BONDSTRAND™

Glassfiber Reinforced Epoxy Piping Systems for Offshore Applications

Fiber Glass Systems | NOV Completion & Production Solutions

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Bondstrand Glassfiber Reinforced Epoxy Piping Systems

Historically, offshore production platform, drilling rig and FPSO owners and operators have had to face the grim reality of continuously replacing most metal piping because of severe corrosion. This has resulted in piping systems costing two or three times the original investment since steel and metal pipe systems are very costly to maintain.

Bondstrand GRE pipe systems are the cost-effective, maintenance-free and lightweight solution that provides corrosion-free and erosion-free operation during the service life of the vessel.

The many advantages of Bondstrand GRE pipe systems

Durable and corrosion resistant

Bondstrand GRE is highly resistant to corrosion caused by (salt) water, chemicals, residues and bacteria.Similarly, it resists corrosion even in aggressive environments. Cathodic protection is not required.

Lightweight – easy to install

Bondstrand GRE pipes weigh only a quarter to an eighth of steel pipes and are easy to install without the need of heavy nstallation equipment, welding or protective coating. For installation of GRE piping systems no 'hot' work is required.

Low installation and operating costs

Installation costs of Bondstrand GRE pipe systems are less than that of carbon steel; total installed costs are comparable. Operating costs are reduced due to less energy needed to pump fluid through the smooth internal bore.

Wide range of pipe systems

Fiber Glass Systems offers a complete range of pipe systems in a variety of diameters and pressure classes for many different applications. Pipe systems are available in diameters up to 1000 mm (40 inch), and standard lengths up to 12 m (40 feet).

No contamination

Bondstrand GRE does not rust or scale. This prevents plugging of nozzles, valves and other components.

WIDE RANGE OF APPLICATIONS

Our corrosion-resistant piping systems can be used in a wide range of applications.

Typical application areas are:

- Ballast water
- Caissons
- Cooling water
- Disposal
- Deluge (dry)
- Drains
- Drilling mud
- Fresh water
- Potable water
- Produced water
- Fire mains
- Saltwater / seawater
- Sanitary / sewage
- Column piping
- Vent lines

WIDE RANGE OF SOLUTIONS

As a leading producer Fiber Glass Systems offers the world's most comprehensive range of glassfiber reinforced epoxy and phenolic pipe systems. Whether you need corrosion protection, fire protection, or a conductive system, Fiber Glass Systems offers the right choice.

Bondstrand GRE pipe series

Sizes

25-1000 mm (1–40 inch)

Pressure classes

up to 25 bar (365 psi)

Internal liners

available if needed

Conductive systems

available if needed

Joining systems

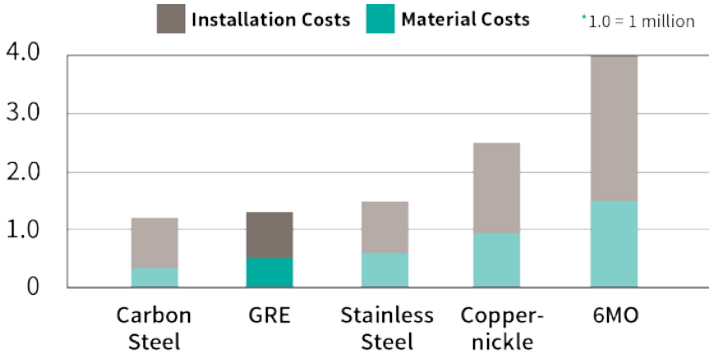
Quick-Lock™ and Taper/Taper adhesive bonded joints

COST COMPARISON

CONVENTIONAL STEEL SYSTEMS

TOTAL INSTALLED COST EQUALS TRADITIONAL STEEL PIPING

A comparison of costs clearly shows the typical savings during the service life of the piping system.



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PRODUCT OVERVIEW

(External pressure rating according to IMO Regulations)

Series	Characteristics	Joining System	Nominal Pipe Size		Maximum Operating Temperature		Maximum Operating Temperature	
			mm	in	C	F	bar	psi
Bondstrand 2000M	A standard epoxy system for applications where corrosion resistance and external pressures are of paramount importance.	Quick-Lock	25 - 150	1 - 6	121	250	17.2	250
		Taper/Taper	200 - 1000	8 - 40	121	250	17.2	250
Bondstrand 2400 Series	An epoxy system for applications where internal pressure, corrosion resistance and light weight are the primary performance criteria. Product selection determined by internal pressure requirements.	Taper/Taper	50 - 1000	2 - 40	93	200	25(1)	350(1)
Bondstrand 7000M*	An epoxy system with high strength conductive filaments incorporated in the wall of the pipes to prevent accumulation of static electricity.	Quick-Lock	25 - 150	1 - 6	93	200	17.2	250
		Taper/Taper	200 - 1000	8 - 40	93	200	17.2	250

**** Conductive version of Bondstrand 2000M**

(1) 2425 Bondstrand Series

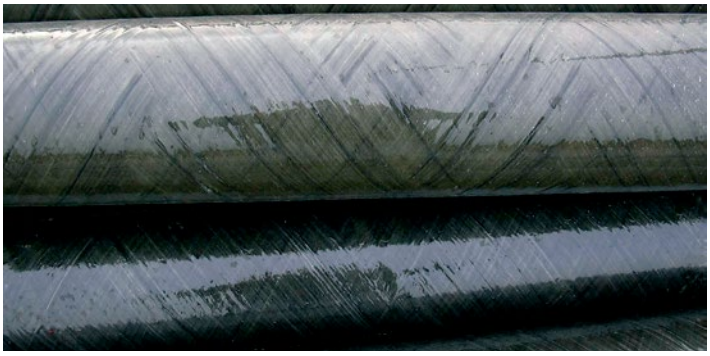
Note: All systems are available with a fire-protection layer.

Bondstrand Conductive Piping Systems

Bondstrand conductive piping systems have been developed to prevent accumulation of potentially dangerous levels of static electrical charges.

Pipe and flanges contain high strength conductive filaments; the fittings include a conductive liner. Combined with a conductive adhesive this provides an integral electrically continuous system.

Grounding saddles can be bonded on the pipe. Integral grounding cables are then bolted to the steel structure to drain accumulated charges.



Bondstrand conductive piping systems

SPECIFICATIONS

ISO

The objective of ISO 14692 is to provide the oil & gas industry and the supporting engineering and manufacturing industry with mutually agreed upon specifications and recommended practices for the design, purchase, manufacturing, qualification testing, handling, storage, installation, commissioning and operation of GRP (Glassfiber Reinforced Plastic - a generic terms including epoxy and other resins) piping systems.

ISO 14692, part 2, 3 and 4 follow the individual phases in the life cycle of a GRP piping system, i.e. from design through manufacture to operation. Each part is therefore aimed at the relevant parties involved in that particular phase.

ISO 14692 is primarily intended for offshore applications on both fixed and floating topsides facilities, but it may also be used as guidance for the specification, manufacture, testing and installation of GRE piping systems in other similar applications found onshore, e.g. produced water and firewater systems.

IMO

In 1993, the International Maritime Organization (IMO) issued Resolution A.753(18) covering acceptance criteria for plastic materials in piping systems, appropriate design and installation requirements and fire test performance criteria for assuring ship safety. Major certifying bodies (such as Lloyd's Register, Bureau Veritas, Det Norske Veritas, American Bureau of Shipping and United States Coast Guard) have adopted and implemented these Guidelines in their respective Rules and Regulations for the Classification of Ships and Floating Offshore facilities.

All Bondstrand pipe series that are used in the marine/offshore industry are Type Approved by these major certifying bodies.

ENGINEERING CAPABILITIES

With manufacturing locations all over the world, Fiber Glass Systems has experienced teams of engineers supporting the customer with support design, engineering analysis, spool and isometric drawings and installation procedures.

Fiber Glass Systems Engineering Service can include:

- General engineering calculations such as support span, thrust loads, joint strength, collapse pressure and internal pressure ratings, etc.
- Design drawings, stress and surge analyses
- Pipe Spool drawings from piping isometrics
- Pipe support detailing
- Material take offs (MTO)
- Special product design for custom made parts
- Expertise on international specification work towards approval authorities
- Field service
- Training to certify installers

Certified installation of Bondstrand piping system

PREFABRICATION

Bondstrand GRE systems are assembled using standard manufactured components. Spools can be pre-fabricated at the yard, or can be supplied from Fiber Glass Systems spooling operation or one of the network partners. The need for adhesive bonded joining on board can be limited.

If pipe spacing is a constraint, Fiber Glass Systems can offer custom made spools to meet specific dimensions. Fiber Glass Systems team of piping engineers and fabricators can assist to ensure that custom-made spools are designed and fabricated to meet the project requirements.

Pre-fabricated spools will reduce the number of field joints and provide greater reliability because of the high quality joints and testing at the Fiber Glass Systems factory.

Installers, trained and certified by Fiber Glass Systems – according to IMO standards – can handle the complete installation.

Fiber Glass Systems' scope of supply may vary from material supply to complete 'turn-key' projects.

Prefabrication of custom made fiberglass spools

TESTING

Bondstrand fittings are tested to 1.5 times their pressure rating before they leave the factory or are used in spools. Small diameter fittings, to 150 mm (6 inch) are air tested, when possible.

All others and the large diameter fittings are hydrotested. Fiber Glass Systems is the only manufacturer to conduct unrestrained hydro-test of fittings above 500 mm (20 inch) in diameter using self-energizing test plugs. Unrestrained testing is a more representative test as it simulates the actual conditions to which the pipe system is subjected in most Offshore installations.

Fiber Glass Systems has extensive testing capabilities to meet special requirements. Comprehensive qualification testing is done on representative sizes before manufacturing. Qualification test includes long-term hydrostatic test in accordance with ASTM D 2992, medium term survival test (1000 hour survival test) and short time burst test in accordance with ASTM D-1599. Mechanical and physical property tests of Bondstrand pipe can also be conducted.

Hydrotesting of Bondstrand prefabricated pipe spool prior to shipping

FIRE ENDURANCE

Epoxy pipe

Under IMO Rules, Bondstrand epoxy products can be used for systems (normally water filled) without additional passive fire protection. Fire exposure will cause the outer surface of the pipe to char, but the functionality of the piping remains.

Additional fire protection

Depending on the level of fire endurance required, epoxy pipe with enhanced fire resistance properties can be supplied meeting any of the following fire endurance requirements:

- IMO L1
- IMO L2
- IMO FTP 2010
- United States Coast Guard (USCG) W/D - USCG PFM 1-98
- Jet Fire 30 OTI 95/634
- Jet Fire 60 OTI 95/634

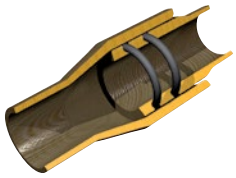
Fire endurance testing of Bondstrand fiberglass pipe and fitting

JOINING SYSTEMS

Quick™ Lock - An adhesive-bonded joint with straight spigot and tapered bell. The integral pipe stop in the Quick-Lock bell provides accurate laying lengths in close tolerance piping. Available in sizes 50-400 mm (2-16 in).

Taper x Taper - An adhesive-bonded joint with matching tapered male and female ends offering superior joint strength by controlled adhesive thickness. Available in sizes 50-1000 mm (2-40 in).

Flanges - One-piece flanges and Stub-end flanges with movable rings. Available in sizes 50-1000 mm (2-40 in).



Double O-Ring - A mechanical joint offering quick assembly between male and female ends. Two “O” rings are employed to provide sealing. Available in sizes 50-900 mm (2-36 in).

Fittings - Standard filament-wound Couplings; 30°, 45°, 60°, and 90° Elbows; Tees and Reducing Tees; Concentric Reducers; Flanges and Nipples. Standard Flanges are available with the following drilling: ANSI B16.5 Class 150 & 300, DIN, ISO and JIS. Other drilling patterns are available on request. Available in sizes 50-1000 mm (2-40 inch)

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