It’s never easy bringing a 300,000-ton VLCC (Very Large Crude Container) to a secure rest. It’s a complicated, labor-intensive undertaking that involves ship personnel, longshoremen and tug operators. Typically, the mooring lines used for this operation are made of steel wire, which are extremely heavy and hard to handle, messy and sometimes dangerous. Yet, steel lines have been the industry standard for decades – simply because they get the job done, no matter what the consequences may be. And because, until now, there has not been a viable alternative.

But COSCO Dalian (a subsidiary of China Ocean Shipping Group) was willing to explore new possibilities. For an eight-month sea trial period, the company evaluated two mooring lines made with Dyneema®, the world’s strongest fiber™, aboard one of its VLCC vessels. The company was so impressed with the performance of the lines during that period that it decided to equip its newest VLCC vessel with a complete set of mooring lines made with Dyneema®. In January 2008, the COSPEARL LAKE became the world’s first VLCC vessel to be 100% equipped with mooring lines made with Dyneema®. There were, in total, 22 lines brought on board. Twenty were installed in winches for operation. The other two were stored as spares. Each line had a nominal diameter of 46 mm, a net length of 280 meters and was rated MBL 1300 kN. The COSPEARL LAKE still operates throughout the world... and depends on mooring ropes made with Dyneema®. Here’s why.
All the strength, a fraction of the weight... adds up to more speed

With a steady increase in the length and capacity of oil and LNG carriers, and the trend towards mooring in more exposed conditions, greater loads are placed on mooring lines. When conventional steel lines are made stronger, they become even heavier and more difficult to handle. The connecting shackles between steel wire and nylon tail alone can weigh up to 90 kg.

Mooring lines made with Dyneema®, however, are exceptionally strong and light. A mooring line made with Dyneema® with the same strength and diameter as a steel line will weigh one-eighth as much. And there is no need for a connecting shackle. This means mooring lines made with Dyneema® are much easier – and much safer – to handle.

“Application of mooring lines made with Dyneema® greatly reduced docking time, making the mooring operation quick and easy,” said Mr. Cheng Guofu and Mr. Tang Zhaojun, the first and second Captains of the vessel.

In fact, docking and undocking times for the COSPEARL LAKE have been significantly reduced with the new set of mooring ropes. With steel wire lines, the typical docking time is approximately 240 minutes. By using the mooring lines made with Dyneema®, the crew is able to dock in less than 90 minutes.

“If steel lines were used, only the preparation would need two and half hours of hard work by the deck crew,” said Mr. Wang Lije, boatswain of the vessel. Preparation of mooring lines consists of pulling lines out of the winches to their corresponding fairleads. The lines made with Dyneema® have greatly relieved the crew of the hard and dangerous work of handling heavy, greasy steel wire and tail shackles. Captain Tang put it this way: “In fact, there is no need to prepare mooring lines made with Dyneema® before docking.
You just pull them out from the winch and start docking.” On July 7, 2008 at Qingdao terminal, Boatswain Wang said, “Today we created a new docking record for a VLCC by using mooring lines made with Dyneema® -- 32 minutes!” Strong, light, safe to use... it all means that using mooring lines made with Dyneema® can speed up the entire mooring operation. And a faster operation means a more profitable operation. The sooner a vessel can tie up, unload, reload and then cast off, the more productive it can be. Zhao Jinwan, General Manager of Technical Department COSCO Dalian, said, “We dramatically reduced mooring time, which will help lower port fees and allow faster turnarounds for our vessels.”

For a healthier workforce... and a better world
Because they are lightweight, as well as soft and flexible, mooring lines made with Dyneema® are very safe to handle. There are no jagged hooks or spurs, as found on steel wire lines. Due to the low elongation of the fiber in the lines (less than 3% at break), there is minimal backlash in case of failure. To date, not a single case of hand, wrist or back injury has been reported due to handling the new mooring lines of the COSPEARL LAKE.

In addition, mooring lines made with Dyneema® require no grease or other lubricant. Not only does this eliminate time-consuming tasks – greasing the lines as well as de-greasing the desk – it also contributes to a safer work environment. No more slippery, greased decks. Furthermore, the absence of grease helps the COSPEARL LAKE comply with strict European and U.S. environmental pollution regulations.

Boatswain Wang explains: “With steel lines, after each docking and undocking at least two seamen would be assigned to clean the deck and other polluted parts of the vessel. The job would take them more than half a day, and all the water they use ends up right in the sea, along with the grease. This task is simply not necessary with lines made with Dyneema®.”

Mooring lines made with Dyneema® even improve life in the tropics. “Many oil-loading terminals are in tropical or subtropical zones,” stated Captain Tang. “Working with heavy steel lines for a long time in such an environment can be harmful to seamen’s health. At one terminal, the deck temperature aboard the COSPEARL LAKE reached 48 °C. If the crew had not been working fast and efficiently with the ropes made with Dyneema®, explains Mr. Wang Futian, commissar of the COSPEARL LAKE, “some crew members would have suffered serious heatstroke.”

Strong in other ways, too
Mooring lines made with Dyneema® are highly resistant to abrasion. After 380 hours of operation on the COSPEARL LAKE, there was only minor abrasion evident on one rope yarn. This was caused by rough and abrasive fairleads that are made for use with steel wire lines. To reduce this abrasion, existing fairleads should be modified by welding a stainless steel plate on the passage or by smoothening and painting, or using moveable protection sleeves. This relatively inexpensive modification has proven effective by practice on tugboats as well as oil and LNG tankers. The Dyneema® fiber is also resistant to exposure to UV rays, salt water and chemicals, making it ideal for use in mooring lines that need to operate in a variety of extreme environments.

Latest news.
Based on the successful COSPEARL LAKE experience, COSCO Dalian decided to rig the sister ship COSJADE LAKE (now under construction) with mooring lines made with Dyneema®.

Tying up in the future with Dyneema®
Of course, DSM Dyneema, the inventor and manufacturer of Dyneema®, is optimistic about the potential of mooring lines made with the fiber. Edwin Grootendorst, DSM Dyneema, said, “The ease of handling and stowing of lightweight mooring lines made with Dyneema® provides so many advantages that many shipping companies are moving away from steel wire.

About Cosco Dalian.
Dalian Ocean Shipping Company (COSCO DALIAN) is wholly owned subsidiary of China Ocean Shipping Company (Cosco Group). The company was formed in January 1st, 1978, and it is the only company within the group specializing in liquid bulk transportation. Cosco Dalian currently owns and operates total 40 vessels including tankers, LPG and chemical ships, with total deadweight of more than 5 million. The scale of total fleets is in the leading position comparing with other similar enterprises in China. The seven owned VLCCs became the company’s “flagship” to establish corporate brand together with other four time-chartered VLCCs. COSCO DALIAN have been continuously developing international customers and strengthening the strategic cooperation with international renowned owners, which expanded their business to more than 300 ports of one hundred countries and regions throughout the world.
Being lightweight and easy to handle, the lines speed up turnaround and are much safer to work with. Being durable, they last and make great economic sense. They also are eco-friendly. We clearly see increased interest in mooring lines made with Dyneema® for VLCC and bulk carriers."

Find out how mooring lines made Dyneema® can improve your business
COSCO Dalian was impressed with the performance of mooring lines made with Dyneema®. Remember, they are:
- Easier to handle, which boosts productivity, speeds turnaround and increases worker safety.
- Resistant to UV exposure, chemicals and salt... further boosting their cost efficiency.
- Require minimal maintenance and no greasing, which makes them eco-friendly.

Mooring lines with Dyneema® have proven successful in this case. Find out what they can do for your operation.

For more information, visit www.dyneema.com