

DYNEEMA® IN MOORING

TECHNICAL GUIDE

THE DIFFERENCE IS IN THE CORE

Dyneema® is born from science. Ever since we developed the world's strongest fiber™, we've been consistently pushing the boundaries of what's possible in high-performance fibers and in high-stakes industries.

This outstanding performance begins in the core – of our fiber and our company.

As the inventor and manufacturer of premium HMPE fiber under the brand name Dyneema®, we do what others can't: we engineer the ingredient polymer from scratch, design the molecular alignment, and control the entire manufacturing process. We use our extensive expertise and legacy of cutting-edge R&D to drive new innovations in material science, rigorously testing every solution to validate its key attributes.

The result? Consistency, reliability, and predictability – the core fundamentals that define our fiber's performance. Today, our brand is recognized for premium quality and safety, and our fiber is used inside the best products on the market.

THE SCIENCE AT THE CORE: OUR UNIQUE POLYMER ENGINEERING

Dyneema®'s position as the world's strongest fiber™ – 15 times stronger than steel at the same weight, yet light enough to float on water – begins at the core of every Dyneema® fiber.

By controlling the entire manufacturing process from start to finish, we engineer ultra-lightweight strength into our solutions at the molecular level.

We are the only fiber manufacturer that produces its own polymer from its own feedstock, using patented and proprietary technology. By contrast, others are forced to use available polymers from untraceable sources on the open market, which leads to uncertainty and inconsistency in performance.

This unique manufacturing process enables us to:

- **Perform polymer engineering at the molecular level**

Modifying the polymer chains at the core of each fiber to enhance strength, fatigue resistance, and other key attributes.

- **Guarantee consistency to our customers**

There is no question of where our raw material is sourced or how it is produced.

- **Innovate faster**

Our in-house R&D teams and 100% process control accelerate the development of new product grades.

THE FATIGUE BUFFER: ENABLING SAFE, RELIABLE MOORING

In mooring ropes, fatigue is the process of fiber degradation caused by repeated cyclic loading over long periods of time. This degradation happens inside the rope at fiber level and is invisible to the eye.

Fatigue can happen more quickly or slowly depending on the conditions in which the rope is used. The three parameters affecting the rate of fatigue are time, temperature, and tension (the 3Ts).

Fatigue is the main factor affecting a rope's durability, and therefore its safety and reliability. Thanks to our unique polymer engineering, we're able to engineer fatigue resistance into the core of our fibers at a molecular level.

With far greater fatigue resistance than any other available HMPE fiber, mooring ropes made with Dyneema® provide a large safety margin between point of failure and discard. We call this the fatigue buffer.

The fatigue buffer is unique to ropes made with Dyneema®, and it ensures the reliability of mooring operations over the full life cycle of the rope.

Based on dataset from Dyneema®

WORKING WITH OUR WORLD-CLASS PARTNERS

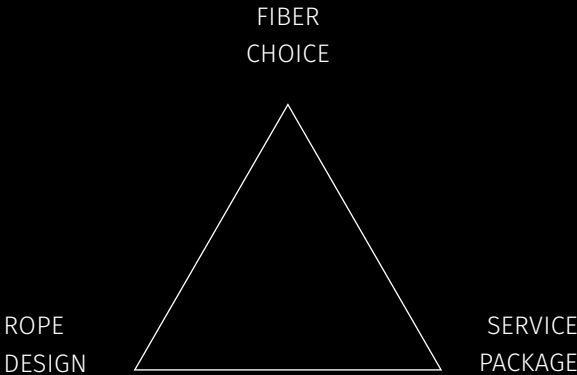
Dyneema® is a key ingredient inside high-performance mooring lines because of its molecular structure and ability to withstand fatigue.

But the quality and reliability of a mooring rope are also determined by how it's manufactured by rope suppliers and maintained by users. In simple terms, rope performance is determined by:

- Fiber choice
- Rope design
- Service package

At Dyneema®, we're selective about who we partner with. We only supply our fiber to the most respected, reliable rope manufacturers. And when we do, we provide them with all the necessary data and support to ensure they can offer vessel crews a safe and comprehensive service package.

Dyneema® triangle of trust:



OUR PREMIUM PORTFOLIO

DYNEEMA® SK78 FIBER:

Dyneema SK78-1760		
	Tenacity	Modulus
cN/dtex	35.1	1160
GPa	3.4	114

Elongation at break (%): ~3.5–4.5%

Dyneema SK78-2640		
	Tenacity	Modulus
cN/dtex	33.5	1118
GPa	3.3	110

Elongation at break (%): ~3.5–4.5%

For decades, Dyneema® SK78 fiber has been the industry standard for high-performance mooring lines. At the polymer level, Dyneema® SK78 fiber is optimized for increased fatigue resistance. With a significant fatigue buffer between discard point and failure, ropes made with Dyneema® SK78 fiber can be reliably deployed to moor valuable cargo and keep payloads and personnel safe.

Dyneema® SK78 delivers*:

- More than 3x higher fatigue resistance
- 4x abrasion resistance
- Superior resistance to high temperatures

*Compared to generic HMPE

Used for:

- LNG and oil carriers
- Cargo and container ships
- Cruise ships
- Tension systems on shore

OUR PREMIUM PORTFOLIO

DYNEEMA® SK80 FIBER:

Dyneema® SK80-2640		
	Tenacity	Modulus
cN/dtex	35.1	1180
GPa	3.3	116

Elongation at break (%): ~3.5–4.5%

We have long set the bar for performance with Dyneema® SK78 fiber. But now, we’re raising that standard again to further increase safety and reliability. Dyneema® SK80 fiber is the latest evolution of Dyneema® for mooring lines, and is the most durable and fatigue-resistant solution in our portfolio.

Dyneema® SK80 fiber delivers*:

- 2x durability
- 2x fatigue resistance
- 2x resistance to the elements (UV and oxidation)

*Compared to Dyneema® SK78 fiber

Provides additional reliability for:

- LNG and oil carriers
- Cargo and container ships
- Cruise ships
- Tension systems on shore

OUR PREMIUM PORTFOLIO

DYNEEMA® DM20 FIBER

DYNEEMA® DM20		
	Tenacity	Modulus
cN/dtex	32.0	960
GPa	3.1	94

Elongation at break (%): ~3.5–4.5%

Dyneema® DM20 fiber is the only HMPE fiber that’s suitable for use as a load-bearing core in permanent installations, and has a DNV-approved lifetime performance model.

Used for:

- Floating wind, FSRU, and FPSO mooring systems
- Subsea tethers
- Many other extreme applications

PERFORMANCE BENEFITS AT A GLANCE



INCREASED RELIABILITY

Greater durability and a far longer fatigue life mean Dyneema® fiber maintains its performance, with no unexpected loss of strength before the end of its working life.



TEMPERATURE RESISTANCE

Maintains its strength and performance in extreme cold or hot climates, ranging from -40°C to 70°C and beyond.



LONGER SERVICE LIFE

Mooring lines made with Dyneema® last longer than conventional alternatives, requiring fewer replacements and reducing long-term costs.



EXCELLENT ABRASION RESISTANCE

Withstands constant friction against fairleads and bollards.



SUPERIOR DURABILITY

Designed to withstand the harshest marine environments, from UV and saltwater exposure to constant tensioning and stress.



NO WATER ABSORPTION

Dyneema® fiber is hydrophobic, meaning mooring lines neither absorb water nor gain weight when wet.



SUPERIOR FATIGUE RESISTANCE

Engineered at a molecular level to resist internal fiber degradation, mooring lines with Dyneema® provide a unique fatigue buffer – a built-in safety margin between discard point and failure (resulting in safer operations).



REDUCED ENERGY CONSUMPTION

The ultra-light weight of Dyneema® fiber means less fuel is needed to transport, deploy, and recover mooring lines – saving on time and cost.

RIGOROUS TESTING, PROVEN PERFORMANCE

When you choose a mooring line with Dyneema® in its core, you're investing in a product built with the most durable HMPE fiber inside. We guarantee this because, alongside controlling the entire end-to-end manufacturing process, we're the only fiber manufacturer to test our solutions at fiber, yarn, and rope level.

This approach ensures our precise polymer engineering translates into reliable performance in end-use applications.

We've developed state-of-the-art testing equipment and created models based on the results of these tests, helping us accurately predict the lifetime of ropes made with Dyneema®.

For example, our digital rope service lifetime tool shows users how time, temperature, and tension affect the rate of fatigue – and how the Dyneema® fatigue buffer increases the safety and reliability of mooring systems.

Access the tool here:



Third-party validation

Our Dyneema® solutions are accredited by leading certification bodies such as DNV, Bureau Veritas, ABS, and ClassNK. This further demonstrates the reliability and safety of the world's strongest fiber™ and its suitability for high-stakes mooring operations.

Additionally, our premium rope manufacturing partners are dedicated to producing strong, durable mooring and rowing ropes with Dyneema® fiber, in accordance with MEG4 guidelines.

WANT MORE INFORMATION?

Discover why Dyneema® is the material
of choice for mooring applications at
www.dyneema.com.

