Anchor Mooring Lines made with Dyneema®

To prevent any issues arising with anchor lines, Dockwise concluded that they needed ropes made with Dyneema® fiber to meet the tough challenge to come. With sensitive subsea structures to contend with, and a tight deadline to meet, the company required strong yet light lines it could trust not to damage anything, and not to break.

And what a challenge it was
Dockwise had been contracted to move the topside section of a new central processing platform from the Malaysian yard where it had been built to its production location off the coast of peninsular Malaysia. The attachment of the topside to its 70-meter seafloor jacket would be a milestone in Malaysia’s first large-scale EOR (enhanced oil recovery) project, and one of the largest offshore EOR projects in southeast Asia.

At 18,900 tonnes and 124 meters tall, this is one of southeast Asia’s largest offshore platforms

A demanding job in demanding conditions
Dockwise, which is the world’s biggest seagoing heavy transport shipping company, operates a fleet of 23 ships and semi-submersible vessels. For this job the company called up the Black Marlin, an open-stern heavy transport vessel. The ship, and the company, faced some significant requirements. First they would have to safely load and transport the topside platform to the transportation site. At 18,900 metric tons and 124 meters tall, the topside was one of southeast Asia’s largest offshore platforms. Second, the float-over installation needed to be carried out without damaging the existing, and extensive, underwater infrastructure in a field that dates back to 1978.
Meet the Black Marlin

- **Length o.a:** 217.50 meters
- **Length b.p:** 206.57 meters
- **Breadth molded / max:** 42.00 meters
- **Deck space (L X B):** 165.60 x 42.00 meters
- **Depth:** 13.30 meters
- **Draft submerged at FPP / APP:** 23.34 meters
- **Maximum draft:** 10.08 meters
- **Water depth above main deck FPP / APP:** 10.00 meters
- **Deadweight:** 57,021 metric tons
- **Speed:** 14.5 knots

*Equipped with fixed casing at starboard

“The operation was in the vicinity of pipelines and other subsea assets”

**Quicker installation with Dyneema®**

These factors led Dockwise to replace the Black Marlin’s normal complement of steel wire anchor lines with synthetic lines made with UHMWPE. “The operation was in the vicinity of pipelines and other subsea assets,” explains Aart van den Hoonaad, Senior Project Manager at Dockwise. “In such demanding and precise operations, it might be possible to use steel wire rope with mid-line buoys, but it would have required more installation time.”

The company initially chose lines made with UHMWPE from another manufacturer. However, when one of those failed, Dockwise opted for Oliviera X-Trema Line 12 Strand Rope made with Dyneema® sk78 fiber. Mooring lines made with Dyneema® are as strong as steel wire rope of the same diameter, yet they are less than one-seventh the weight. In addition, a rope with Dyneema® is about 60% of the diameter and 30% of the weight of an equally strong polyester or nylon rope.

**Taking the strain**

- **The lines:** 12-strand braided sk78 with an MBL of 3210 kN. 800 meters long, diameter of 64 mm
- **Mooring configuration:** Rope with Dyneema® > shackle > SWR > steel chain > anchor
- **Total length of mooring system:** approx. 1,450 meters
- **Anchors:** 15 metric tons, positioned using an anchor handling vessel

The Black Marlin transported the topside from Pasir Gudang, near Johor Baharu, Malaysia, to the field, off the state of Terengganu, eastern Malaysia, where it was floated over in a three-day operation.
A flawless float-over operation
As the loading window approached, the Black Marlin was outfitted and prepared for the skid-out operation that would slide the topside onto the Black Marlin. Two days' sailing later, and the team executed a flawless float-over installation.

“Reeling in the lines made with Dyneema® proved to be an easy job as the material floats”

The float-over involved the use of a four-point anchor mooring arrangement. The four mooring lines held the Black Marlin in position during the operation. But instead of the usual steel wire rope, the mooring system this time used anchor lines made with Dyneema® to prevent damage to the existing field layout. Three tugs assisted in the topside’s installation on the jacket.

A time-saver in tough conditions
And what was it like using lines made with Dyneema® in such a challenging operation? “Generally, the crew found that handling the stored rope is easier, although it needs more attention,” comments Aart van den Hoonaard, “while installing and uninstalling the lines took about the same as with steel wire rope. We could have done the same thing using steel wire rope and mid-line buoys [to prevent the rope from hitting the seabed and possibly damaging pipes and other subsea infrastructure], but it would have been much more time-consuming to install.”

How Anchor Lines Made With Dyneema® Helped Install a 19,000 Tonne Platform
When Dockwise was planning how to install the topside, the company knew that with sensitive subsea structures to contend with, and a tight deadline to meet, it would require strong yet light lines that it could trust not to damage anything, and not to break. Lines made with Dyneema®.

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