PIPELINES
BUILDING PIPELINE COATING PERFORMANCE

FROM SPEC TO PROTECT
PROVIDING COMPLETE PIPELINE COATING SOLUTIONS FOR BOTH ONSHORE AND OFFSHORE APPLICATIONS

As the industry moves into an era of complex exploration and transmission, the requirements for coatings become more demanding. To meet the increasing difficulty of drilling and distribution, Sherwin-Williams has developed coatings to meet even the most challenging pipeline project requirements.

We are constantly developing new products and technologies to enhance the efficiency and effectiveness of your operation’s critical assets, wherever they are in the world. Sherwin-Williams has been providing protection to the exterior and interior of pipes for the oil and gas industry for over 50 years and we build pipeline protection one layer at a time.

With multiple innovative technologies, products that meet or exceed the most challenging industry standards, dependable deliveries wherever the project is located around the globe, and onsite application engineering expertise, Sherwin-Williams has your needs covered.
WHY BUILD PIPELINE COATINGS ONE LAYER AT A TIME?

It’s all about performance. Each layer provides unique characteristics while chemically reacting with each other. This creates a stratification of properties that give unparalleled performance attributes, all from a monolithic coating with benefits extending to both asset owners and applicators.

Customer benefits

• **Durable finish**: outstanding resistance to cracking, cold flow and softening over a wide temperature range.
• **Exceptional chemical resistance**: allows coated pipe to endure exposure to a wide range of chemicals including aliphatic hydrocarbons, aqueous salts and caustics
• **Outstanding performance**: superior adhesion to the substrate; offers excellent cathodic disbondment resistance in a wide range of environments
• **Excellent flexibility**: meets the most demanding field bending requirements including extreme temperatures and “reel barge” pipe laying
• **Efficient operations**: well-controlled, efficient application process in a coating plant gives consistent coating performance in all size projects
• **Dependable service**: Sherwin-Williams team of global service representatives support application and repair around the world, wherever our customers need us most
**PIPPINES**
PREVENT, PROTECT, PRESERVE

**PREVENT, PROTECT AND PRESERVE...**

Sherwin-Williams provides unparalleled, end-to-end anti-corrosion coating systems, each designed for various operating temperatures, environments and types of pipeline. The gold standard in corrosion protection, each pipeline coating provides durable, reliable performance and easily layers with other Sherwin-Williams coatings for flow assurance, mechanical protection, weight stabilization and more.

**Prevent:** The first line of defense is your anti-corrosion fusion bonded epoxy. Providing robust protection against oxidation in a variety operating temperatures while simultaneously working synergistically with cathodic protection to reduce the overall cost of pipeline operations.

**Protect:** These layers provide protection for the underlying prevention layer and create unique properties for the system. These can be ARO (abrasion resistant overcoats), MRO (moisture resistant overcoats), or roughcoats (for subsequent concrete overlays.)

**Preserve:** This layer provides UV protects for stored pipes.

MRO/ARO is applied as a dual layer powder system that provides an extremely robust protective coating to the outside of pipes. It is designed to be applied over FBE (fusion bonded epoxy) coatings on the exterior of pipes.

It features an innovative product which provides superior protection against moisture and corrosive elements in the environment, while also providing abrasion resistance equal to typical ARO coatings.

It provides optimum protection for the corrosion protection layer against both moisture uptake, as well as damage throughout storage, transit, construction and service of the pipeline, including during horizontal directional drilling and backfilling.

This coating is designed for service temperatures up to 150°C/300°F or higher dependent upon the base layer of corrosion protection which is applied.
PIPELINES
PREVENT, PROTECT, PRESERVE

PIPECLAD EXTERNAL COATINGS

PREVENT
FBE single layer and primer
(up to 110°C/230°F)
Pipeclad 2000

High operating temp
(up to 200°C/392°F)
Pipeclad HOT 120
Pipeclad HOT 120 Flex
Pipeclad HOT 150
Pipeclad HOT 150 Flex
Pipeclad HOT 180
Pipeclad HOT 200 (in development)

Low application temp FBE
(down to 170°C/338°F)
Pipeclad 2000 LAT

FBE 3LPO Primer
Pipeclad 1000

PROTECT
Abrasion resistant overcoats
Pipeclad 2040
Pipeclad 2040 Flex

Moisture resistant overcoats
Pipeclad 2060 MRO
Pipeclad HOT 150 Flex MRO
Pipeclad HOT 180 MRO

Textured fusion bonded epoxy
Pipeclad Roughcoat
Pipeclad HOT 120 Roughcoat
Pipeclad HOT 150 Flex Roughcoat

PRESERVE
Fusion bonded polyester
Pipeclad PTA50057

Acrylic latex overcoat
Pipeclad UV Protect
SHERWIN-WILLIAMS®

PIPCINES
PREVENT, PROTECT, PRESERVE

FIELD JOINT COATINGS

Sherwin-Williams provides complete solutions for pipelines including field joint coatings, end-to-end anti-corrosion coating systems, each designed for various operating temperatures, environments and types of pipeline.

THE RANGE COVERS

• Fusion bonded epoxy powder with low application temperature and/or high operating temperatures
• Two component ultra-high solids liquid epoxies
• Quick setting, 100% solids polyurethane

PIPECLAD® 2000 LAT

Thermosetting epoxy coating system is engineered to be applied to pipelines. It is designed for use in single layer applications and as a primer layer for dual layer FBE and 3-layer PE/PP applications and as a girth weld coating.

It is applicable down to 170°C/338°F, with an extended shelf life.

PIPECLAD® 5000

From the first field joint to miles of pipeline rehab and repair, Pipeclad 5000 Exterior Pipeline Epoxy makes pipeline construction and integrity management easy and reliable for pipeline contractors and corrosion engineers.

Pipeclad 5000 is an ultra-high solids amine cured epoxy engineered specifically to deliver long-term corrosion resistance to below grade oil and gas pipelines, valves, and other equipment. It is formulated to provide outstanding resistance to impact, abrasion, chemical immersion, and from cathodic disbondment when used in combination with cathodic protection systems.

Customer benefits

• Increase production and throughput with fast drying times and simple application. Manually apply or spray up to 1500 microns/60 mils wet in one multi-coat pass with ambient spray conditions of 2°C–65°C/35°F–150°F (metal surface temperature)
• Reduce damage and expedite backfills with excellent gouge, impact and abrasion resistance. When paired with cathodic protection, provides corrosion protection for your high value pipeline assets
• Improve your process and waste less product with innovative packaging including drums, pails, liter tubs, liter burst pouches, holiday repair 16 ml burst pouches and 1000 ml/400 ml cartridges
• Maintain compliance with a product that meets or exceeds CSA Z245.30-2014 coating standard

NOVA-PLATE™ 325

Nova-Plate 325 is an amine cured, glass and ceramic filled that utilizes advanced novolac technology. It is engineered to protect cargo, steel tank and vessel interiors from aggressive chemicals stored and processed at high temperatures and high pressures. Also used as internal and external pipeline coating.

For use over prepared steel or masonry surfaces in industrial and marine exposures such as: oil storage tanks up to 149°C/300°F.

CORROPIPE® 3000

A two component, quick setting, 100% solids polyurethane designed to protect pipelines from corrosion and abrasion. It can be sprayed in a single coat application at varying temperatures and film thicknesses.

Corropipe 3000 is designed for external use in a variety of demanding applications for pipelines such as rock shield, slip bore and directional drill applications.
PIPELINES
PREVENT, PROTECT, PRESERVE

REPAIR COATINGS

PIPECLAD® 5000
Pipeclad 5000 is an ultra-high solids amine cured epoxy. It can be used as repair coatings on exterior coatings of pipelines.

• Convenient packaging options provide low waste and on-the-go application for any size project
  o Cartridges – 300 ml x 100 ml, 750 ml x 250 ml
  o Burst Pouch® 1 liter packaging
• Ease of mixing and delivery to the surface
• Application via brush, roll, broad knife, or plural component spray

PIPECLAD® PATCH STICK 970P
Pipeclad Patch Stick 970P is a thermoplastic material designed for quick repairs to minor pinholes and abrasions in Pipeclad 2000 FBE. It is designed for ease of application, particularly in the field, as it is quick setting.

1. PREP:
   Brush the coating surface around repair area.

2. PREHEAT:
   Apply coating surface.

3. APPLY:
   Abdorbents or corrosion medium while brushing or roll and flow.

4. COOL:
   Allow coating to cool or apply water to quench.
INTERNAL POWDER COATINGS

PIPECLAD® FBE POWDER COATINGS WILL PROTECT ASSETS AND BRING VALUE

Our internal powder coatings have an extensive track record of protecting OCTG assets and drill pipe in a variety of aggressive environments around the world. The coatings provide improved hydraulic efficiency for faster drilling and better pumping and exceptional corrosion protection, thereby extending the life of the equipment and reducing the total operating cost. Whether applying direct to metal or over our liquid phenolic primer, this family of FBE powder coatings will protect your assets and bring value to your customer.

PHENOLIC PRIMER – FOR ID POWDERS

<table>
<thead>
<tr>
<th>Product</th>
<th>Colour</th>
<th>Description</th>
<th>Area of usage</th>
<th>Usage temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeclad HXR0015</td>
<td>Red</td>
<td>Phenolic primer with iron oxide</td>
<td>All ID coatings, certainly with sour gas</td>
<td>Full range</td>
</tr>
<tr>
<td>Pipeclad HXR0016</td>
<td>Red</td>
<td>Phenolic primer, no iron oxide,</td>
<td>All ID coatings, certainly with sour gas</td>
<td>Full range</td>
</tr>
</tbody>
</table>

ID/OCTG POWDERS

<table>
<thead>
<tr>
<th>Product</th>
<th>Colour</th>
<th>Area of usage</th>
<th>Usage temperature (°C)</th>
<th>Usage temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeclad 702N</td>
<td>Tan</td>
<td>CO2 injection WAG oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes</td>
<td>121</td>
<td>250</td>
</tr>
<tr>
<td>Pipeclad 702N Flex</td>
<td>Tan</td>
<td>High flexibility for CO2 injection WAG oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes</td>
<td>121</td>
<td>250</td>
</tr>
<tr>
<td>Pipeclad 702NAR</td>
<td>Tan</td>
<td>High abrasion resistance for CO2 injection WAG Oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes</td>
<td>121</td>
<td>250</td>
</tr>
<tr>
<td>Pipeclad 702G</td>
<td>Green</td>
<td>High temperature drill pipe Oil, gas and water wells, Rod pump wells, Gas lift</td>
<td>150</td>
<td>302</td>
</tr>
<tr>
<td>Pipeclad 702GAR</td>
<td>Green</td>
<td>High abrasion resistance for high temperature drill pipe Oil, gas and water wells, Rod pump wells, Gas lift</td>
<td>150</td>
<td>302</td>
</tr>
<tr>
<td>Pipeclad 704G</td>
<td>Blue-green</td>
<td>CO2 injection, WAG, Oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes</td>
<td>121</td>
<td>250</td>
</tr>
<tr>
<td>Pipeclad 706G</td>
<td>Green</td>
<td>CO2 injection, WAG, Oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes</td>
<td>150</td>
<td>302</td>
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<tr>
<td>Pipeclad PFG70021</td>
<td>Green</td>
<td>Can be used inner diameter and outer diameter for high temperature drill pipe, Production tubing, Above ground transfer tubing</td>
<td>136</td>
<td>277</td>
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<tr>
<td>Pipeclad PFG70002</td>
<td>Green</td>
<td>High temperature drill pipe Oil, gas and water wells, Rod pump wells, Gas lift</td>
<td>204</td>
<td>399</td>
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</table>
PIPECLAD® FLOWLINER FLOW EFFICIENCY COATINGS FOR NATURAL GAS TRANSITION

Pipeline Flowliner epoxy coatings are designed to reduce owner operational costs by providing maximum flow efficiency in oil and gas pipelines while also reducing maintenance, commissioning and installation times. They reduce corrosion of pipes during storage and make for cleaner effluent products when testing a pipeline with water. Pipeclad Flowliner coatings are formulated to meet performance requirements of the API RP 5L2, ISO 15741 and DIN EN 10301 international standards. These coatings are designed with Pipeclad Internal flow efficiency superior application properties thereby enabling a variety of DFT levels to accommodate coatings specifications.

BENEFITS OF COATING GAS PIPELINE INTERIOR

- Lower pressure drop; increase gas capacity
- Higher gas flow capacity with internal pipe coating
- Lower pressure drop from one compressor station to the next

PIPECLAD FLOWLINER PRODUCTS

<table>
<thead>
<tr>
<th>Product</th>
<th>Volume solids %</th>
<th>Mix ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeclad Flowliner 930R CS</td>
<td>52</td>
<td>1:1</td>
</tr>
<tr>
<td>Pipeclad Flowliner 930R HS (Winter version)</td>
<td>68</td>
<td>4:1</td>
</tr>
<tr>
<td>Pipeclad Flowliner 930R HS (India)</td>
<td>76</td>
<td>4:1</td>
</tr>
<tr>
<td>Pipeclad Flowliner 930R HS Ultrasmooth</td>
<td>82</td>
<td>4:1</td>
</tr>
<tr>
<td>Pipeclad Flowliner 930R SF (solvent free, China)</td>
<td>100</td>
<td>3:1</td>
</tr>
</tbody>
</table>
A COATING SYSTEM WITH GLOBAL TRACK RECORD

Abu Dhabi National Oil Company
ADOC (Abu Dhabi Oil Co.)
Air Products
AKA Energy
Alaska Gas Development Corporation
Alliance Pipeline
American Midstream
Anadarko
Andeavor (formerly Tesoro)
Antero Resources
Apache
Atmos Energy
Baltimore Gas & Electric
Bechtel
BHP Billiton (Petrohawk Energy)
Blue-Knight Energy Partners
Boardwalk
BP (US, Alaska)
Buckeye Partners
Cabot Oil & Gas Corporation
CenterPoint Energy
Cheniere Energy
Chesapeake Energy
Chevron
CHS Pipeline
Colorado Springs Utilities
ConocoPhillips
Copano Energy
Crestwood Midstream
Cuu Long JSC
DCP Midstream
Denbury LLC
Denbury Resources
Devon Energy
DistributionNow
Dominion Transmission
Dow Chemical
Dubai Petroleum
Duke Energy (Piedmont Natural Gas)
Eastern Shore Natural Gas
Edgen Murray
EIL - Engineers India Ltd.
Enable Midstream
Enbridge (US, Canada, Spectra Energy)
Energy Transfer Partners (Regency, Sunoco Logistics)
Enterprise Products Partners
EOG Resources
EP Energy
EQT Midstream
Excel Midstream
Excelerate Energy
ExxonMobil
Explorer Pipeline
Fermaca
Florida Power & Light
Fluor
Formosa Plastics
Gazprom
GAIL India Ltd.
Gas Natural Fenosa
GIGL (GSPL India Gasnet Ltd.)
Grupo Carso
GWIL (Gujarat Water Infrastructure Limited)
HESS
Hilcorp (Harvest Pipeline)
Houston Pipe Benders
Howard Energy Partners
Indian Oil Corporation Ltd.
INGL, Israel
JD Fields
Jemena Australia
Kern River Gas Transmission
Kiewit
Kinder Morgan (Canada, CO2, Natural Gas, Products, El Paso, Copano Energy)
Koch Pipeline
Kuwait Oil Company
Loop LLC
Magellan Midstream Pipeline
Mammoth Carbon Products
Marathon Petroleum (MarkWest)
MDU Resources Group (WBI Energy)
Mecon Ltd
Meritage Midstream
Michcon (DTE)
Mid-States Supply
MRC
National Fuel
NextEra Energy (NET Midstream)
NGL Energy
NiSource
Noble Energy
NuStar Energy
Occidental Petroleum
OG&E
ONEOK
PNG (Pacific Northern Gas)
Pembina
Penn Virginia Corp.
Petrojet Egypt
Petroleum Development of Oman
Petronas
PG&E
Phillips 66
Pioneer Natural Gas
Pipesource
Pipe Exchange
Plains All American Pipeline
PPC
PV Gas
Qatar Petroleum
Questar Gas
Rangeland Energy
Rice Energy
Rimrock Midstream
Saddle Butte Pipeline
Saudi Aramco
SAUNI Yojana, India
SCOP Iraq
Scotia Gas Networks
SemGroup
Sempra Utilities (Southern California Gas)
Sempra Mexico (IENOVA)
SGN Commercial Services Ltd
Shell
SilverBow Resources (formerly Swift Energy)
South Jersey Gas
Southcross Energy
Southern Company Gas (AGL Resources)
Southern Star
South Stream
Southern Gas Networks PLC
Spire Energy (formerly LaClede)
Subsea 7
Suncor Energy
SWCC, KSA
Tall Oak Midstream
Taligrass Energy
TANAP
Targa Resources
Techtin/Mexico
Technip
Tellurian LNG (Driftwood LNG)
Tengizchevroil
Texas Pipe
TexStar Midstream
TOTAL
TransCanada (Columbia Pipeline Group)
Trans Adriatic Pipeline
UGI Corporation
Universal Pagasus
Valero (Wilmington Refinery)
We Energies
WhiteWater Midstream
Williams (Access Midstream)
Xcel Energy
Sherwin-Williams has been providing protection to the exterior and interior of pipes for the oil and gas industry for over 50 years and we offer a product approved and/or complied with global pipeline standards such as not limited to below standards.

API RP 5L2 RP
API RP 5L7 RP
API RP 5L9
AS/NZS 3862
ASTM A 972/A972M
AWWA C213
CSA Z245.20-18
CSA-Z245.20-06
DIN 30607
DNV RP-F102
DNV RP-F106
EN 10289
EN 10290
EN 10301
EN 10329
GOST
ISO 15741
ISO 21809
NACE RP0105
NACE RP0394
NACE RP0394
NACE RP0402
NACE TM0185

Approved/Complied with Global Pipeline Standards

ISO
NACE INTERNATIONAL
DNV GL
British Gas
DIN
CSA Group
National Grid
THE SHERWIN-WILLIAMS DIFFERENCE

Sherwin-Williams Protective & Marine delivers world-class industry subject matter expertise, unparalleled technical and specification service, and unmatched regional commercial team support to our customers around the globe. Our broad portfolio of high-performance coatings and systems that excel at combating corrosion helps customers achieve smarter, time-tested asset protection. We serve a wide array of markets across our rapidly growing international distribution footprint, including oil and gas, water and wastewater, bridge and highway, steel fabrication, flooring, food and beverage, rail and power, marine and passive fire protection.