

GF Piping Systems

+GF+



# Fit for use onboard

Exhaust gas scrubber



# The best choice for you

## Corrosion and chemical resistant system solutions

### + Georg Fischer

Georg Fischer focuses on three core businesses: GF Piping Systems, GF Automotive and GF Machining Solutions. The industrial corporation, founded in 1802, headquarters in Switzerland and operates approximately 120 companies with more than 14 800 employees in 33 countries. GF Piping Systems is a leading supplier of plastic and metal piping systems with global market presence. We offer pipes, fittings, valves, automation products, jointing technology and corresponding services for the treatment of water and chemicals, as well as for the safe distribution of liquids and gases.

### + Our market segments

Being a strong implementation partner, GF Piping Systems supports its customers in every phase of the project. No matter which processes and applications are planned in the following market segments:

- Automation
- Building Technology
- Chemical Process Industry
- Energy
- Food & Beverage / Cooling
- Microelectronics
- Marine
- Water & Gas Utilities
- Water Treatment

### + Global presence

Our global presence ensures customer proximity worldwide. Sales companies in 26 countries and representatives in another 80 countries provide customer service around the clock. With 32 production sites in Europe, Asia and the USA we are close to our customers and comply with local standards. A modern logistics concept with local distribution centers ensures highest product availability and short delivery times. GF Piping Systems' specialists are always close by.

### + Complete solutions provider

Our extensive product range represents a unique form of product and competence bundling. With over 70 000 products, allied with a broad range of services, we offer individual and comprehensive system solutions for a variety of industrial applications. Having the profitability of the projects of our customers in focus, we optimize processes and applications that are integrated into the whole system. Continually setting standards in the market, we directly provide our customers with technological advantages. Due to our worldwide network customers benefit directly from our 50 years+ experience in plastics.

From start to finish, we support our customers as a competent, reliable and experienced partner.

## Introduction

# Go green with GF Piping Systems

A carbon footprint is the sum of all greenhouse gases given off to the atmosphere during the processes of extraction and refining of a material, production, transportation, use and recycling. Comparisons show that the sum of greenhouse gases released in manufacturing plastic solutions is smaller than in manufacturing traditional materials.

### A comparison of materials

In the framework of an in-depth study, pipes in a length of one metre and made of various materials were compared. The results showed that a plastic pipe has a carbon footprint which is up to five times lower than that of a comparable steel pipe.

### Lightweight all-plastic solutions

Plastics score particularly well because of their low weight, which pays off especially in the areas of transportation and processing. All-plastic solutions from GF Piping Systems are lighter in weight than piping systems made of conventional materials and this has a positive effect on the carbon footprint.

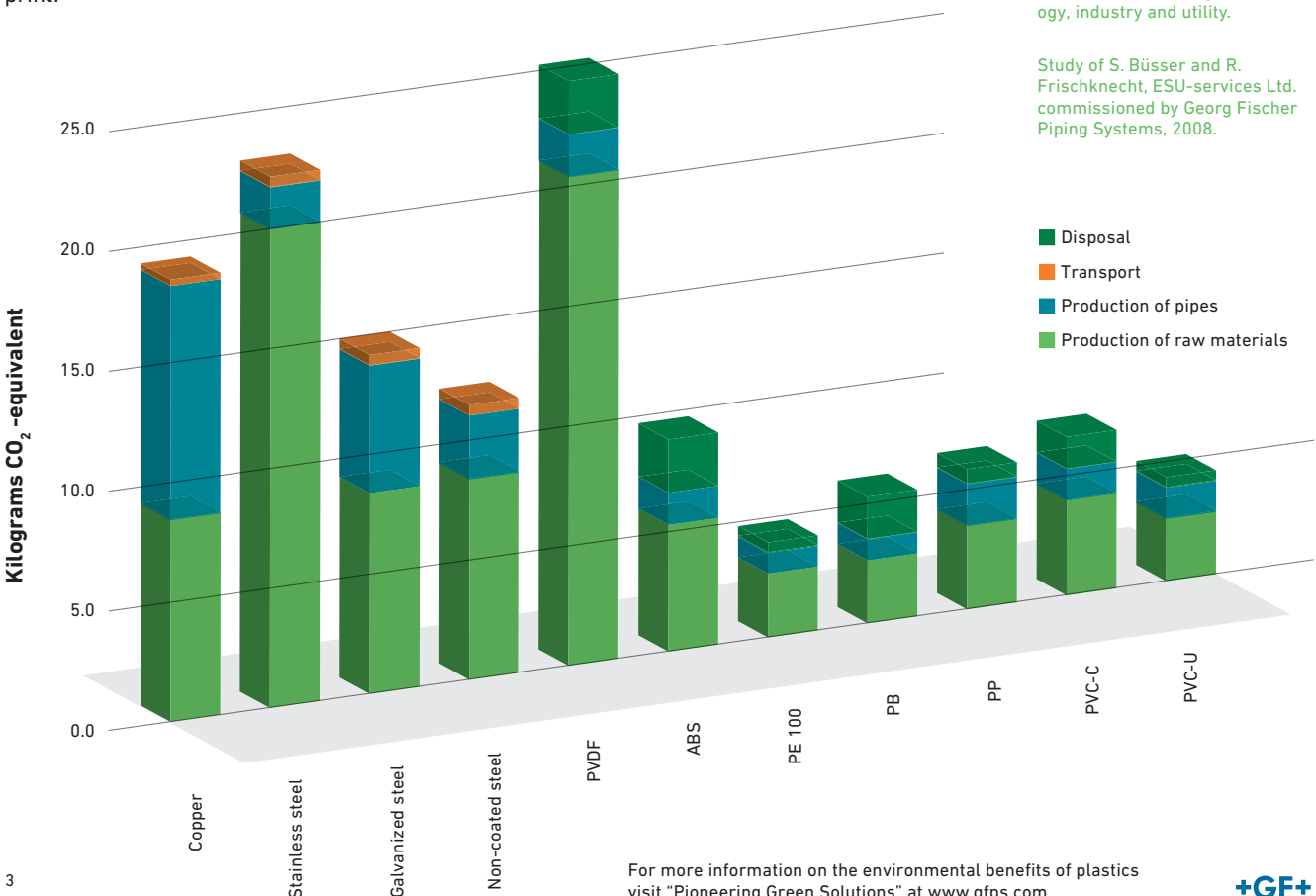
### Lower energy costs

Energy costs can be reduced with targeted layout planning and optimal sizing for pressure needs, allowing lower pump capacity requirements. Using plastic components contributes to a steady flow rate as well as a stable energy requirement. Pre-insulated plastic pipes further reduce energy requirements and have a positive impact on the carbon footprint.

### Carbon footprint

Carbon footprint of plastic and metal pipes (1-meter DN80 pipe) – Comparison of various piping materials for building technology, industry and utility.

Study of S. Büsser and R. Frischknecht, ESU-services Ltd. commissioned by Georg Fischer Piping Systems, 2008.



## Introduction

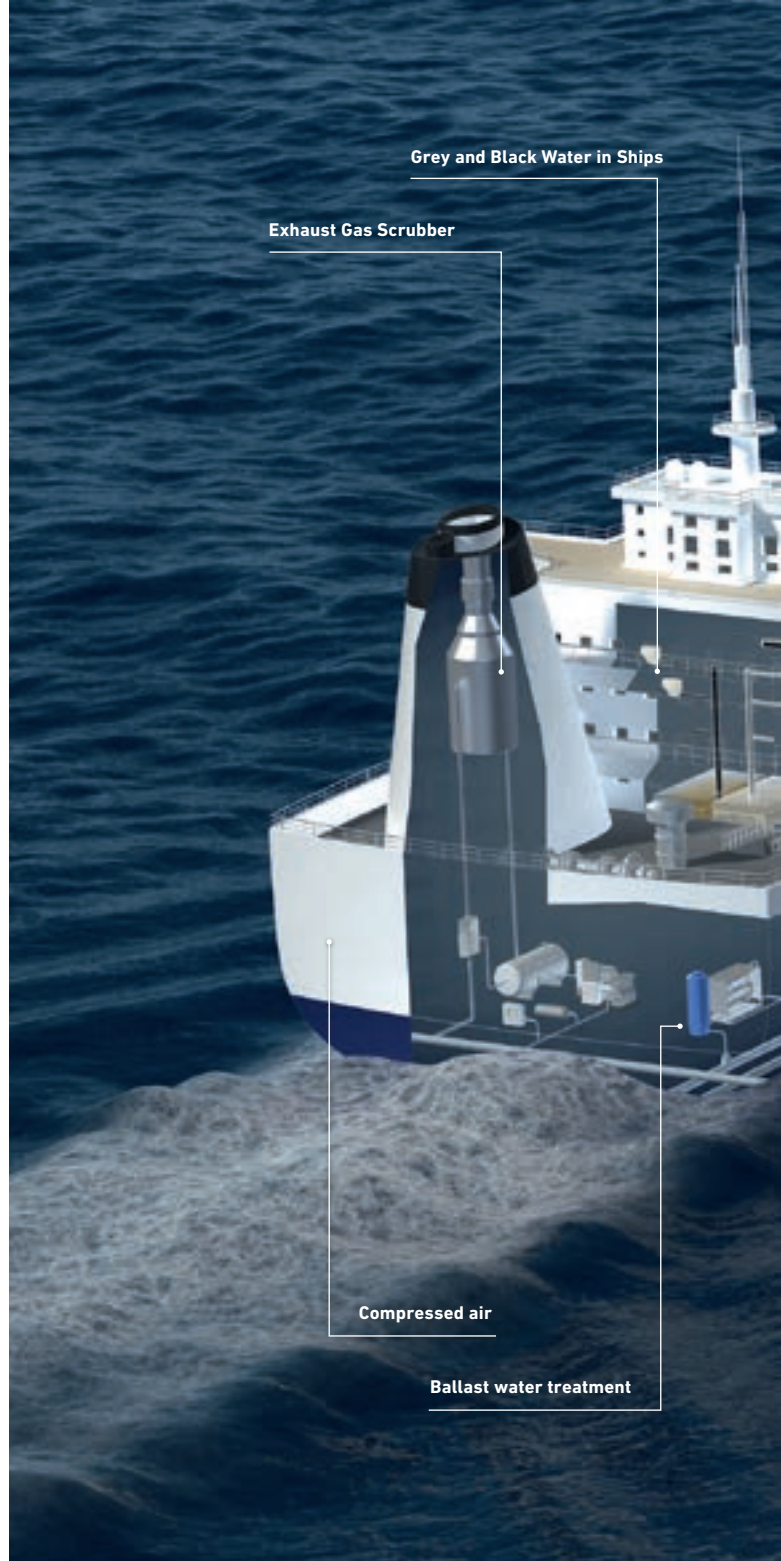
# Tailored for the future

Intelligent solutions reliably fulfilling the requirements of the maritime industry and the responsibility towards the maritime environment

Over the years, the global shipbuilding market has been in continuous growth, undergoing a process of profound change at the same time. Due to a significant increase in transport volumes and worldwide tourism, vessel fleets of larger dimensions dominate today's worldwide maritime traffic. This trend is accompanied by rising environmental requirements and standards to counteract pollution resulting from the expanded trade and travel. With high-quality plastic piping solutions for exhaust gas scrubber systems and other shipbuilding applications, GF Piping Systems supports the industry to face these technical, operational and environmental challenges. The corrosion, abrasion and chemical resistant systems are ideally adapted to the extreme conditions on the high sea, offering outstanding cost-efficiency and a long system life cycle.

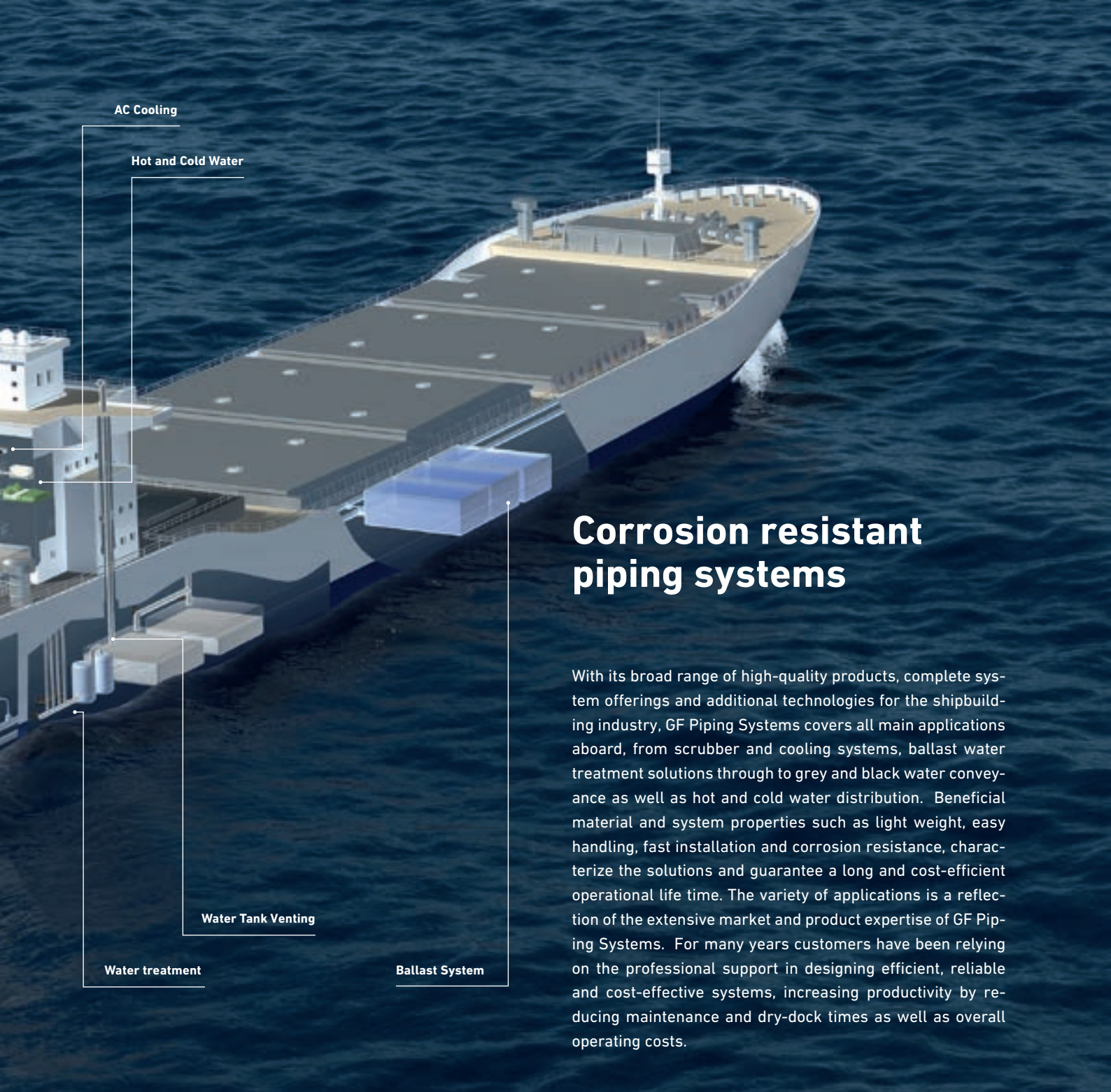
### Solutions for extreme conditions

Since sea water can be described as the lifeblood of ships, products and systems used in applications aboard have to deal with extreme conditions. Thus, preventing corrosion and leakage is more important here than anywhere else. With all-in-one plastic solutions, GF Piping Systems provides tailored systems for various ship applications, consisting of pipes, fittings, valves and corresponding jointing and automation technologies.



### Environmental approach

To a great extent, world's economy benefits from the high-performance maritime sector. But using the oceans as passenger and commercial routes, signifies a responsible approach at the same time. Several approvals, complying with inter-national standards and current IMO\* guidelines, prove the quality, safety and reliability of our products and systems. Compared to competitive materials, plastic solutions cause less CO<sub>2</sub> emissions and show a lower ecological footprint, lately forming the basis for sustainable performance.\*\*



# Corrosion resistant piping systems

With its broad range of high-quality products, complete system offerings and additional technologies for the shipbuilding industry, GF Piping Systems covers all main applications aboard, from scrubber and cooling systems, ballast water treatment solutions through to grey and black water conveyance as well as hot and cold water distribution. Beneficial material and system properties such as light weight, easy handling, fast installation and corrosion resistance, characterize the solutions and guarantee a long and cost-efficient operational life time. The variety of applications is a reflection of the extensive market and product expertise of GF Piping Systems. For many years customers have been relying on the professional support in designing efficient, reliable and cost-effective systems, increasing productivity by reducing maintenance and dry-dock times as well as overall operating costs.

### Added value for our customers

For more than 50 years, GF Piping Systems has been the market leader in supplying innovative plastic and metal piping solutions, that offer:

- a long lasting system life
- highest corrosion resistance
- outstanding welding systems
- a maximum of efficiency and safety

Our experience in specified water applications, profound market expertise and a global presence and network, with sales subsidiaries, production sites and distribution centers in 108 countries, make GF Piping Systems a qualified partner for different customer groups in shipbuilding. Experts ensure valuable customer proximity and a reliable support performance worldwide.

### Approvals:



\* IMO = International Maritime Organization  
 \*\* For more information on the environmental benefits of plastics visit "Pioneering Green Solutions" at [www.gfps.com](http://www.gfps.com)

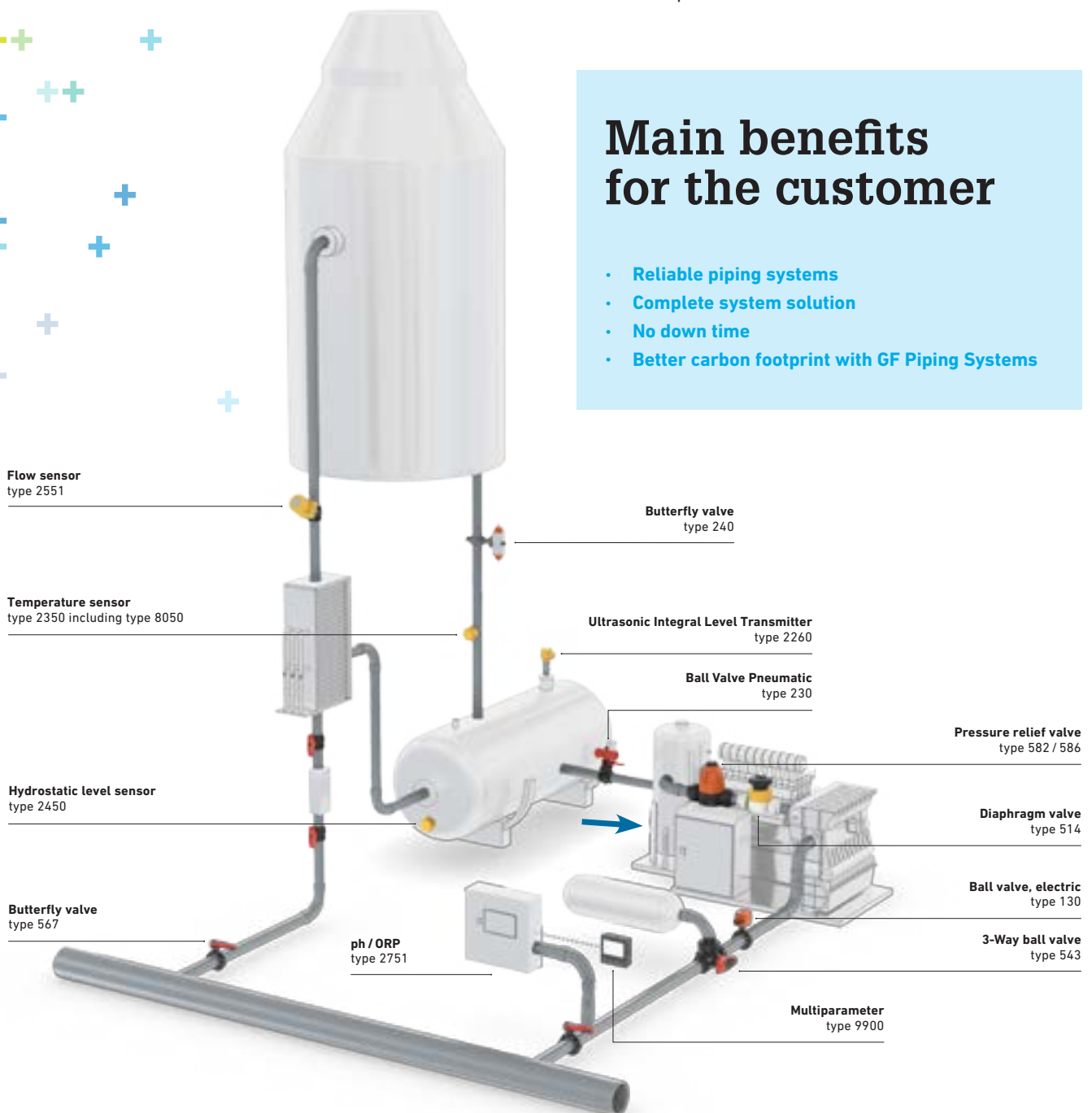
## Applications

# Exhaust gas scrubber

The International Maritime Organization has stipulated a reduction in the maximum sulfur limit in marine fuels from 3.5% to 0.5%. In a few years, all ships across the globe will mandatorily have to use low-sulfur fuels or gas instead of the high-sulfur fuel oil that currently dominates the market. Ship-owners will have to choose whether they want to use 0.5% sulfur fuel or scrubbing technology as one of the alternative measures to changing to low-sulfur fuels. Scrubbers are exhaust gas cleaning systems that remove sulfur from fuel, thus enabling continuous use of HSFO. They are permitted under the IMO rules but have related technical and environmental challenges. GF has wide experience and know-how in scrubber technology on land and onboard and can support in best material choice thanks to our material-chemical expertise.

## Main benefits for the customer

- **Reliable piping systems**
- **Complete system solution**
- **No down time**
- **Better carbon footprint with GF Piping Systems**



Key system in exhaust gas scrubber

# System overview



## ecoFIT (PE) System

ecoFIT qualified, corrosion resistance solution for universal usage in highly diverse industrial applications. Fuseable plastic (butt, socket, electro, and IR-Plus fusion), UV and impact resistant.



## Butterfly valve, type 567 / 578

The double eccentric operating principle of the butterfly valve type 567/578 guarantees good friction behavior and therefore less wear and tear compared to conventional centric butterfly valves. A high level of security against water hammer is thus provided.



## PROGEF (PP) System

Heavy duty piping system with good impact strength in non freezing indoor conditions. Very good chemical and abrasion resistance up to high process temperatures. Very cost-efficient system assembled from a comprehensive product range.



## 3-way ball valve type 543

the perfect valve for all mixing and distribution processes. Horizontal versions with L or T port as well as vertical versions with L port or 3-way ball allow realizing any number of application options. Redirecting, mixing, distributing or even shutting off a medium are just some of the possibilities.



## PVC-C Marine Grade (Metric / Sch80)

System with good chemical resistance and excellent mechanical properties at high temperatures. Typical for the system are the fast and safe connections by cementing with low investment for tools and equipment.



## Automation

A broad range, especially designed for harsh environments, consisting of sensors, transmitters, actuators and controllers, which is simple to use and highly reliable.



## Machines and tools

A wide range of welding machines, providing highest reliability, process control and simplicity in operation. Electro and butt fusion machines from manual up to hightech traceability machines.



## Measurement

Our measurement offering will cover your needs: flow, pH, conductivity, level, temperature and various water quality parameters; most sensors are available in plastic and are therefore highly resistant to chemicals.

## Reference

# Successful scrubber project



## GF delivers successful scrubber project to Brittany Ferries

The increasing attention to the environmental issue has impacted the shipbuilding industry. A progressive reduction of SOx and NOx emission from marine engines is foreseen between now and 2025. Mandatory energy measures have been adopted, the ECA Emission Control Area defined the area where the recent and more stringent emission limit are in place.

In order to comply with ECA regulations, ships have to burn low sulphur fuel or improve the process by passing through an air cleaning system. FGD (flue gas desulphurisation) is quite common a process on coal fuel power plant, to implement this onboard ships would require some challenges to be met, such as weight and close proximity of space.

### Project Background

Scrubber maker companies have highest requirements on product quality and process safety. Compliance with international standards as e.g. IMO (International Maritime Organization) is a must. The limited space and the harsh environment onboard make the installation complex and challenging. Suppliers therefore on the one hand have to deliver high quality equipment and on the other hand to follow the stringent regulations concerning manufacturing, onsite specialized training, class approved material and documentation. Our plastic products for shipbuilding help our customers to meet these high requirements whilst simplifying their internal proceedings as much as possible.



### Chosen technical solution

Brittany relies on GF Piping Systems' ecoFIT, piping systems because of their proven corrosion resistance, and weight. The system is simple to install reducing prefabrication costs for the customer.

### System and product selection

- ecoFIT / ELGEF pipes, fittings and saddle
- 546 Ball Valve / 567 Butterfly valve
- Signet measurement and control



## Main benefits for the customer

- Corrosion proof piping system for scrubber
- Swiss high quality make it easy to install
- Lower weight
- Qualified installer



## Reference

# Exhaust gas scrub water



Increasingly stricter legislation on emissions of ships limits the sulphur content of marine fuel. As an alternative to switching to low sulphur fuel, shipping companies can install scrubber systems for the purification of exhaust gases resulting from heavy bunker oil usage. Scrubbers produce scrub water as by-product. IMO (International Maritime Organization) has foreseen limiting values in terms of pH, PAH and turbidity before discharging it to the sea. This makes a certain treatment necessary.

### Project Background

APATEQ was awarded an onshore scrub water treatment system for a Danish shipping company, that launched two new ferries that are driven by a hybrid propulsion system, combining traditional fuel with electric battery power. The ferries have also both been fitted with an exhaust gas cleaner, a so-called closed-loop scrubber, producing scrub water.

### Chosen technical solution

The solution for the shipping company was to implement a centralized, onshore scrub water treatment facility, treating the scrub water from both ferries to an effluent quality suitable for direct discharge into the harbour according to the most stringent international legislation that goes far beyond IMO requirements. They chose APATEQ's "MarinePaq" as green and cost-efficient one-stop solution for scrub water treatment. MarinePaq is constructed for a long service life and continuous operation by meeting the most stringent standards in a highly corrosive environment. Corrosion-resistant, weight-saving GF piping is used for the entire installation to ensure a failure-free, long-lifetime operation of the MarinePaq system, performing under toughest conditions, i.e. salty seawater with a very high load of contaminants.

### System and product selection\*

- Main piping system made of PROGEF PP d40-d250 and dosing pipes for chemicals made of PVC-U
- PP manual and pneumatic operated ball valves type 546 / 230
- PP manual and pneumatic operated butterfly valve type 567 / 240
- Pressure sensors type 2450

\* Depending on the specific application other plastic material choices are possible



Redundant ultrafiltration module with GF piping, valves and instrumentation.



Containnerized MarinePaq onshore installation at the port in Denmark.

## Main benefits for the customer

- One-stop shop for all required items of a complete thermoplastic piping system
- High-quality products
- Reliable service
- Suitable solutions for a long-lasting, reliable operation in highly-corrosive environments

## Material

# Benefits of plastic

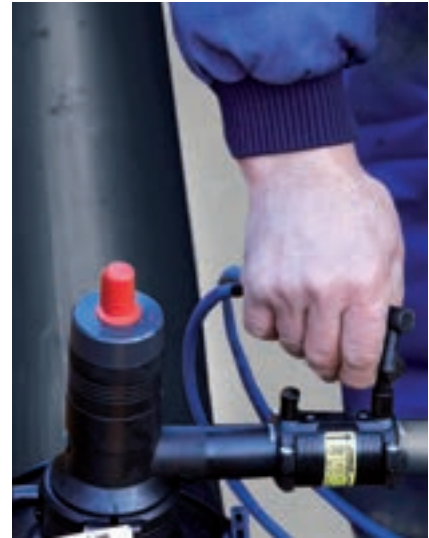
## The right material for durable and cost-efficient system performance



Flexible jointing with saddle: Under pressure drilling without operational interruptions.



Reliable welding: Quality control protocol and barcode reader card for data input.



Easy and safe welding on site: Without hazardous vapors, smoke and flame formation.

	PE	Metal	GRP
<b>Environmental benefits</b>			
Full recyclability	+++	+	-
<b>Chemical and physical properties</b>			
Low weight	+++	-	++
Material flexibility	+++	++	--
Impact resistance	+++	+++	-
Corrosion resistance	+++	-	+++
Abrasion resistance	+++	--	++
<b>Welding and jointing characteristics</b>			
100 % reliable welding process on site	+++	-	--
Quality control protocol and data report	+++	+	--
Welding process safety	+++	+	++
Welding / jointing on board	+++	++	--
<b>Installation and maintenance savings</b>			
Easy customizing on site	++	+++	---
No painting required	+++	--	+++

+++ excellent performance  
 ++ good performance  
 + sufficient performance

- poor performance  
 -- very poor performance  
 --- insufficient performance

## Additional Information

# Services & solutions in all project phases

When moving from metal to plastic and increasing the use of those materials, their benefits are clear: low material weight, corrosion and chemical resistance, low total cost of installation and long life expectancy are just a few.

At GF, we have over 60 years of plastics know-how, and can offer you full support to meet your needs in designing, installing and commissioning plastic systems.



### Planning

Specifications & tenders

#### Efficiency & innovation from beginning

Our experts support you with practical solutions for your specific applications.



### Tendering

Project preparation

#### Good preparation reduces the rework

Equipped with the right know-how you can reduce the risk of faulty design and construction work.



### Preparation

Material, ordering & delivery

#### From plan to implementation

We will check with you the feasibility of individual details and support you in all the planning phases.



### Implementation

Execution of project

#### Security and competence on site

We accompany you for a smooth and compliant installation.



### Commissioning & operation

Testing & assessment

#### Security and competence on site

We will confirm the proper and professional execution with professional testing and analysis.

# Worldwide at home

Our sales companies and representatives ensure local customer support in over 100 countries

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