Fiberspar LinePipe™

Clear technical advantages over alternative composite products

OIL & GAS MINING

Fiberspar LinePipe Design

There are many ways to make a fiber reinforced pipe system but Fiberspar LinePipe and connectors start with proven oilfield pipeline technologies and add patented design advances to provide a reliable product in the widest range of oilfield applications. Fiberspar LinePipe technology is a unique combination of advantages unavailable from any other source.

Reinforcement/Strength Member

Fiberspar LinePipe uses glass fiber-reinforced epoxy resin to provide strength. This proven technology has been used for more than 60 years in GRE or jointed fiberglass pipeline applications. While building on this technology, Fiberspar's unique spoolable design comes on a reel with long lengths of pipe thus reducing the number of joints and significantly reducing the installation time and manpower requirements.

Pressure Barrier

Fiberspar LinePipe's internal pressure barrier is either pipe-grade high-density polyethylene or high-temperature polyethylene for higher temperature applications. LinePipe's pressure barrier is integrally bonded to the structural layer, and fluid compatibility with this material is well established. Fiberspar manufactures both HDPE and HTP LinePipe pressure barriers completely in-house.

Integral Structure

Fiberspar LinePipe's inner thermoplastic pressure barrier is permanently chemically bonded to the epoxy matrix and glass fiber reinforcing layers. An integrally bonded structure is essential to manage the effect of permeation and to ensure that the liner does not collapse upon decompression even in the presence of highly permeable gases such as CO_2 and H_2S. Fiberspar LinePipe is qualified to ensure the inner barrier does not collapse or blister based on operating conditions and chemical compatibility in compliance with API17S.

Alternative Composite Spoolable Pipe

Other composite spoolable pipe designs now being introduced in the market use a variety of reinforcement and strength members including dry-glass fiber, aramid, carbon or steel reinforcing. Some of these new products are fully un-bonded, or only partially bonded.

Although these new products are all generically being called composite spoolable pipe, there are fundamental differences between the design, construction and qualification required of these alternatives compared to Fiberspar LinePipe.

Reinforcement/Strength Member

- Historically, the industry does not consider dry-glass fiber (no matrix) reinforcement for critical components, because the unprotected fibers are vulnerable to damage. Bare glass fiber will become damaged over time with even minor cyclic changes in pressure, temperature or axial loading. This deterioration can occur quite rapidly where the cycling is more than minor. As a result of these damage mechanisms, dry-glass fiber is not considered suitable as reinforcement material in structural applications where the dry-glass fibers would be exposed to water through permeation, or where the glass fibers are in direct contact with one another and there is any cyclic loading.
- Aramid fiber reinforcement, unlike glass fiber, is fairly resistant to abrasion damage. It is often used unprotected, is usually very high cost, and is not a good value proposition for typical oilfield applications.
- Steel reinforcement in a multi-layer composite structure would generally be suitable in applications where steel would ordinarily not experience significant loss of strength from corrosion. Steel reinforcement also results in a heavier construction, giving up the lightweight and easy handling advantage enjoyed by other reinforcement materials.

Pressure Barriers

- Pressure barriers in alternative products include the same or similar grades and materials used by Fiberspar, as well as alternative materials. Establishing proper chemical compatibility as well as operating temperature limits for pressure barrier materials is essential in any spoolable composite pipe design.

Bonded/Un-bonded Structures

- Some alternative composite spoolable pipe designs have multi-layer, un-bonded structures, and in some cases structures that are partially bonded. Permeating fluids, including extremely small quantities of gas common in virtually all production or injection “liquid” applications, will eventually build up and accumulate at the interface between any un-bonded multi-layer structure. Managing pressure and volume of fluids present between layers in multi-layer, un-bonded structures is essential to prevent either external jacket rupture, or inner pressure barrier collapse.

LinePipe pressure and temperature ratings, qualification and performance record

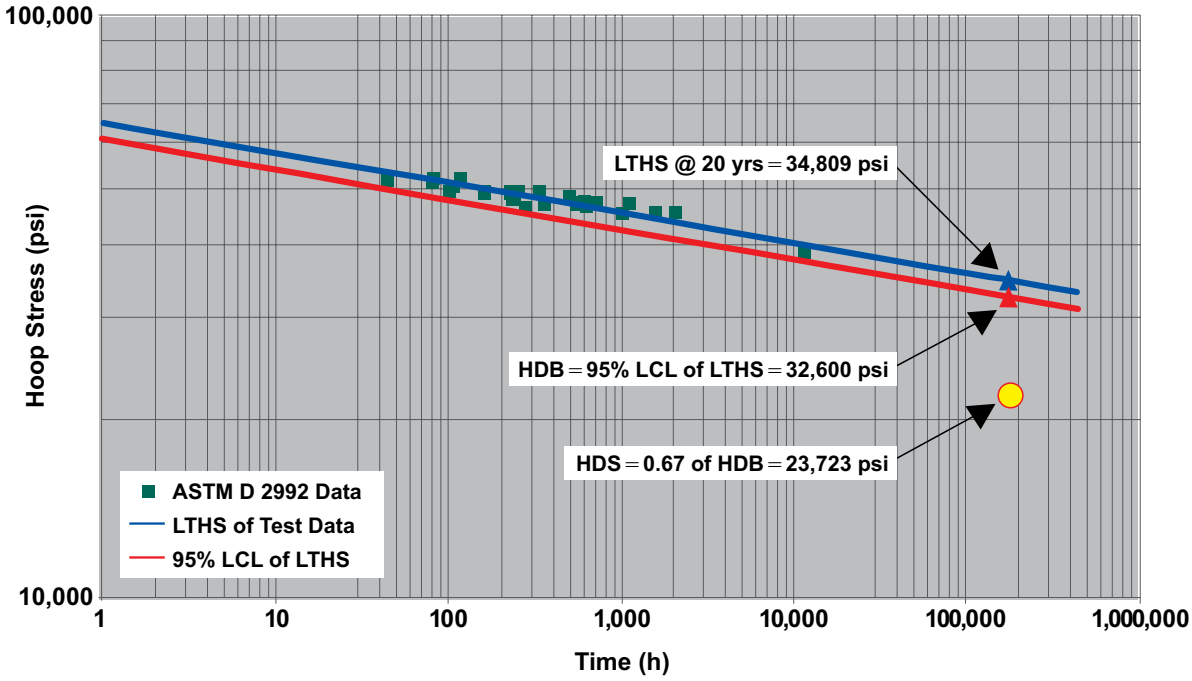
Pressure, Temperature, Design and Safety Factors

- Fiberspar LinePipe qualification has been conducted according to ASTM D2992, API 15S and CSA Z662-07 requirements. Fiberspar LinePipe pressure and temperature ratings are based on full qualification and safety factors recommended by Fiberspar, and meet the requirements of these industry specifications. Fiberspar qualification testing has been audited by CSA and Shell Global Solutions.
- In cooperation with the Energy Resources Conservation Board, an extensive experimental harvesting program was conducted that included harvesting more than 42 samples from working LinePipe installations that had been in service for a minimum of two years. One hundred percent of the samples met or exceeded the requirements of new pipe after testing.
- Fiberspar has an installed base of greater than 80 million ft (24.4 million m) of Fiberspar LinePipe in service for more than 450 operators.

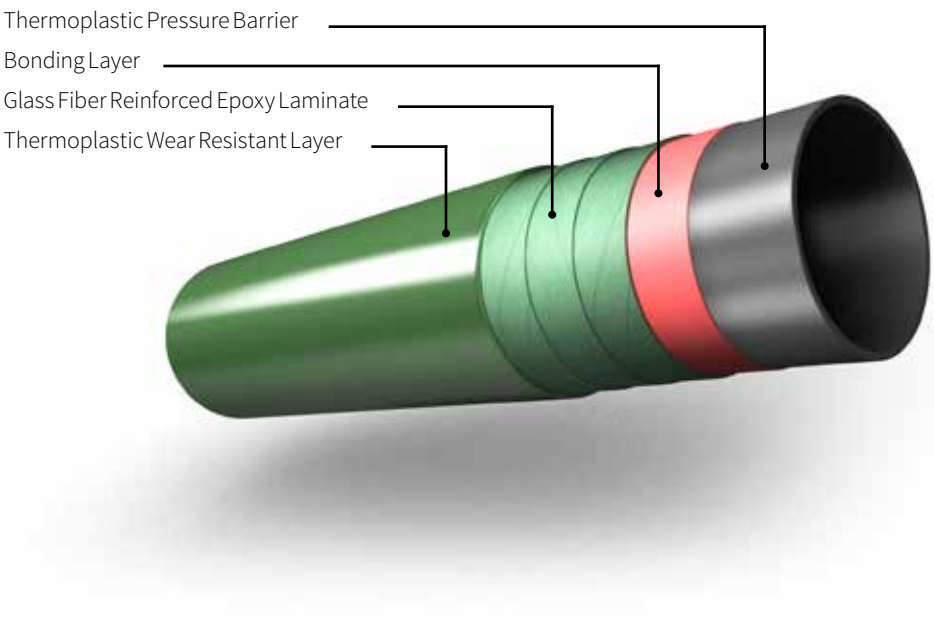
Fiberspar LinePipe Deployment

Fiberspar LinePipe can be installed with the support of Fiberspar employees using Fiberspar-designed installation equipment located throughout North America, South America, Africa, Australia and the Middle East. In addition, Fiberspar LinePipe installation can be supported by Fiberspar LinePipe certified installers.

Regression curve for Fiberspar LinePipe per ASTM D2992-96, Procedure B



LinePipe Product Geometry



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