chains.

AmSteel®Blue is Samson's flagship product made with Dyneema® fiber. Size for size, AmSteel®Blue is as strong as steel, making it an excellent wire rope replacement. In addition, the 12-strand single-braid construction is 1/7th the weight of the steel-wire rope it replaces while providing superior wear and flex fatigue resistance.

SWOS provided 738 feet of 3-1/4" (80 mm) diameter AmSteel®Blue with a soft eye on each end. This rope is able to handle a working load limit of 100 metric tons with an approximately 400 metric ton minimum breaking strength, equalling a 4:1 safety factor.

THE RESULTS

AmSteel®Blue: In a typical FPSO mooring application, both wire and synthetic ropes are used on a split-drum winch; however, AmSteel®Blue worked in place of both. The added benefits of its easy handling and change out allowed engineers to simplify the winch-drum design, and provided flexibility overall for the nine-anchor-chain installation and tensioning. The AmSteel®Blue took quite a beating, but finished the job without failure. Once the Kwame Nkrumah was secured in place, the Turbo-EPX was reinstalled on the winch and ready to pull in the risers.

Turbo-EPX: Only one of the three Turbo-EPX lines was used to pull the 11 total risers. According to one Technip installation engineer, the rope was still in good shape after the job was complete. Samson synthetic lines were proven without a doubt that they can perform extremely well in the tough conditions of the offshore installation world.

A FIRST FOR THE SAMSON ADVANTAGE

Samson is the only rope manufacturer in the world that provides the combination of experience, technology, manufacturing, products, and service, bringing to our customers what we call The Samson Advantage. While most of what makes us excellent happens behind the scene, our service is something that is observed with every purchase. The case of the Jubilee mooring chain and riser installation lines is no exception and is one of the best examples of what makes our service legendary. Our qualified service technicians are available for installing lines, training crews on how to care for Samson lines, and inspecting and repairing lines. On this project, it was two of our best service techs that Technip relied on to oversee the performance of the AmSteel®Blue and Turbo-EPX lines to the extent that one of them was present for a total of six months while the anchor chain and riser installations were completed. This long-term deployment was at the special request of Technip and a first for Samson.

In order to provide this unprecedented service, these dedicated professionals underwent extensive training that included helicopter underwater egress training (HUET) and survival training. They also obtained transportation worker identification credentials (TWIC) that allows them unescorted access to secure areas of ports, vessels, and outer-continental-shelf facilities.

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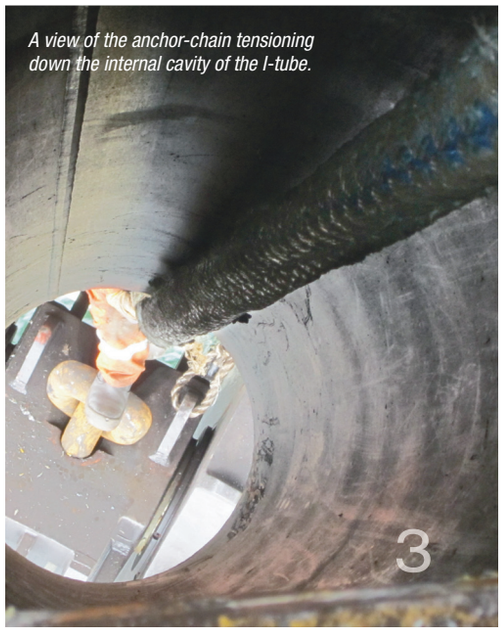
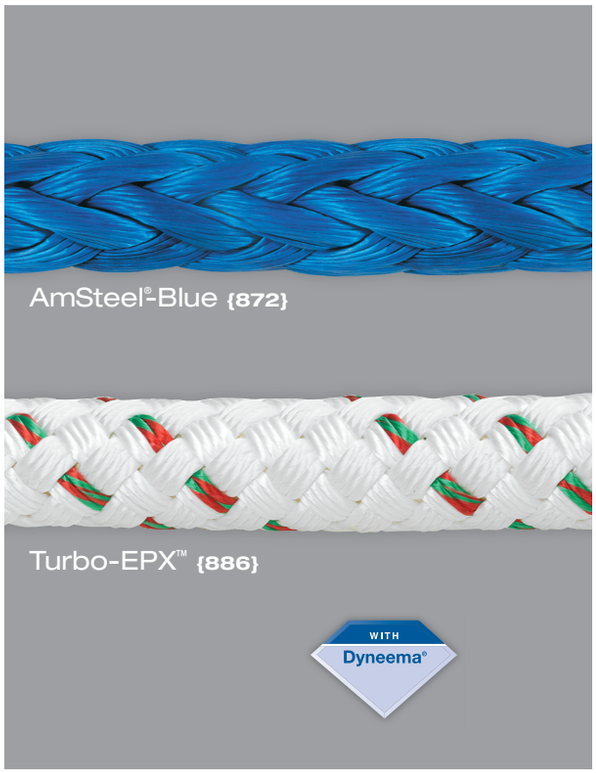


A view of the anchor-chain tensioning down the internal cavity of the I-tube.



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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