

kuraray

Vectran™

Case Study

**VECTRAN™ fibers
for high-performance
mooring ropes**



Durable ropes for heavy ships

Sector

Mooring ropes and towing lines for shipping and marine applications

Application

Marine ropes with very high tensile strength and up to twice the normal service life

The challenge:

Mooring ropes and towing lines for large liquified natural gas (LNG) vessels and tankers have to withstand enormous tensile loads, heat, abrasion and aggressive salt water throughout their entire service life. At the same time, handling needs to be as easy as possible.

The solution:

Using high-performance VECTRAN™ liquid crystal polymer (LCP) fibers from Kuraray, Katradis, a leading manufacturer of marine ropes, has developed a new marine rope that is lightweight, flexible and far more durable than the solutions previously available:

- Spun from liquid crystal polymers, VECTRAN™ fibers have **very high tensile strength**. In relation to their weight, they are **five times stronger than steel**.
- These LCP fibers have low wear and creep fatigue, which **limits the service life of most other high-modulus fibers**.
- VECTRAN™ fibers have **outstanding resistance to both high and very low temperatures and chemicals**.

Customer benefits:

With a braided core of VECTRAN™ fibers, Katradis' new LCP-Siri S12 COVERED marine rope grade has an exceptional performance profile:

- Thanks to the extremely robust structure of VECTRAN™ fibers, the rope retains its dimensional stability, making it easier to handle and ideal for use with winches.
- VECTRAN™ fibers are treated with a special finish and, in combination with Katradis' NikaThane coating, LCP-Siri S12 COVERED can be used for up to twice as long as established ropes with HMPE and aramid cores.
- VECTRAN™ ropes retain their extremely high tensile strength even when exposed to enormous frictional heat and in very cold and hot climates.

Fine LCP fibers for high-tonnage tankers: VECTRAN™ fibers make Katradis' mooring ropes ultra-strong

Katradis is developing a lightweight, high-performance mooring rope with VECTRAN™ fibers that lasts up to twice as long as established HMPE and aramid ropes.

Background and requirements

Ropes that are reliable in extreme conditions

Mooring ropes and towing lines for large cargo ships and LNG tankers need a highly reliable performance profile: they have to withstand enormous tensile loads, heat, friction and permanent exposure to aggressive salt water. After all, in extreme situations the safety of the entire ship may depend on them. At the same time, they are expected to be light and easy to handle and have a long

service life. The experts at Katradis Marine Ropes Industry S.A. know exactly what is important: Based in Piraeus, Greece, this company is one of the leading manufacturers of marine ropes. For its new high-performance LCP-Siri S12 COVERED ropes, the company relies on a braided core made from Kuraray's VECTRAN™ liquid crystal polymer fibers.

The solution

Ultra-high-strength fibers made of liquid crystal polymers

VECTRAN™ is a high-tech multifilament yarn spun from liquid crystal polymers (LCP). Thanks to their unique structure,

these high-performance fibers have very high strength. They are also resistant to high temperatures, including extreme frictional heat, for example in difficult towing maneuvers, and are suitable for use in both hot and cold climates because they have ideal dimensional stability. In relation to their weight, VECTRAN™ fibers are five times stronger than steel. They also have another benefit compared with aramid fibers: extremely low moisture absorption. Ropes made from these fibers retain their shape, volume and low weight, even after prolonged use in wet conditions. Thanks to their excellent creep and break resistance and high wear resistance, they can be used to manufacture extremely strong and durable ropes.



High-performance fibers for lasting strength: Katradis' new LCP-Siri S12 COVERED rope with a 12-strand core made of VECTRAN™ liquid crystal polymer fibers from Kuraray has enormous strength and flexibility so it can be used on cargo ships and tankers for up to twice as long as competing HMPE and aramid ropes.

The concept

Safer marine ropes with twice the durability

Due to the excellent properties of VECTRAN™ fibers, Katradis chose a 12-strand core of these LCP fibers braided with a highly abrasion-resistant polyester sheath for its new high-performance rope. A key advantage for the structure of the rope is the extremely high wear resistance of VECTRAN™ fibers. In combination with the specially developed NikaThane coating from Katradis, the ropes can withstand considerably more load cycles in towing maneuvers than established HMPE and aramid ropes. Moreover, they are just as strong and similarly light. In field tests, LCP-Siri S12 COVERED showed hardly any wear even after three years of use and more than 2,000 hours of

operation as a mooring rope on an LNG tanker. In the subsequent breaking tests, the rope had an excellent breaking strength of 97.85 percent compared with the load capacity directly after manufacture. And there is another benefit: The extremely robust structure and good dimensional stability of VECTRAN™ fibers reduce the snap-back force if a rope does break – and that improves safety.





Customer benefits

Double service life, simple handling, less personnel required

“Our new LCP-Siri S12 COVERED rope can be used on cargo ships and tankers for up to twice as long as competing ropes made of HMPE, aramid or steel. The enormous strength of VECTRAN™ fibers, combined with our NikaThane coating, plays a decisive role in that. And the special finish that Kuraray applies to every VECTRAN™ fiber ensures that bonding of the coating is particularly durable and reliable. Another key advantage of our new type of rope compared with steel ropes is that they are not subject to corrosion.”

*Akis Zygouris,
Technical Sales Manager at Katradis*

Strong ropes for heavy ships: Mooring ropes and towing lines for tankers and cargo ships have to be easy to handle and function reliably even in adverse conditions. Using VECTRAN™ LCP fibers, Katradis has developed a rope that meets the highest requirements.

In addition, Kuraray's VECTRAN™ LCP fibers give this new type of rope excellent flexibility and dimensional stability, making the ropes easier to handle with less personnel, which speeds up mooring. Moreover, the ropes are very suitable for use with winches. Akis Zygouris: “Kuraray's experts provided us with extensive advice and support in the development of our new rope. With our joint expertise, we have already been able to convince numerous shipbuilders and shipping companies of the advantages of LCP-Siri S12 COVERED.”

About Kuraray Europe

Established in 1991, Kuraray Europe GmbH is based in Hattersheim, near Frankfurt am Main, Germany. In 2020 the company generated annual sales of EUR 593 million. It has more than 800 employees in Germany at its sites in Hattersheim, Frankfurt and Troisdorf. Kuraray is a global speciality chemicals company and one of the largest suppliers of industrial polymers and synthetic microfibers for many sectors of industry. Examples are KURARAY POVAL™, MOWITAL® and TROSIFOL®. Kuraray Europe also has around 215 employees at six other European sites. They are also working on the development and application of innovative high-performance materials for a wide range of sectors, including the automotive, paper, glass and packaging industries, as well as for architects and dentists. Kuraray Europe is a wholly owned subsidiary of the publicly listed Kuraray Co., Ltd., which is based in Tokyo, Japan, and has more than 11,200 employees worldwide and sales of EUR 4.4 billion



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