



**Piping
Systems
Ecologically
Sound**
for Scrubber
Installations

Fiber Glass Systems

NOV Completion &
Production Solutions

Bondstrand™ GRE piping system helps reduce vessel emissions.

The maritime industry is facing tough new challenges of adopting new technologies and operational practices to comply with international, national and local regulations, introduced in order to reduce exhaust emissions from ships. As of January 2015, the International Maritime Organization (IMO) legislation stated that all ships operating inside of designated emission control areas are to use fuel with a low sulfur content, or to employ technology to reduce sulfur oxide (SOx) emissions.

One technology option is to install an exhaust gas cleaning (EGC) after-treatment system, also known as scrubbers. The exhaust gas scrubber system cleans the exhaust gas to reduce SOx emissions to the appropriate legal limit.

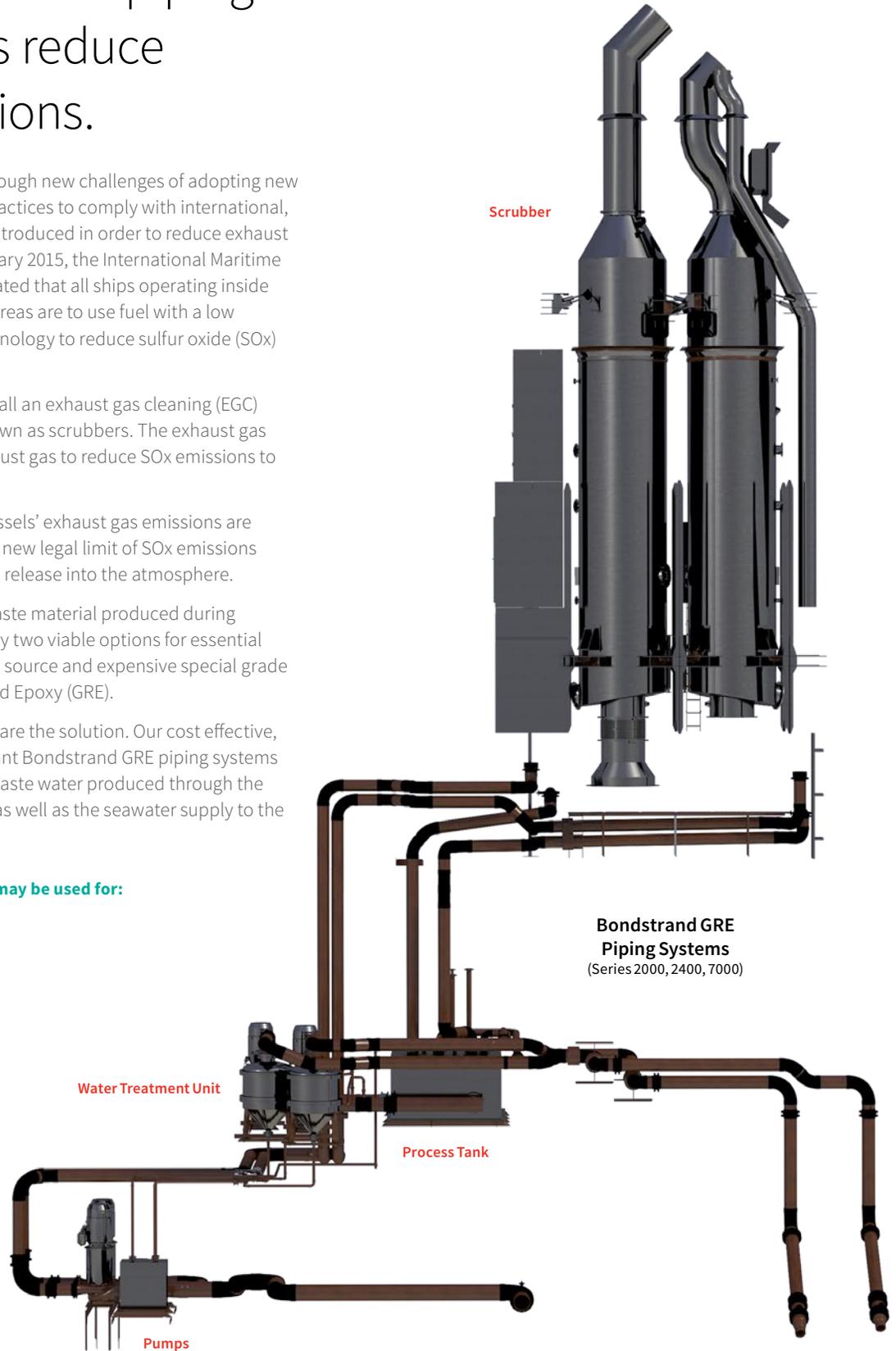
This method ensures that the vessels' exhaust gas emissions are sufficiently cleaned to within the new legal limit of SOx emissions (which is now just 0.10%) prior to release into the atmosphere.

The highly corrosive nature of waste material produced during the scrubbing process leaves only two viable options for essential associated pipework - difficult to source and expensive special grade stainless steel or Glass Reinforced Epoxy (GRE).

Bondstrand GRE piping systems are the solution. Our cost effective, lightweight and corrosion resistant Bondstrand GRE piping systems are suitable for both the acidic waste water produced through the exhaust gas scrubbing process, as well as the seawater supply to the scrubber.

Bondstrand GRE piping systems may be used for:

- Seawater
- Close/open loop wash water
- Treated washwater
- Sludge
- Sodium Hydroxide
- Fresh water



Model supplied by: Houlder Ltd.

Engineered for environmental compliance and performance excellence anywhere in the world.

Bondstrand GRE pipes and fittings are manufactured using **less energy** than carbon steel piping. Depending on whether the carbon steel is manufactured from recycled steel or from iron ore, the energy consumed manufacturing Bondstrand piping can be **80% less for new** and **50% less for recycled steel**.

Key Benefits

- Bondstrand Piping requires less energy for production of its pipes and fittings.
- Bondstrand piping requires less energy to move an equivalent volume of fluid due to its smooth interior surface.
- Bondstrand Piping will not need to be replaced unlike carbon steel piping. Replacing materials mean energy will be required to make the replacement.
- NOV Fiber Glass Systems' **Global Service Network** program is designed to provide owners and operators of marine and offshore ships and facilities with fast-response, comprehensive, professional repair and replacement services for Bondstrand piping systems anywhere in the World.

Other environmental benefits are:

- Due to its **smooth interior** surfaces of Bondstrand GRE piping, there is less frictional loss in the fluid flow, compared to carbon steel piping. In other words, **less energy** is consumed conveying the **same volume of fluid** over the same distance. In addition to this, the added advantage of Bondstrand GRE piping is that the smooth interior surface is maintained throughout the **life of the piping**, unlike carbon steel that has an increasing frictional loss, due to corrosion of the interior surfaces, compounded by scaling and oxide build up.
- In some cases, the Bondstrand GRE pipe diameters can be reduced compared to carbon steel piping, this is due to **larger pipe IDs** and **increased flow** values. Imagine the weight (and fuel) savings for your vessel when she has 18" GRE piping, instead of 20" metallic piping that is filled with water.
- Transportation and delivery cost are reduced due to the light weight characteristics of Bondstrand GRE piping. This also **reduces fuel consumption** and **carbon emissions**.



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