Corrosion Resistant Fiberglass Piping Systems
For Oil & Gas Applications
NOV Fiber Glass Systems
Headquartered in San Antonio, Texas, NOV Fiber Glass Systems is the leading worldwide manufacturer of fiberglass reinforced epoxy (GRE) products used for onshore and offshore corrosion control in a variety of low to high pressure oilfield applications. NOV Fiber Glass Systems brings over 60 years of experience in the oil and gas sector with its offering of the most highly recognized and respected brands in the industry. These brands include STAR® and Centron® for high-pressure line pipe and downhole tubing and casing applications as well as Red Thread® and Bondstrand® for low-pressure applications.

Line Pipe
Standard and API Design
Line pipe for oil and gas production is manufactured in sizes ranging from 1½” through 36” (40 to 900mm) diameters and will handle pressures from 150 psi (1,03 MPa) to 4000 psi (27,6 MPa) depending on size and temperatures up to 210º F (99º C). These high pressure products are typically used to transport highly corrosive produced water and CO₂ gas from an oil field’s central station to injection wells. Additionally, line pipe is used in lower to medium pressure oil and gas flow lines where corrosive flows are encountered. The epoxy resin systems offered include aliphatic amine, aromatic amine, and anhydride and each provides slightly different chemical and temperature resistance. Fiberglass reinforcement provides the structural strength. NOV Fiber Glass Systems line pipe is manufactured to a minimum design life of 20 years at rated temperature and pressure according to ASTM D2992 Procedure B and industry standards, such as API 15 HR and 15 LR.

Applications
• Flow Lines or Injection Lines
• Transfer Lines or Disposal Lines
• Tank Battery Piping
• Fire Water Lines
• Oil
• Natural Gas Production
• High Pressure CO₂ and Salt Water Injection
• Crude Oil, Salt Water, H₂S
• Light Chemicals:
  - Salts
  - Solvents
  - pH 2-13 Solutions

Benefits
Corrosion Control
Resists corrosion caused by CO₂, H₂S and saltwater. Requires no protective coating.

Reduced Line Pipe Installation Cost
Light and easy to handle. Less personnel and equipment needed during installation.

Improved Flow Capacity
Smoother interior pipe surface increases efficiency and resists scale/paraffin build-up.
Advanced Composite Thread (ACT) connection is manufactured with a special composite consisting of epoxy, graphite, and ceramic. These materials with a Teflon® base lubricant or proprietary sealant, and the consistent tolerances of ACT, provide exceptional sealability to high pressure fluids and gases with excellent make-up and break-out performance. The molded ACT provides higher thread shear and chemical resistance and is preferred over cut or ground fiberglass threads for downhole tubing.

Precision Ground Thread (PGT) is produced with numerically controlled grinding equipment and the tolerances provided by PGT require only the use of Teflon base lubricant or proprietary sealant for make-up. The PGT connection is manufactured according to the industry standard EUE 8rd or OD 8rd thread.

Centron SP/SPH is a 4-thread per inch pattern that, in addition to being a sealed thread, also incorporates a self-contained, restrained O-ring seal for added reliability. This exceptionally user friendly connection is used in high pressure applications up to 3500 psi and 210°F.

Centron CEN is also a coarse 4-thread per inch pattern that seals exclusively with a self-contained, restrained O-ring seal. It is used primarily in low pressure flow line or transfer applications in pressures from 500-800 psi and temperatures up to 210°F.

Taper/Taper adhesive bonded matched joints are the primary system used for Red Thread II piping systems. The pipe is supplied with one end belled and one end tapered. Epoxy adhesive is used to secure the joint. For 2"-6" diameter (50-150 mm) Red Thread II pipe, factory supplied ends, have special profile double lead threads for quick reliable assembly.

STAR Super Seal (SSS) is a fast, reliable, all-weather and self-restrained mechanical o-ring seal. O-rings are standard Nitrile for normal applications up to 200°F (93.3°C). The pipe is provided in 8" through 12" (200-300 mm) sizes with two threads per inch.
Downhole Tubing and Casing
Integral Joint / Threaded and Coupled
STAR and Centron Fiberglass Tubing / Casing

NOV Fiber Glass Systems is the leading downhole GRE producer in the industry due to its unique zero degree fiberglass layering sequence, which provides superior tensile performance. Tubing is offered in 1½” through 9 ½” diameters (40 mm - 250 mm) with pressure rating from 1000 to 3500 psi (6,9 to 24,1 MPa). Casing products range in size from 1½” through 9½” diameter (40 mm - 250 mm) with pressure ranges from 1000 to 3250 psi (6,9 - 22,4 MPa). The STARWell design program will assist in selecting the correct product based on tensile and collapse conditions.

FGS offers GRE downhole tubing and casing products produced with three distinct curing agents that withstand temperatures up to 210°F (99°C). All products come in standard nominal joint lengths of 30 ft. (9,1 m). The company’s downhole products are used in a variety of highly corrosive applications such as saltwater and CO₂ injection wells, due to corrosive nature of injection fluids, in observation wells for monitoring formations where steel can interfere with monitoring equipment, and in producing wells where steel products corrode easily.

Joining Systems
NOV Fiber Glass Systems offers the industry standard API 5B EUE 10rd, EUE 8rd and OD 8rd steel compatible joining systems, in addition to the coarse 4-thread per inch plus O-ring seal connections, which are available either Threaded and Coupled (T&C) or Integral Joint (IJ). The joining system is a critical consideration in determining GRE’s relative performance versus steel products. It impacts the number of times a string of tubing can be “tripped” in and out of a well, as well as the speed of installation and compatibility with other products.

Applications
• Disposal or Injection Tubing
• Production Tubing (ESP, Gas Lift or Rod Pump)
• Casing Liners
• Chemical Waste Disposal
• Geothermal
• Slotted Production Liners
• Observation Well Casing
• Open Hole Casing, Zone or to Surface

Improved Downhole Make & Break Performance
ACT Tubing
Less breakout torque, tighter thread tolerances, less thread wear and higher thread shear.

Superior Downhole Performance
Unique axial and balanced hoop reinforcement

Downhole Systems

<table>
<thead>
<tr>
<th>PRODUCTS</th>
<th>SIZE</th>
<th>PRESSURE</th>
<th>TEMPERATURE</th>
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<tr>
<td>STAR Tubing</td>
<td>1½”-9 5/8”</td>
<td>3500 psi</td>
<td>Up to 200°F (93.3°C)</td>
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<tr>
<td></td>
<td>(40-250 mm)</td>
<td>(24,1 MPa)</td>
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</tr>
<tr>
<td>STAR Casing</td>
<td>1½”-9 5/8”</td>
<td>3250 psi</td>
<td>Up to 200°F (93.3°C)</td>
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<tr>
<td></td>
<td>(40-250 mm)</td>
<td>(22,4 MPa)</td>
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</tr>
<tr>
<td>STAR Shallow Well</td>
<td>1½”-2 7/8”</td>
<td>1500 psi</td>
<td>Up to 150°F (65.6°C)</td>
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<tr>
<td></td>
<td>(40-75 mm)</td>
<td>(10,3 MPa)</td>
<td></td>
</tr>
<tr>
<td>Centron DHT (Downhole Tubing)</td>
<td>1½”-4¼”</td>
<td>3500 psi</td>
<td>Up to 210°F (99°C)</td>
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<tr>
<td></td>
<td>(40-115 mm)</td>
<td>(24,1 MPa)</td>
<td></td>
</tr>
<tr>
<td>Centron DHC (Downhole Casing)</td>
<td>4½”-9 5/8”</td>
<td>2500 psi</td>
<td>Up to 210°F (99°C)</td>
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<tr>
<td></td>
<td>(115-250 mm)</td>
<td>(17,2 MPa)</td>
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**STARWell**

The NOV Fiber Glass Systems well simulation analysis program was developed to analyze actual well conditions so that the correct tubing products can be recommended to the customer. Often a series of conditions will be evaluated using the worst and best case scenarios, thereby assuring the customer that the product will give years of trouble-free service.

**Service**

Field support during the installation of the product is an integral part to ensure the reliability and long-term, worry-free performance of your piping system. NOV Fiber Glass Systems offers complete training and inspection service for all products throughout the world. The availability of trained personnel at the job site leads to a more successful installation.

**Quality**

The NOV Fiber Glass Systems commitment to quality extends throughout the company and supplier network. All products are closely monitored during production and thoroughly tested. Quality standards are strictly enforced and reinforced with production employee incentives and quality audits. Third party inspections are a normal occurrence at NOV Fiber Glass Systems. The API Q1 Quality Rating is a requirement for approval by API 15HR and API 15LR. The quality and performance requirements of API assure the customer that, not only do we have a quality system, but they also receive a product qualified and approved for performance standards. Our adherence to this internationally recognized quality system is another indication of our commitment to our global role as a manufacturer of the highest quality fiberglass tubulars.

**Certifications and Approvals**

Awarded the FIRST API Q1 and API 15HR approval for the manufacture of high pressure fiberglass pipe.

[Logo of ISO 9001:2000 Certification]
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