Rope Breakage in the First Week in Operations and Several More Over 9 Months Versus No Breakage at All.

This is Why Not All HMPE Fiber is the Same.

When PT Indo Straits was looking for new mooring lines for its coal transshipment crane barges, it knew what it wanted: something strong, safe, highly reliable and easy to handle that would perform well for at least a year in service in harsh working conditions. It wanted the best. Ropes made with HMPE fiber. But within a week of installing the ropes they discovered that not all HMPE fiber is the same.

Demanding conditions need strong, safe and reliable ropes

In 2012, PT Indo Straits began researching the purchase of new spring line ropes for these vessels. The ropes were needed to position and stabilize transshipment crane barges. These barges are used out at sea to transship coal from smaller barges to large bulk carriers for onward transportation.

It didn’t take long for the company to determine what it wanted: ropes made with HMPE fiber. There were three reasons why: safety, easy handling, and to maximize operational efficiency. And obviously, the company wanted the best.
Coal transshipment configuration with a PT Indo Straits crane barge. Lines in red and blue are ropes used as spring lines, which are most crucial for operations. The crew uses these two winches to give out or take in rope. These move the barge along the side of the bulker carrier and take most of the load. During transfer, the same ropes, supported by other polypropylene ropes, ensure the vessels remain in the same position relative to each other.

Not all HMPE fiber is the same

In January 2013, PT Indo Straits purchased and installed the new 48mm diameter spring lines made with 12-strand generic HMPE fiber with a 32-strand polyester jacket. These ropes were specified with a breaking load of 165tons and expected to have a life expectancy of approximately 4,000 operational hours – roughly one year; which was a realistic reflection of the harsh conditions in which the ropes would be used: often heavy swells, coal dust and the many rough surfaces and sharp edges over which the ropes would have to run.

Unfortunately, these new ropes made with generic HMPE fiber broke within a week in operations. As the PT Indo Straits barge master involved puts it: “Once the jacket broke, the rope would not last. It broke quickly. This caused lots of additional work and exposed the crew and equipment to risk."

Rope made with generic HMPE fiber after 9 months in service on PT Indo Straits’ Straits Venture coal transshipment crane barge. This rope was first used as a spring line and broke in its first week of operation. It continued to break several times during its 9 months service time.

Although there were no injuries to personnel or damage to equipment, PT Indo Straits takes a serious view in upholding safety and operational excellence for business success. They immediately contacted the DSM Dyneema Asia Pacific Technical Center in Singapore to investigate and seek recommendations even though these ropes that were purchased were not made of Dyneema® fiber. During investigations, PT Indo Straits learnt that not all HMPE fiber is the same in terms of performance, quality and consistency.

Why use mooring ropes made with HMPE in coal transshipment

Mooring lines made with HMPE fiber, particularly Dyneema®, which is the most trusted brand, 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.

Its high strength to low weight properties enable easy handling during operations and mean fewer resources and time are needed to maneuver alongside and dock with bulk carriers. This improves productivity and operational efficiency.

In the area of safety, any rope breakage is a huge risk as three ships are positioned closely next to each other. Also, if steel wire were to snap, the backlash could cause serious injury or even death.

Ropes made with HMPE fiber, particularly Dyneema® also have greater abrasion resistance. This gives them a longer life expectancy compared with other synthetic fiber ropes, such as polypropylene ropes, when used in such harsh conditions. Other synthetic ropes typically only last only two to three months before they fail due to their poor abrasion resistance.

Rope made with generic HMPE fiber after 9 months in service on PT Indo Straits’ Straits Venture coal transshipment crane barge. This rope was first used as a spring line and broke in its first week of operation. It continued to break several times during its 9 months service time.
Demanding specifications
PT Indo Strait’s specifications were demanding so as to uphold its high standards in safety and operational efficiency. The new replacement ropes should last longer than the rope made with generic HMPE fiber, and at least one year. There should be no or, at worst, minimal instances of ropes breaking, to reduce downtime and the number of crew required on deck.

Based on the initial investigations and their operational needs, PT Indo Straits decided to procure their ropes with Dyneema® from Samson, a worldwide leader in the development and manufacture of high-performance ropes.

Samson recommended its 48mm AmSteel®-Blue 12-strand rope made with Dyneema®, with a breaking load of 155tons. An order for two coils were made.

However, until it was ready, the company had to continue using its generic HMPE fiber ropes. The breakages continued.

Samson’s AmSteel®-Blue ropes made with Dyneema® outperformed on all scores
October 1, 2013 was a big day for PT Indo Straits, Samson and DSM Dyneema. It was then that the new AmSteel®-Blue ropes made with Dyneema® were installed on the PT Indo Straits crane barge. At the same time, the generic HMPE fiber ropes, by then 9 months old, were removed.

During the first three months of operation usage, the AmSteel®-Blue ropes, made with genuine Dyneema®, clearly and convincingly outperformed not just the generic HMPE fiber ropes, but also the technical specifications the company laid down.

Samson’s AmSteel®-Blue ropes made with Dyneema® after three months in service. No breakages and the lines are in excellent condition despite the harsh working and operating environment.

Another inspection was done after 11 months of operational usage, the ropes were showing only half the amount of wear expected. Clearly, the one-year lifetime PT Indo Straits wanted would be no problem. And the ropes have continued to perform well. During subsequent inspections, the AmSteel®-Blue ropes made with Dyneema® proved their quality by showing higher abrasion resistance than the generic HMPE fiber ropes they replaced. This despite the fact that the earlier ropes were jacketed, whereas the AmSteel®-Blue ropes were non-jacketed 12-strand ropes.

As the PT Indo Straits barge master noted in September 2014: “There have been no breaks in the AmSteel®-Blue ropes since we began using them. Our expected lifetime for these ropes was one year. We are happy with the result and looking forward to using them longer – maybe up to one year more.”

In fact, they were still in use two years after going into service.

Samson’s AmSteel®-Blue Rope made with genuine Dyneema® delivered on all fronts:
- Zero line breakages in the first 11 months of usage and still in use after two years (versus rope breakage in the first week with generic HMPE fiber).
- No downtime due to rope breaking.
- Increased safety through reducing the time and number of crew required on deck.
- Savings from significantly longer service life far outweigh higher initial purchase cost.
- Improved productivity thanks to faster transfers and loading times and smooth operations.
Samson's AmSteel®-Blue spring lines after 11 months in service. Despite the harsh and dusty working conditions, and the constant contact with rough surfaces, there had been no breakages. Visual inspection concluded that the ropes were only halfway through their lifespan and so set to easily beat the one-year specification set by PT Indo Straits. The ropes were still in use – nearly two years after being installed. There had still been no breakages.

For Paul Chong, Technical Sales Manager, APAC, Samson, the project demonstrated the value of the company's expertise and its longstanding collaboration with DSM Dyneema: "Samson’s AmSteel®-Blue made with Dyneema® has a proven track record going back many years. In this case it exceeded expectations and provided the client with peace of mind when working in such a harsh environment."

This is supported by Neil Liu, Applications Development and Technical Services Manager at DSM Dyneema: "The operational usage conditions were harsher for the spring line ropes than other maritime operations, like docking mooring and tug towing, as the rope comes into contact with coal dust and rough contact surfaces. Also, the mooring configuration means the ropes made with Dyneema® take most of the load during operations. During the inspection, it was proven that the ropes made with Dyneema® had higher abrasion resistance and exceeded the strength requirements."

Edwin Grootendorst, Global Business Director, DSM Dyneema said: "As the inventor of ultra high molecular weight polyethylene fiber, DSM Dyneema continues to push the performance benchmark and the quality of all our Dyneema® products and innovations. We rigorously ensure consistent high performance and quality from each and every fiber that goes into applications that secure maritime assets and operations. This ensures that shipping operators will always feel secure and have peace of mind in their operations."

About PT Indo Straits
Founded in 1985, PT Indo Straits Tbk (PTIS) is a highly recognized marine engineering company in Indonesia, servicing leading customers in the oil, gas and coal mining industries. The company is known for its expertise in marine civil engineering, including offshore lifting works, dredging and reclamation and breakwater construction, among others. Its other specialization is marine logistics support, and the company operates over 40 different types of floating equipment of various sizes. Among these are two coal transshipment crane barges: Straits Venture and Straits Venture II.

About Samson
For more than 130 years, Samson has been recognized as a worldwide leader in the development and manufacture of high-performance ropes. Among its many innovations, Samson invented the double braid and pioneered the first high modulus polyethylene fiber ropes. Today, Samson engineers continue to pioneer the use of new fiber technology and the development of innovative coatings and constructions to produce ropes with unprecedented performance characteristics. Samson’s research and development team is meeting an ever-expanding market need for products with exceptional performance in critical applications. Samson is part of Wind River Holdings™ portfolio of operating companies. For more information about Wind River Holdings™ visit www.windriverholdings.com.
More information?
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