

united[®]

United Pipeline Systems



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High-density polyethylene lining systems
for pipeline protection and rehabilitation

United Pipeline Systems

The transportation of corrosive or abrasive materials in the oil & gas, mining, industrial and municipal markets can wreak havoc on your pipelines. Internal corrosion and abrasion can lead to leaks, pipeline failure, environmental damage, and lost production.



Internal Corrosion

Complete replacement of these pipelines is costly and time-consuming. Internal abrasion and corrosion can be avoided by utilizing the pipeline construction capabilities of United Pipeline Systems.

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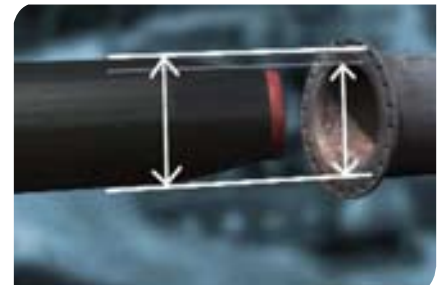
United Pipeline Systems is the global leader in providing high-density polyethylene (HDPE) lining systems for internal pipeline protection. United has constructed and internally lined more than 13,000 kilometers (8,000 miles) of pipelines on six continents since 1985.

With office facilities in the USA, Canada, Mexico, Chile and Brazil, United can respond quickly with the specialized personnel, equipment and material resources necessary to complete turnkey projects anywhere in the world.

The Tite Liner® System

United developed the Tite Liner® system, a technology that enables an HDPE liner to fit tightly inside a host pipe.

The Tite Liner® system begins as an HDPE pipe that is manufactured with a larger outside diameter (OD) than the inside diameter (ID) of the host steel pipe.



Outside Diameter vs. Inside Diameter

The Tite Liner® system temporarily reduces the HDPE pipe liner for insertion that expands tight following installation. The tight-fitting HDPE liner acts as a continuous barrier between the bare steel and the corrosive or abrasive material.

The corrosion and abrasion resistance properties of polyethylene allow the Tite Liner® system to protect steel pipelines from a variety of chemicals and abrasives through a broad range of temperatures and pressures. It is an efficient and cost-effective way to protect new or existing pipelines, and its use can often extend the life of a pipeline far beyond the expected life of an asset. The Tite Liner® system comes in sizes from 2" to 52" in diameter, with larger diameters possible in certain situations.



The Tite Liner® System offers many benefits:

- **Long Pull Lengths:** Average pull lengths are approximately 600-800 meters, and longer pull lengths of a kilometer or more have been achieved (individual section length depends on the diameter, bends, terrain and condition of the host pipe).
- **Low Cost and Time:** The Tite Liner® system can often rehabilitate your pipelines for less than one-half the cost and time of dig-and-replace solutions.
- **No Maintenance:** The Tite Liner® system is a “fit and forget” solution, unlike chemical injection alternatives that require ongoing maintenance and operating costs.



- **Temperature Limitation:** The polyethylene pipe utilized in the Tite Liner® system exhibits superior mechanical properties in temperatures up to 90° C (194° F) for water and oil emulsion service. For higher temperatures or more aggressive fluids, United can recommend alternative lining materials.

- **Chemical Resistance:** HDPE is very resistant to chemicals and other media such as acids, alkalis and salts which makes its use suitable in almost every process application.
- **Field Bends:** The lining system can easily negotiate field bends of 50D or greater, and tighter bends may be possible.
- **Pressure Limitation:** The Tite Liner® system has no pressure limitation, since the pressure is contained by the host pipe.
- **Leak-Free Connections:** Tite Liner® system flange-fittings have been successfully used in projects with pressures up to 5,000 psi. The connection has been tested and independently verified up to 7,500 psi.
- **Increased Operating Efficiencies:** A Tite Liner®-protected pipeline often experiences increased operating efficiencies because the smooth HDPE liner improves hydraulic properties over and above a slight reduction of the inside diameter.

The Tite Liner® system can often rehabilitate pipelines at one-half the cost and time of dig-and-replace solutions.

Worldwide Experience



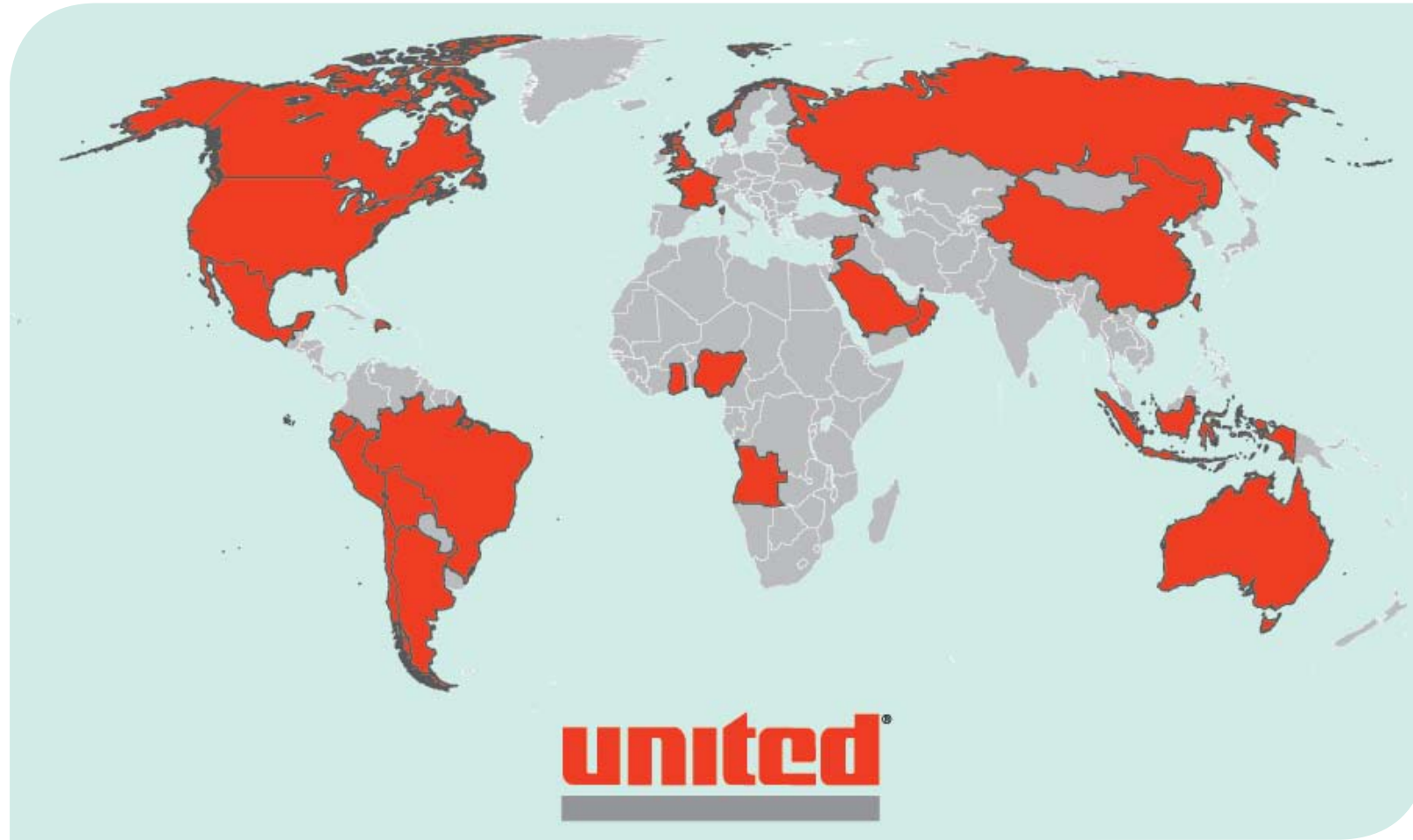
Canada



China



North Sea



United has lined more than 13,000 kilometers (8,000 miles) of pipelines on six continents.



USA



Middle East



South America



North Slope Alaska



West Africa

Tite Liner® System Installation Process

1 Before installation can begin, a new or existing host steel pipeline is sectioned to allow for the insertion of the Tite Liner® liner pipe. Once on site, short individual pipe lengths are joined together by thermal fusion to form long, continuous lengths of liner pipe. A blow-down pig and sizing plate are then attached to a steel cable and sent through a section of the host pipeline. Once the steel cable reaches the other end of the section, it is attached to a pull-head on a corresponding length of liner pipe (Fig. 1).

2 A wireline unit pulls the liner pipe through United's Roller Reduction Box positioned at the insertion end of the host pipe. The liner pipe is compressed radially as it passes through the Roller Reduction Box (Fig. 2). This temporary reduction provides sufficient clearance between the OD of the liner pipe and the ID of the steel pipe to allow for insertion. While the liner is pulled into the host pipeline, the liner remains under axial tension, and the reduced OD is maintained (Fig. 3).

3 When the tension is released, the liner pipe expands, creating a tight fit against the inner wall of the steel pipe (Fig. 4). Following relaxation of the liner pipe, custom manufactured polyethylene flange-fittings are attached at each end of the lined section. A steel spacer ring is placed around the raised face of the steel flange and the polyethylene flange-fitting to help ensure a leak-free connection. The two steel flanges are positioned together and the line is tested and bolted-up before placing in service.

Installation Snapshots



Fig. 1: Steel Cable and Roller Reduction Box

The steel cable is pulled through a Roller Reduction Box and attached to a pull-head on a fused section of liner.



Fig. 2: Hydraulic Rollers

The liner is pulled through a series of hydraulic rollers, temporarily reducing the liner's diameter while it is installed inside the pipeline section.



Fig. 3: Liner Under Tension

The wireline unit keeps the liner under tension as it is pulled into the host pipe.



Fig. 4: Tight Fit Created

After the liner is pulled into the host pipe, the tension on the steel cable is released. The memory of the polyethylene material allows the liner to grow back tight against the host pipe wall.



Safetyliner™

United developed the Safetyliner™ system for use in gaseous applications.

Safetyliner™ offers all of the same polyethylene lining protection of the Tite Liner® system, but differs in that a series of small grooves exist on the outside of the liner in order to provide an exit path for any gas molecules that may permeate the liner. The unobstructed grooves provide the ability to immediately detect any possible leak. Safetyliner's advanced design has proven especially effective in applications such as CO₂, sour gas, 3-Phase oil, and tailings pipelines.

Quality and Manufacturing

To respond quickly to customer needs and project requirements, United has established quality manufacturing and construction support facilities in multiple countries. United maintains a high standard of quality by designing and manufacturing all of its specialized material and proprietary installation equipment. Our manufacturing ability allows us to ensure materials are tailored for every job and delivered on time.



United's in-house research, design, engineering, and manufacturing capabilities provide complete control over quality, production scheduling and project coordination.

Safety

Our corporate safety policy and job training goal is to provide an accident-free work environment. We have maintained an excellent safety record and instill an attitude of safety awareness in everything that we do.





Typical Applications

Thousands of kilometers of the Tite Liner[®] system have been successfully installed around the world in a wide variety of industries. Typical applications include:

Oil & Gas

- Crude oil and oil emulsion
- Sour and wet gas
- Water injection and disposal systems
- Offshore
- CO₂ production and injection

Municipal

- Force sewer mains
- Transmission lines

Mining

- Tailings
- Concentrate
- Acid lines
- PLS
- Water lines

Industrial

- Chemical slurries
- Sodium carbonate
- Corrosive effluents
- Caustics
- Brine

The Worldwide Polyethylene Lining Leader

United has the trained manpower, the specialized equipment, the worldwide experience and the expertise to safely tackle a wide variety of challenges in new or existing pipelines - on time and on budget.

For more information about United Pipeline Systems and its pipeline construction capabilities, or for a feasibility analysis and cost estimate for your next pipeline project, visit our web site or contact us at the office listed below.

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