



The experience with Dyneema®

Mooring the world's largest cruise ships is safe and simple with ropes made with Dyneema®



When the world's two largest cruise liners currently afloat make their brief stops at ports around the Caribbean, mooring ropes made from the world's strongest fiber hold them firmly in place. Outstanding strength coupled with low weight and great ease of handling are the key reasons why Royal Caribbean Cruises Ltd. (RCCL) chose ropes with Dyneema® for the Oasis of the Seas and the just-launched Allure of the Seas.

The two identical ships are both 360 meters long, have a beam of 47 meters, contain 16 passenger decks and are capable of carrying around 8000 people, including the crew. Built at the Turku, Finland shipyards by leading shipbuilding group STX Europe, they both have a gross tonnage of 222,900 tonnes. They are some

40% larger than the next biggest cruise ship currently afloat.

When the Oasis of the Seas was launched in late 2009, it was the first ever Royal Caribbean ship to use mooring ropes with Dyneema® rather than the normal mixture of polypropylene (PP) and polyester (PET). Given the size and importance of the ship, STX originally proposed to RCCL that ropes made with Dyneema® be used during the initial design stages back in 2004.

The Oasis of the Seas is so large that ordinary ropes used for other large cruise ships could not even be considered. *"Normal ropes would have been too bulky for easy handling. The winches would have been huge.*



And RCCL wanted smaller winches so they could maximize the space available for their passengers,” says Jan Willem Visser Marketing Manager Commercial Shipping at Gleistein Ropes; the manufacturer of the ropes and one of the world’s leading innovative manufacturers of high-quality rope, headquartered in Bremen, Germany.

On such a large ship, it may come as a surprise to find that the space used up by winches can be so critical. But on the Oasis of the Seas, the kitchens are next to the mooring deck, so bigger winches means smaller kitchens. And with up to 5400 passengers onboard, the ship needs large kitchens.

Steel wire ropes would have a similar diameter to strength ratio as ropes with Dyneema®, but would be up to 7 times heavier and much more difficult to handle. STX experienced this first hand during the final stages of construction as the Oasis was initially moored with

steel ropes. This is standard practice at STX during the construction phase. Gleistein’s market manager Jan Willem Visser was one of the people involved in installing the ropes with Dyneema®, selected by RCCL, before the ship left the yard. *“Maneuvering the steel wire ropes was a back-breaking job,”* he recalls. Esthetics also play their part: ropes with Dyneema® can be made to match the colors of the ship, something not possible with steel wire ropes.

The Oasis of the Seas has 24 blue-colored mooring lines with Dyneema®, 12 of them in the bow and 12 aft, amounting to 190 meters in total. Each 12-strand rope has a diameter of just 46 mm. By comparison, PP/PET ropes would have to be between 88 and 96 mm in diameter (depending on the mix) and weigh close to 5 kg per meter.

Clayton Van Welter is Chief Officer on the Oasis of the Seas. He says that Dyneema® was chosen for its



durability and strength to diameter ratio. *“The key advantage is the overall durability of the ropes,”* he says. *“They have lasted a whole year with little to no wear.”* Chris van Raalten, Ship Manager for RCCL’s “Oasis” class ships, concurs. *“Our experience thus far has been very good, the lines are holding up great to the wear and tear,”* he says. *“We have yet to replace any of them.”* He says that RCCL may now consider using ropes with Dyneema® for some applications on its smaller “Freedom Voyager” and “Radiance” class ships.

Van Welter points out that the ropes with Dyneema® have white ‘tails’ in an eight-strand PP/PET line that serve as a weak link. A protective sleeve made with Dyneema to protect the tail when connected to a bollard. *“The idea is to break the weak link before parting the line with Dyneema®,”* he explains. *“We were recently moored on the island of St. Maarten on a day with a particularly long and deep swell. This obviously*

caused the vessel to sway on and off the pier, and this led to the lines going slack and tight over and over, all day. Another large cruise ship was docked on the other side of the pier. She broke six standard mooring lines, and the procedure for putting out a new line was very time-consuming.”

“We broke three weak links that day. When this happened, we would heave in the rope with Dyneema®, inspect it, attach a new weak link and send it out. All the lines with Dyneema® withstood the constant rubbing on the fairleads and we left that day without one of the lines with Dyneema® breaking.”

Word from the bridge is that the captain of the Oasis of the Seas is more than happy with the new ropes too. For one thing, the time taken to moor is short because two ropes can be sent ashore at the same time to secure the ship. Engines can be turned off sooner, with important fuel savings accruing as a result.



“RCCL is now considering how and where it might use more Dyneema® across a variety of applications where steel wire rope is being used,” says Van Welter. “These include the collapsible rails we have on our mooring platforms where we are currently using wire rope with a plastic sleeve over it. I feel that Dyneema® would be a perfect solution to add color as well as functionality to the rail system we have in place.”

“This is an excellent illustration of how Dyneema® can make a difference- in terms of cost, performance and safety for our customers and end-users of ropes,” said Marc Eijssen, Applications Manager Offshore & Industrial for DSM Dyneema. “Moreover, the use of Dyneema® in protective sleeves can extend the durability of the ropes with Dyneema® even further.”



Gleistein Ropes concentrates on the development, manufacturing, and sales and distribution of high quality and high performance ropes. Founded in 1824, Gleistein is the oldest family-owned industrial enterprise in the Hanseatic city of Bremen, so tradition plays an important role in the company, especially the tradition of always looking ahead! Our eventful history and vast wealth of experience form the foundation for innovation and far-sighted decisions: Gleistein Ropes today is an international group of companies and a leader in many areas of rope technology.

For more information about Gleistein Ropes and their products, visit www.gleistein.com.

www.dyneemamatters.com

Dyneema® and Dyneema®, the world’s strongest fiber™ are trademark(s) (applications) owned by Royal DSM N.V.

All information supplied by or on behalf of DSM Dyneema LLC and/or DSM Dyneema B.V. (“DSM”) in relation to its products, whether in the nature of data, recommendations or otherwise, is supported by research and/or experience and believed reliable, but DSM gives no warranties of any kind, expressed or implied, including, but not limited to, those of correctness, completeness, merchantability or fitness for a particular purpose and DSM assumes no liability whatsoever in respect of application, processing or use of, or reliance on, the aforementioned information or products, or any consequence thereof, including but not limited to any infringement of the rights owned or controlled by a third party regarding intellectual, industrial or other property. Any information provided by DSM does not release the user from the obligation to verify such information and to perform its own testing and analysis to determine the suitability of the products for the intended process, use or specific application. The user accepts all liability in respect of or resulting from the application, processing, use of, or reliance on, the aforementioned information or products or any consequences thereof.

DSM Dyneema B.V., Mauritslaan 49, 6129 EL Urmond,
The Netherlands. Tel. +31 (46)4 76 79 99

DSM Dyneema LLC, 1101 Highway 27 South,
Stanley, NC 28164, USA. Tel. 800 883 7404

DSM Dyneema, 476 Li Bing Road,
Zhang Jiang, Shanghai 201203, China.
Tel. +86 (21)61 41 80 58

www.dyneema.com

a **DSM**Brand

 **Dyneema**®
With you when it matters