TRELLEBORG

A Smarter Approach

Foam Fenders for the Cruise Industry

PRODUCT OVERVIEW

Introduction

For more than 30 years, Trelleborg Marine Systems has been a world leader in the design and manufacture of innovative solutions, for both onshore and offshore applications all over the world.

In this time, we have gained a unique understanding of the issues facing port owners and operators, ship owners and operators and the relationship between them. Through a process of continual innovation and refinement, we have developed a broad range of cutting edge solutions that empower faster turnaround and increased throughput, improved safety and lower operating costs for ports and terminals, and the vessels that visit them. This process of continuous innovation continues to this day.

COMMITMENT TO THE CRUISE INDUSTRY

We understand the key issues facing the cruise industry. Our solutions are geared towards driving improvement across these concerns.

Modern cruise ships are larger than their historic counterparts and therefore require a larger crew. This means more people are depending on the safety and reliability of the port than ever before.

And with the huge capacity of today's vessels, comes the need for more efficient solutions port side, to accommodate and optimize intended economies of scale.

There are many ways that optimizing the port environment can increase safety and efficiency. Our market leading offering, unique industry insight and comprehensive support and aftersales care make Trelleborg the partner of choice to maximize the opportunities offered by today's cruise industry.

Performance and Quality

Over the last five years, Trelleborg Marine Systems has undertaken substantial research into the production and testing of fenders, highlighting concerns with industry practices and making recommendations for change and improvement.

As a result, we are starting to see the industry's perception of fenders shift from being commodity products, to a more in depth understanding of the specialized, engineered solutions required.

But this commitment to quality is not restricted to fenders. All Trelleborg's solutions combine expert design and superior manufacturing techniques and materials to create products that add value in the industries in which we operate.

Every Trelleborg product meets international manufacturing and quality standards, and thanks to our rigorous supply chain management, our customers know they can rely on our products to provide effective solutions to their operational challenges.

Contents

TOTAL CRUISE CARE

Foam Fenders

Used in a variety of challenging applications, foam fenders are extremely versatile. Easy to install, they provide a tough, heavy-duty fender solution for in-harbor, off-shore and ship-to-ship applications. Their resilient foam-filled construction provides an unsinkable fender body that permits high energy absorption with relatively low reaction force and hull pressures.

Trelleborg's wear and tear resistant foam fenders perform in even the harshest environments. Our foam fenders share a construction technology centered on a closed cell polyethylene foam core and an outer skin of reinforced polyurethane elastomer. The closed cell foam structure makes punctures a thing of the past. Every cell is separate and so water cannot migrate into the foam.

Even after many years of active service, the fender can be returned to the factory, re-skinned and made ready for a new lease of life. No matter how badly abused, Trelleborg foam fenders will not burst or explode. Damage is rare, but if the worst should happen our foam fenders will still function until repairs or replacement are possible.

To meet the needs of the modern cruise industry, our foam fenders are available in a range of sizes and performance grades as well as different colors. In addition, customers have the option to customize them with corporate logos.

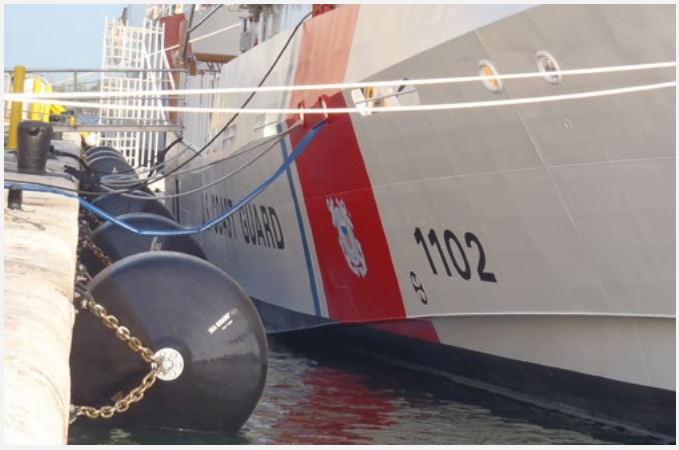
SEAGUARD

SeaGuard fenders are typically used between dock and vessel but can work equally well in harbors or between vessels in near shore applications for passenger lightering operations. Low hull pressures ensure safe berthing for vessels with low hull pressure requirements. Trelleborg's SeaGuard fenders combine a durable, non-marking finish, requiring low maintenance. SeaGuard fenders can be deployed floating or suspended, against a quay wall or for ship-to-ship operations. SeaGuard fenders suit all sites with small or large tidal variations. They also work just as well on new or old structures.

SeaGuard fenders are gentle on low hull pressure vessels. Their skin is very tough but non-marking, even against white-hulled yachts and cruise liners. Low maintenance comes as standard because the polyurethane elastomer is highly resistant to the effects of ozone and ultra violet light. SeaGuard fenders will never sink or deflate. Even at the end of their first service life they can be returned to the factory for refurbishment before going back to work.

- Unsinkable design.
- Virtually indestructible.
- Durable, non-marking finish.

SeaGuard® Fenders are ABS Type approved, based on ABS rules and ASTM standards. This is voluntary and denotes excellence in manufacturing quality and performance.



DONUT FENDERS

Donut fenders are an effective solution for simple berthing dolphins, guide structures and turning structures. The buoyant Donut floats up and down a single tubular pile and freely rotates to help align or redirect ships. The internal casing has long lasting, low-friction bearings which need minimal maintenance. The foam is unsinkable and cannot burst or deflate. The Donut skin is durable polyurethane reinforced with continuous nylon filaments.

Trelleborg's Donut Fenders are custom designed for every application. They can have supplementary buoyancy to present a raised contact face. The body can be additionally protected with rubbing strips to cope with ferry beltings. Bright colors are often used to improve visibility and safety.

- Freely rotates around a pile.
- Requires minimal maintenance.
- Will not mark ship hulls.

To learn more about Trelleborg's research into the characteristics of foam, and the way foam fenders are tested, please read our **Smarter Foam Theory Whitepaper**

Proven in Practice

CASE STUDY

Trelleborg was advised by a senior cruise captain that although he was familiar with the product and trusted its performance, he got to experience just how resilient the product truly is.

During an unexpected storm event, the captain had to make the very difficult decision to evacuate the port at which the vessel was berthed. There was a two-hour period in which the vessel had to remain at the berth in the storm to allow passengers to board the vessel. During this time there were severe swells and dynamic loading which caused several mooring lines to fail catastrophically. Additionally, there were multiple cycles in which the fenders were compressed to beyond normal design levels. Upon departing the facility, the captain reported his “utter shock” that there was no damage to the vessel, dock or fenders.

The vessel had been berthed on multiple 7ft x 14ft extra high capacity Trelleborg SeaGuard fenders.

While there are times that a fender gives its life to protect the assets to which it is assigned, this is a case in which the fenders lived to protect facilities for years to come. Given the severity of the event described, passenger safety was the highest priority followed by asset protection. No one would have been disappointed with the fenders even if they had sustained damage. The fact that there was no damage was “remarkable performance.”

Other Products

MOORING BUOYS

Resilient, easy to handle, self-fendering and requiring minimal maintenance, Trelleborg's mooring buoys offer a low maintenance and lower handling weight alternative to traditional steel mooring buoys. Resilient closed cell polyethylene foam is thermolaminated around a central composite of tubular steel frame and cast closed cell polyurethane foam. This forms a flexible, impact resistant flotation core. The foam core is then coated in a high performance elastomer skin and two flanges are welded in position to secure the foam core firmly in place. These buoys are used extensively in single point mooring (SPM) systems.

GENERAL SURFACE BUOYS

Trelleborg's General Surface utility and Support Buoys are manufactured from a resilient closed cell polyethylene thermolaminated foam core, encapsulated within a self-colored, abrasion-resistant polyurethane outer skin.

SmartPort Products

SMARTPORT BY TRELLEBORG

As our industry continues to face the challenges of globalization and increasing scale and utilization of vessels, we must continuously look for ways to improve efficiencies. The importance of technology in achieving these aims cannot be underestimated.

SmartPort by Trelleborg powers the critical interface between ship and port, on land and at sea. Building on Trelleborg's history of engineering ingenuity and sector knowledge, with a keen eye on data capture and management, and technology-driven insight, SmartPort improves safety and enhances ROI, for ports and vessels alike.

SmartPort connects port operations, allowing operators to analyze performance and use data to improve decision making. The system integrates assets like fenders, mooring equipment, ship performance monitoring, and navigation systems through a network of sensors. With the SmartPort range, Trelleborg is tackling the challenges facing our industry head on, using the latest marine technology to make berthing, mooring and piloting operations easier, safer and more efficient than ever.

AUTOMOOR

AutoMoor is our rope-free, automated mooring system designed to make berthing operations smarter, safer and more competitive.

AutoMoor units eliminate mooring lines and are specifically designed to improve operational efficiency and enhance safety levels. Combining innovative vacuum pad and passive damping technology to rapidly attach to and secure a vessel at berth, the units are suitable for a range of environmental and berthing conditions.

AutoMoor continuously monitors all mooring loads acting on the vessel at berth, providing live data to the operator to enhance the efficiency of day-to-day port and terminal operations.

SmartPort

DYNAMOOR

Combining Trelleborg's class leading Quick Release Hook (QRH) with an innovative constant tensioning system, DynaMoor represents the next generation of mooring solutions.

Safe and secure mooring needs balanced loads on mooring lines. Vessels using DynaMoor are protected from environmental factors like draft change and turbulence, which can lead to parted lines and excessive vessel excursion with conventional rigid line mooring.

Trelleborg QRHs pay in and out line constantly to maintain perfect tension. DynaMoor helps to maximize product transfer efficiency, avoiding downtime and damage, and creates a safer working environment.

DynaMoor offers a complete jetty solution integrating traditional QRHs, or a separate system working independently of a ship's mooring lines and winches.

SAFEPILOT

SafePilot is the new generation of navigation and piloting software from Trelleborg. Developed in conjunction with working marine pilots from across the world, SafePilot offers the most up-to-date, user-friendly PPU (Portable Pilot Unit) software available.

Using touch screen technology to make it easy to operate, this intuitive PPU software consists of six separate modules to meet different operational needs, from docking and river through to lock and offshore.

SafePilot is built around the iOS operating system and supports the use of handheld tablets for improved portability and instant accessibility. A touch screen interface allows quick interaction with the PPU, to make piloting smoother and easier, while the instant zoom function and new intelligent chart structure give you faster zooming than any other navigational software. This improves response and decision-making times to give the pilot greater control and create more accurate piloting and navigational maneuvers.

Why Trelleborg?

We pride ourselves on delivering a truly end-to-end service to our customers. As a long term supplier and partner to the cruise industry, Trelleborg's years of engineering experience and sector specific knowledge makes us the perfect partner to support this industry in the reliable protection of passengers and infrastructure. When you work with us, you will receive dedicated support throughout the full lifetime of your project.

30 YEARS OF EXPERIENCE

With 30 years of experience applying engineering ingenuity in ports and terminals around the world, Trelleborg provides clients with a broad scope of innovative, bespoke solutions for both onshore and offshore applications.

EFFICIENT, COST EFFECTIVE SOLUTIONS

We understand the demands of the modern terminal. Our cutting edge solutions are designed with customers' business imperatives in mind, producing faster turnaround and increased throughput, improving safety and lowering operating costs.

FULLY INTEGRATED SOLUTIONS

Trelleborg works alongside customers to determine best fit solutions for specific applications. We supply fully integrated solutions to meet and exceed customer needs, enhance safety and improve efficiency in all marine environments, from conception to completion and beyond.

GLOBAL PRESENCE, LOCAL SUPPORT

Although a truly global organization, Trelleborg believes firmly in giving our customers feet on the ground, local support. We apply local knowledge with the backing of global expertise to provide expert support, wherever and whenever you need us.

AFTERSALES SERVICE AND SUPPORT

Trelleborg Marine Systems offers full aftersales service and support, including comprehensive training and maintenance programs that can be customized to the needs of the individual terminal and its existing infrastructure.

DISCLAIMER

Trelleborg AB has made every effort to ensure that the technical specifications and product descriptions in this brochure are correct.

The responsibility or liability for errors and omissions cannot be accepted for any reason whatsoever. Customers are advised to request a detailed specification and certified drawing prior to construction and manufacture. In the interests of improving the quality and performance of our products and systems, we reserve the right to make specification changes without prior notice. All dimensions, material properties and performance values quoted are subject to normal production and testing tolerances. This brochure supersedes the information provided in all previous editions. If in doubt, please check with Trelleborg Marine Systems.

TRELLEBORG

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

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