

Fiberspar LinePipe™ The Leader In Spoolable Pipeline Systems

Composite Piping Systems, Development, Application, and Evaluation

July 17th, 2012

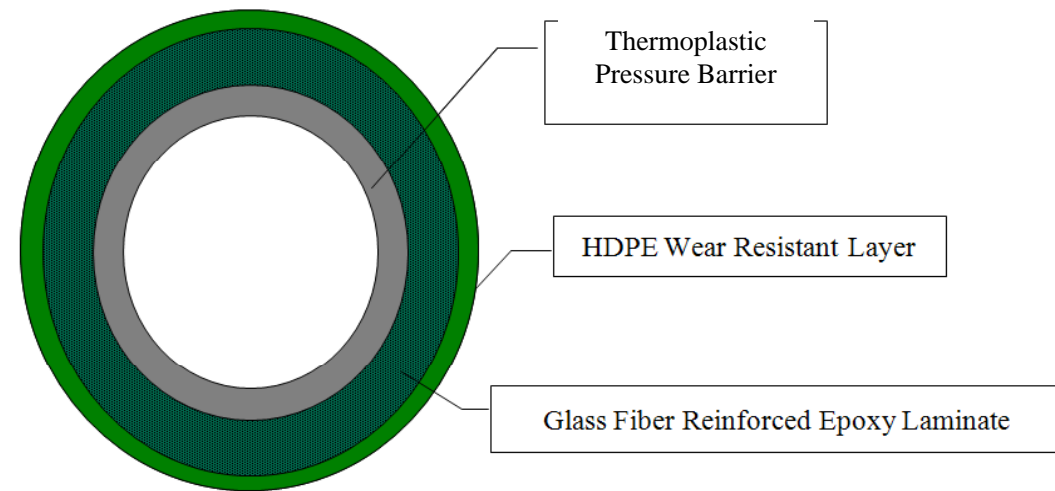


History of Fiberspar and Spoolable LinePipe

- Fiberspar was founded in 1986
- Market leader in high tech sporting goods from advanced composite materials
- Commenced spoolable pipe joint development with Conoco in 1992
- Developed composite coiled tubing with Halliburton
- Sold sporting good division in 1999 to focus on O&G industry
- First installation 2500 psi injection line in 1999 still in trouble free operation
- Total installed base over 50 million ft (15,000 Km)

Spoolable GRE LinePipe

- Spoolable GRE is a unique form of GRE pipe which is made in lengths of more than 3 miles in a continuous process and can be spooled for transport
- The pipe can be installed quickly and safely by unspooling at location
- The basic design consists of:
 - Thermoplastic pressure barrier
 - Helically wound glass fiber
 - Epoxy matrix
 - External wear layer



- Sizes – up to 6 ½” Nom OD
- Pressure Ratings – up to 2,500 psi

Spoolable GRE LinePipe Eliminates Corrosion and Increases Safety

- No risk of failure from corrosion
- Integrity monitoring and chemical treatment programs reduced
- Rapid installation, minimum people and equipment at location, and minimal time spent in the ditch all significantly reduce safety risks during pipeline construction
- Smaller footprint
- Less ground disturbance
- Can also be used very effectively to remediate corroded steel pipelines at low cost without any ground disturbance
- Spoolable GRE is manufactured in a controlled factory environment, tested, and *deployed* on location rapidly and with low labor and low cost equipment

Fiberspar LinePipe Can be Used for All Oilfield Applications

Applications

- Gas or oil gathering
- Water disposal
- Gas injection
- Water injection
- CO2 injection

Installation Methods

- Conventional trench
- Surface Lay
- Rehabilitation



Spoolable GRE Manufacturing

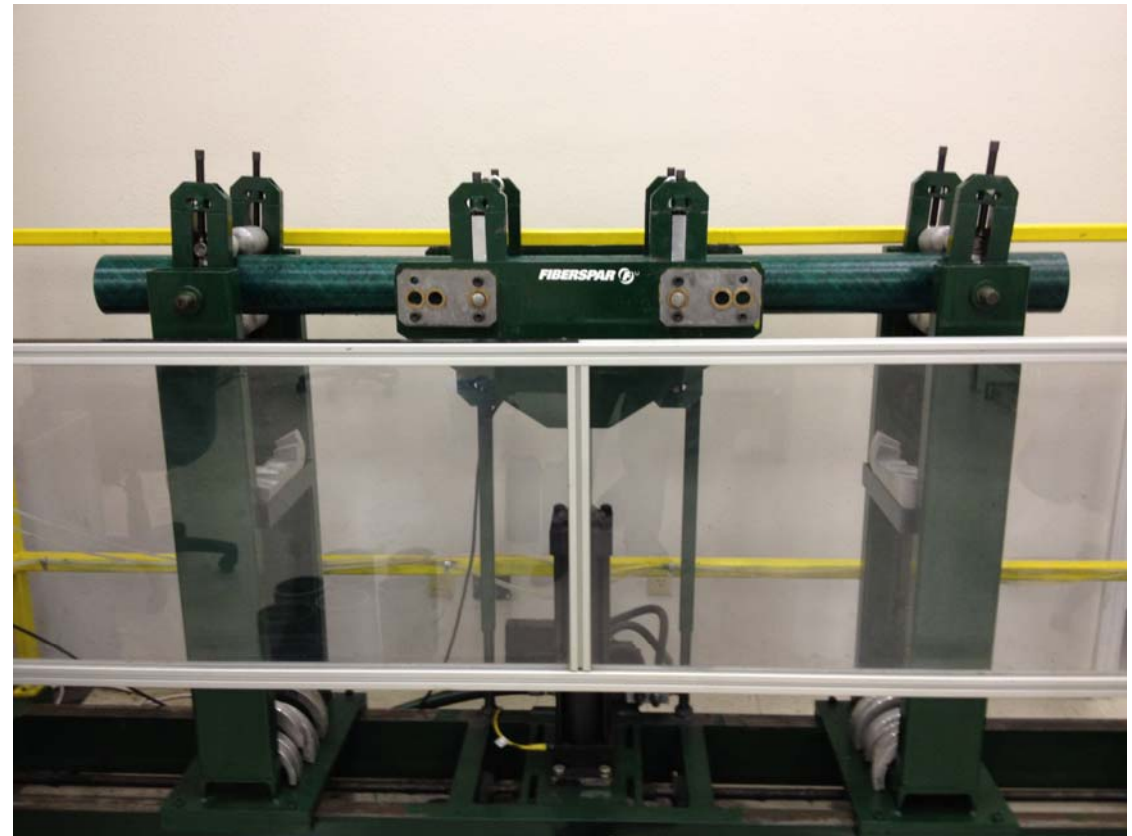
- Production for 2" to 8" ID
- Continuous lengths up to 36,000 ft (depending on size)
- Full statistical process control, in-line marking, serialization
- Full traceability of raw materials



Since the product is shipped as a complete, tested pipeline Spoolable GRE eliminates many of the quality and safety risks associated with fabrication on location

Quality Control Testing

- Pipe Conditioning
- Lead and Tail QC Samples
 - Burst Test
 - Compression Test
 - DSC Scan
 - Ring Crush Test
 - Over 14 years of Data
- Random Test Samples
- Hydro test of entire manufacturing run to 1.5x MAOP



Qualification and Approvals

- LinePipe Design Meets or Exceeds all recognized specifications and standards for lined GRE pipe:
 - API 15HR
 - API 15S
 - ASTM D2992
 - ASTM D2517
 - Shell DEP 31.40.10.20-Gen
 - CSA Z662
 - Pemex Spoolable Pipe Specification NRF 185
- CSA (Canadian Standards Association) Audited
- Shell Qualification Tests conducted by Shell Laboratories in the Netherlands to meet Shell DEP 31.40.10.20-Gen (2005)
- QMS Certified to API Q1/ISO 9001:2008

Field Operations and Installation

- Fast Installation using specialized equipment
- Hydraulic powered spooling equipment includes
 - Carousels – for larger reels to 16ft diameter
 - A frames for reels to 12 ft diameter
- Trained technicians supervises the installation of all Fiberspar LinePipe
- Training Program for Spoolable GRE Installations



Alberta Energy & Utility Board

- AEUB and Fiberspar jointly operated a program to analyze pipe samples after a two-year installation period
- Samples were removed from various locations and applications
- Samples were extensively tested and full reports submitted to the AUEB
- Testing over 40 samples, all were found to show no degradation in service in this extensive evaluation of a new pipeline technology.
- Spoolable GRE accepted by AUEB as a routine application in Oil and Gas service to 1440 psi 2003

Proven Track Record

- Over 50 million feet installed throughout the world
- FS LP 2.5" 2,500 (E) in water injection service since 1999
- FS LP 3.5" 750 (E) in oil emulsion service since 2000
- All samples were visually inspected and tested for physical and mechanical properties
- Sample performed as new compared to original quality control records from date of manufacture



West Texas, installed in 1999.



Alberta, Canada, installed in 2000.

Fiberspar Spoolable GRE in DOT Regulated Applications

- Columbia Gas Waiver approved March 2005 (Docket No. RSPA-04-18757)
- 4200 ft 4" pipe installed in 2005 as a gas transmission line
- Operation at 750 psig for over 7 years with no problems
- Samples at 1, 2.5, and 5 years removed by Columbia Gas and tested by Jana Labs showed no signs of degradation

- Anchor Point Special Permit approved in October 2010
- 33,200' of 4 ½" pipe installed in January 2011 as dual gas transmission lines
- Operating at 1,328 psig for over 1 year

Fiberspar Petition to Modify Part 192

- Submitted in May 2008 and assigned Docket #PHMSA-2010-003
- Revise Part 192.121 to allow the use of thermoset pipe up to its hydrostatic design basis (HDB) as listed by ASTM D 2517
- Revise Part 192 appendix B to reference latest version of ASTM D2517

192.121 Design of plastic pipe.

- **S** = For ~~plastic thermoplastic~~ pipe (thermoplastic and thermoset), the HDB determined in accordance with the listed specification...
- ~~For reinforced thermosetting plastic pipe, 11,000 psig (75,842 kPa).~~

Appendix B

- ASTM D ~~2517-00~~ 2517-06 – Standard Specification for Reinforced Epoxy Resin for Gas Pressure Pipe and Fittings



Next Steps & Path Forward