

MARINE

Glassfiber Reinforced Epoxy Pipe Systems (GRE)

Version 02

- Sea water bilge and ballast water (incl. BWT systems)
- Sea water cooling lines
- Black and grey water lines
- Condensate lines
- Sounding en ventilation lines
- Tank cleaning lines
- Potable water lines
- Jet-water lines
- Gland & flushing lines
- Heeling lines
- Scrubber lines





PRODUCTS

It's designed to last the lifetime of the ship. the design of this economic pipe system is in full compliance with the IMO Resolution A.753 (18) and has been type approved by various leading classifications societies.

For Marine application Future Pipe Industries has two product series available: **FIBERMAR**[®], for in-tank applications with exposure to external pressure and **WAVISTRONG**[®] for systems not exposed to external pressure.

FIBERMAR[®] and **WAVISTRONG**[®] are type approved in the diameters from 25mm (1") to 900mm (36"). When using larger diameters, special project approvals can be obtained.

Joining of the system is achieved by adhesive bonding, rubber sealing (either tensile or non-tensile), lamination, flanges or by using mechanical couplings.

A complete fitting programme for adhesive joints for loose delivery is available for pipe sizes up to 400mm. for larger diameters, fittings will be prefabricated in our factory or by qualified installation companies.

WAVISTRONG[®] is available in various internal design pressure and suitable for systems not exposed to vacuum. **FIBERMAR**[®] has been designed for internal design pressures of 10 and 16 bar and external pressure to 10, 20, 30, 40 and 50 meters water column and full vacuum.

When piping crosses hazardous areas, static build-up needs to be avoided. in this case **WAVISTRONG**[®] and **FIBERMAR**[®] in the electrical conductive series should be used. Possible accumulated charges will be drained via grounding saddles connected to the ship's structure or by flanges connected to the bulkheads

Glassfiber Reinforced Epoxy (GRE) Pipe Systems Onboard Ships

The marine environment is one of the most corrosive environments. Dry docking for maintenance is costly matter for shipping companies.

Replacement of corroded steel pipe is a common thing with every dry docking. Why does the industry accept corroded steel any longer?

Glassfiber reinforced Epoxy (GRE) pipe systems are the sole solution against corrosion. Exhibiting excellent corrosion resistance against seawater, various solvents and chemicals, together with a low weight and favorable cost compared to steel alloys it's the material of choice for onboard ships.

It's designed to last the lifetime of the ship. the design of this economic pipe system is in full compliance with the IMO Resolution A.753 (18) and has been type approved by various leading classifications societies.





APPLICATIONS

Summary of main applications:

- Sea water bilge and ballast water (incl. BWT systems)
- Black & Grey water lines
- Condensate lines
- Sounding en ventilation lines
- Tank cleaning lines
- Potable water lines
- Jet-water lines
- Gland & flushing lines
- Heeling lines
- Scrubber lines
- Sea water cooling



PREFABRICATION

Both **FIBERMAR®** and **WAVISTRONG®** pipe systems can be supplied as prefabricated spools.

These pipe sections are tailor-made to customer's requirements and have the additional benefits of easier and quicker installation. When standard fittings can not be used, tailor-made fittings can be designed and manufactured to meet the specific requirements. Prefabrication can be carried out in our factory, at the shipyard's location or in a workshop by one of our preferred and qualified contractors worldwide.

FIRE ENDURANCE

FIBERMAR® and **WAVISTRONG®** can be applied onboard ships as per IMO Resolution A.753 (18) fire endurance matrix (See page 8 of this brochure) and meet the following standards:

- FTP code for Fire Test Procedures
- Fire Endurance L3 according to IMO Resolution A.753 (18)
- Flame spread according to ASTM D635
- Flame spread according to IMO Resolution A.653 (16)
- Smoke and Toxicity test undertaken by QinetiQ



PROJECT SERVICES

To ensure successful design, delivery and installation, Future pipe Industries offers the following services:

- Project Management
- Assistance in system design:
 - Pipe support detailing
 - Stress analysis
 - Surge analysis
 - Isometrics and spool drawings
 - Material take-off
 - Design of special items
 - Onboard survey
 - Installation training
 - Supervision during installation



RETROFITS

During the lifetime of the ship, the corroded steel pipes need to be replaced 2 or 3 times. This is costly and undesirable.

FIBERMAR® and **WAVISTRONG®** are the ideal replacements for conventional steel pipe systems. GRE's non corrosive characteristics, easy jointing methods and lightweight ensure this. It is simply just "Fit & Forget".

Our International network of preferred and qualified contractors is able to provide retrofit services worldwide.



SCRUBBER UNITS



The International Maritime Organization (IMO) and US Coast Guard (USCG) put together in place a legislation for the cleaning of exhaust gases of ships. Many ships need to be equipped with scrubber units to ensure cleaner air and a greener future.

The non-corrosive and light-weight properties of GRE have made it the material of choice for the connecting piping for many suppliers of scrubber equipment and shipowners. Besides the standard GRE piping, Future Pipe Industries designs and manufactures also special items in GRE like tailor made drain pots, strainers, etc

BALLAST WATER TREATMENT

International Maritime Organization (IMO) adopted the International Convention for the control and management of ships' Ballast Water and Sediments (BWMC), which address the transportation of potentially harmful organism through ballast water.

Therefore many ships' need to be equipped with Ballast Water Treatment units. Also for this corrosive application GRE is the right solution for the connecting pipe systems.



NAVAL SHIPS



Rigorously and successfully tested for use onboard naval vessels, both Wavistrong & Fibermar are suited to many applications onboard both future and current generations of warships and submarines in service throughout the world. Besides the already highlighted material, advantages of GRE has proven to be noise reducing.

Specially for Naval applications, our products have been tested and approved to:

- Shock test
- Smoke and Toxicity
- safety Case compliant with UK MoD DEFSTAN 00-56 & JSP430

DREDGING

Besides the applications as per the IMO Matrix, **WAVISTRONG®** is the right solution for jet-water, gland and flushing systems on-board dredgers.

WAVISTRONG® has been widely applied on-board new dredgers, contributing to more durability. Another advantages of GRE on-board dredgers is the weight saving, allowing for more dredge materials on-board. A special product developed by Future Pipe Industries for the dredging industry is the fall-pipe" for sub-sea rock installation in deep waters. the special **WAVISTRONG®** fall-pipes offer an enormous weight saving making operation on deeper sea-bottoms possible.

Pipe system locations in accordance with the fire endurance matrix according to IMO A. 753 (18) regulations

PIPING SYSTEM	Machinery spaces of category A.	Other machinery spaces and Pump rooms	Cargo pump rooms	Ro-ro cargo holds	Other dry cargo holds	Cargo tanks	Fuel oil tanks	Ballast water tanks	Cofferdams, void spaces, pipe tunnel & ducts	Accommodation, service and control spaces	Open decks
	GRE not applicable	GRE from FPI allowed	GRE not allowed								
Cargo (flammable cargoes f.p. < 60°C)											
Cargo lines								9			
Crude oil washing lines								9			
Vent lines								9			
Inert gas											
Water seal effluent lines			1				1	1	1		
Scrubber effluent lines	1	1						1	1		
Main lines											
Distribution lines											
Flammable liquids (f.p. > 60°C)											
Cargo lines						3		9			
Fuel oil						3					
Lubricating											
Hydraulic oil											
Seawater											
Bilge main and branches											
Fire main and water spray											
Foam system											
Sprinkler system											
Ballast											
Cooling water, essential services											
Tank cleaning services fixed machines										3	2
Non essential systems											
Fresh water											
Cooling water, essential services											
Condensate return											
Non essential systems											
Sanitary/Drains/Scuppers											
Deck drains (internal)	4	4		4							
Sanitary drains (internal)											
Scuppers and dischargers (overboard)	1 7	1 7	1 7	1 7	1 7					1 7	
Sounding/Air											
Water tanks/dry spaces						9					
Oil tanks (f.p. > 60°C)						9		9			
Miscellaneous											
Control air	5	5	5	5	5					5	5
Service air (non essential)											
Brine											
Auxiliary low pressure steam (7 bar)			8	8	8					8	8

Notes

1. Where non-metallic piping is used, remotely controlled valves to be provided at ship's side (valve is to be controlled from outside space)
2. Remote closing valves to be provided at the cargo tanks
3. When cargo tanks contain flammable liquids with f.p. > 60°C may replace or
4. For drains serving only the space concerned may replace
5. When controlling functions are not required by statutory requirements or guidelines may replace
6. For pipe between machinery space and deck water seal may replace
7. Scuppers serving open decks in positions 1 and 2, as defined in regulation 13 of the International Convention on Load Lines 1966, should be throughout unless fitted at the upper end with the means of closing capable of being operated from a position above the freeboard deck in order to prevent down flooding
8. For essential services such as fuel oil tank heating and ship's whistle is to replace
9. For tankers where compliance with paragraph 3(f) of regulations 13F of Annex 1 of MARPOL 73/78 is required is to replace

COST SAVINGS

FIBERMAR® and **WAVISTRONG®** have proven to be cost effective solutions for many applications on-board ships.

Although the GRE material cost might be higher than steel materials, the total installed costs are mostly lower due to reduced fabrication and installation time. Besides this, GRE contributes to the lower total life cycle costs, because of no maintenance during the life time of the ship. Actually, the bigger the pipe size, the bigger the cost savings. The low weight is further contributing to a reduced fuel consumption thus reducing the overall operational cost.



WAVISTRONG® & FIBERMAR® AT THE GLANCE

- Long service life because of the non corrosive characteristics.
- Low installation costs due to the light-weight
- Weight saving allows for more cargo on-board and reduce fuel consumption
- Easy to repair

Summarizing, using GRE on-board is resulting in Lower Life Cycle Costs

TYPE APPROVALS & OTHER CERTIFICATIONS

FPI is committed to ISO 9001:2015 and ISO 14001-2015 to ensure highest standards of quality and environment management.

FIBERMAR® and **WAVISTRONG®** are type approved by the major Classification Societies as:

- D.N.V./GL
- L.R.
- A.B.S.
- B.V.
- RINA
- R.M.R.S
- U.S.C.G.



