

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.

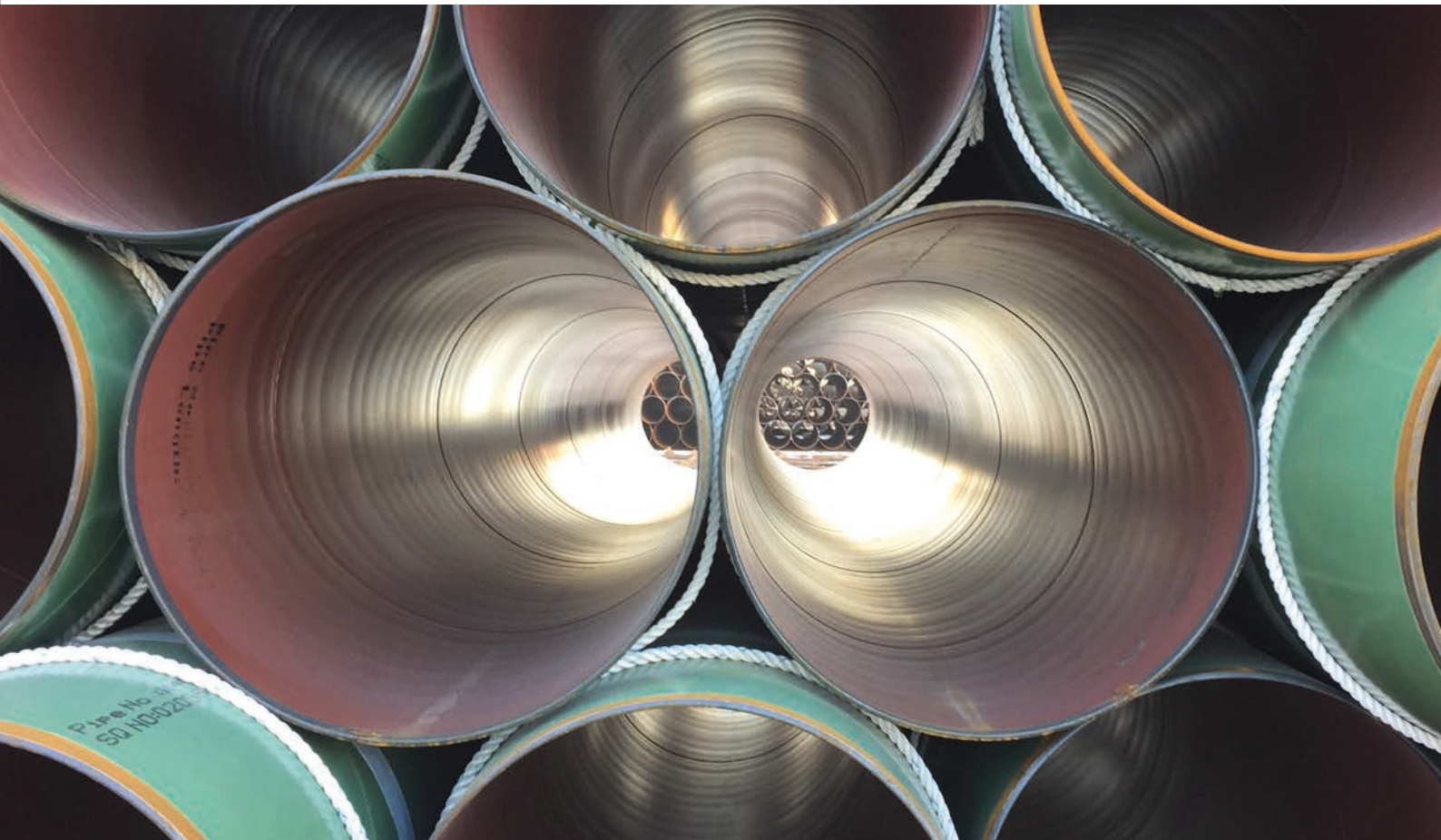


WHY BUILD PIPELINE COATINGS ONE LAYER AT A TIME?

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



PIPELINES

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 coast 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.

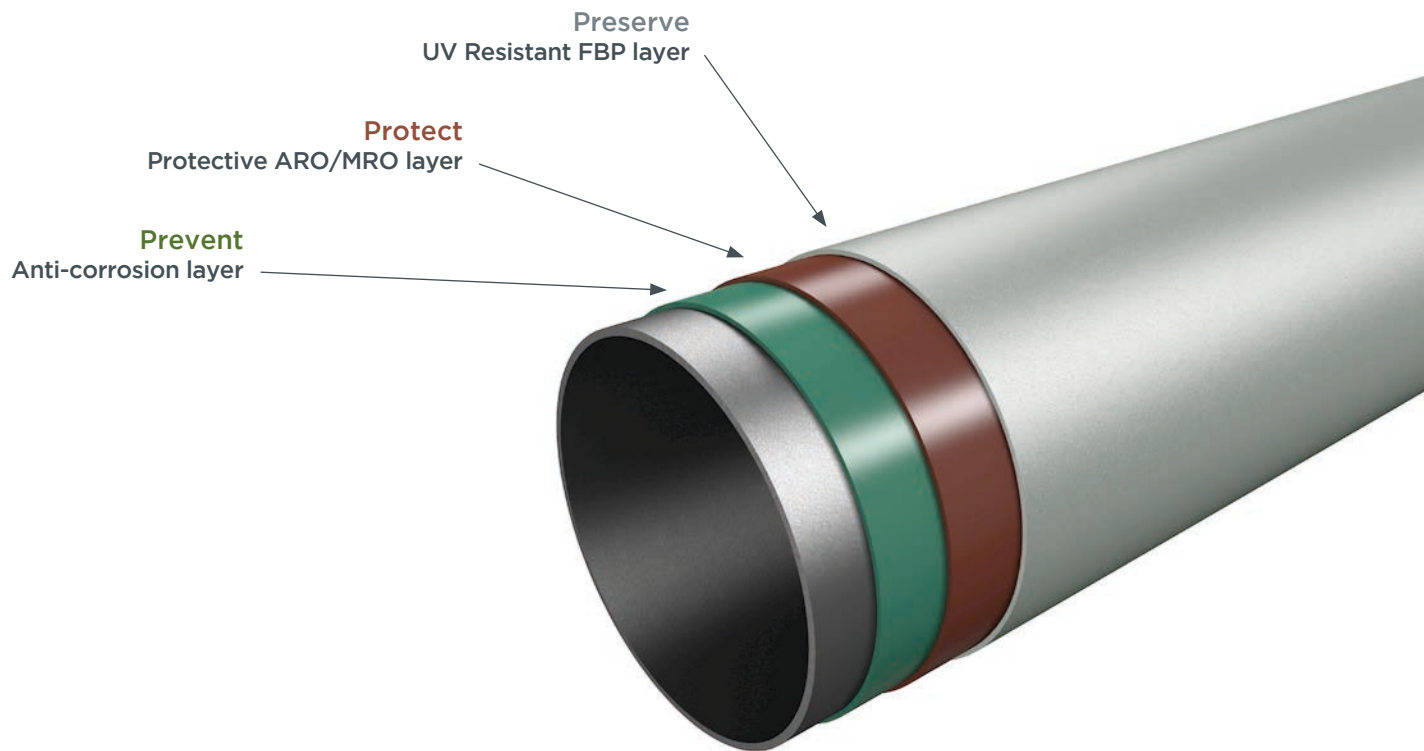
This coating is designed for service temperatures up to 150°C/300°F or higher dependent upon the base layer of corrosion protection which is applied.



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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

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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.

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REPAIR COATINGS

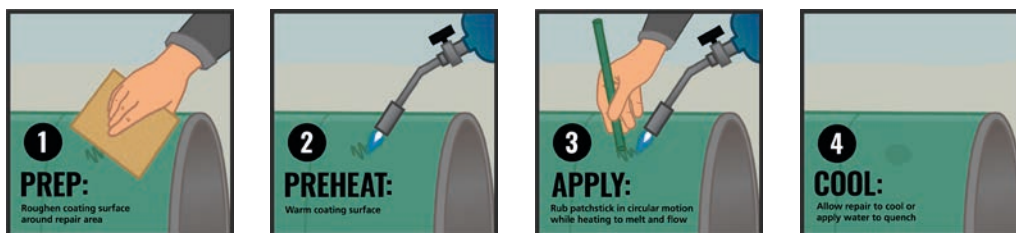
PIPECLAD® 5000

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.



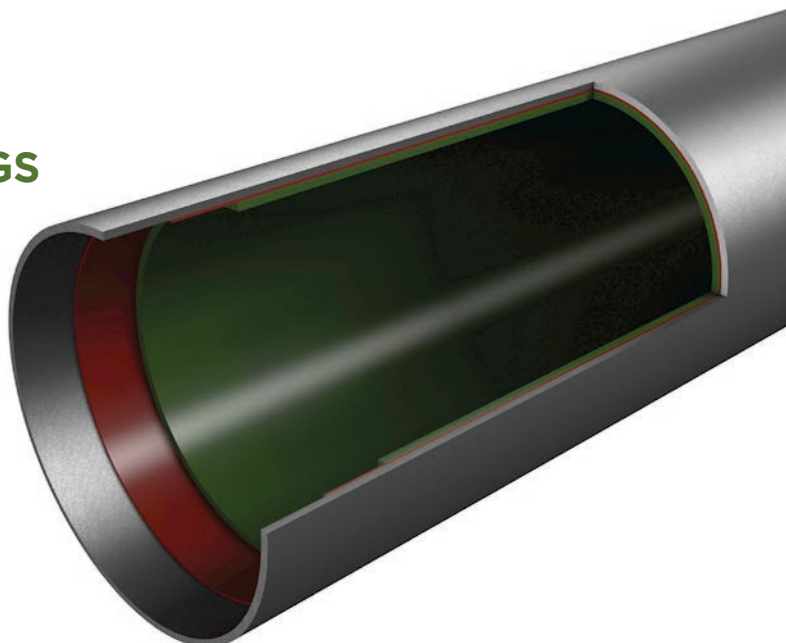
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INTERNAL POWDER COATINGS

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

Product	Colour	Description	Area of usage	Usage temp
Pipeclad HXR0015	Red	Phenolic primer with iron oxide DFT: 13–25 microns/0.5–1.0 mil	All ID coatings, certainly with sour gas	Full range
Pipeclad HXR0016	Red	Phenolic primer, no iron oxide, DFT: <18 microns/<0.7mil	All ID coatings, certainly with sour gas	Full range

ID/OCTG POWDERS

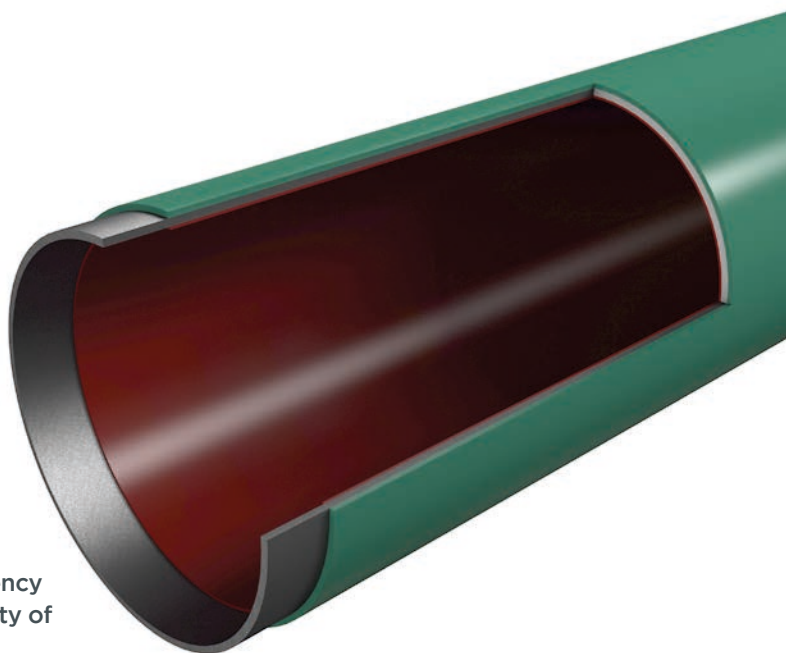
Product	Colour	Area of usage	Usage temperature °C °F	
Pipeclad 702N	Tan	CO2 injection WAG oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes	121	250
Pipeclad 702N Flex	Tan	High flexibility for CO2 injection WAG oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes	121	250
Pipeclad 702NAR	Tan	High abrasion resistance for CO2 injection WAG Oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes	121	250
Pipeclad 702G	Green	High temperature drill pipe Oil, gas and water wells, Rod pump wells, Gas lift	150	302
Pipeclad 702GAR	Green	High abrasion resistance for high temperature drill pipe Oil, gas and water wells, Rod pump wells, Gas lift	150	302
Pipeclad 704G	Blue-green	CO2 injection, WAG, Oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes	121	250
Pipeclad 706G	Green	CO2 injection, WAG, Oil/water/gas production, Brine injection/disposal, Flow lines, Line pipes	150	302
Pipeclad PFG70021	Green	Can be used inner diameter and outer diameter for high temperature drill pipe, Production tubing, Above ground transfer tubing	136	277
Pipeclad PFG70002	Green	High temperature drill pipe Oil, gas and water wells, Rod pump wells, Gas lift	204	399

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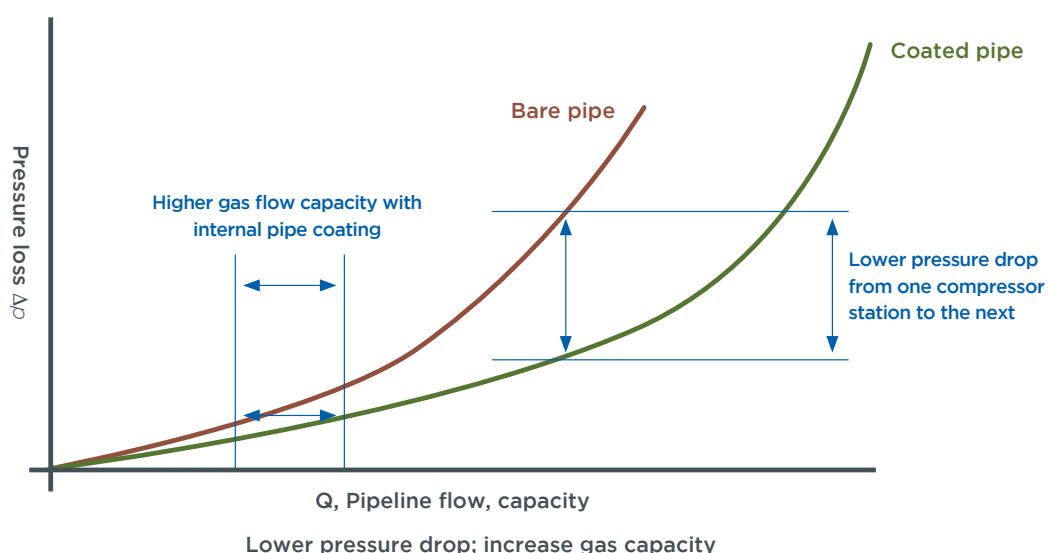
PREVENT, PROTECT, PRESERVE

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



PIPECLAD FLOWLINER PRODUCTS

Product	Volume solids %	Mix ratio
Pipeclad Flowliner 930R CS	52	1:1
Pipeclad Flowliner 930R HS (Winter version)	68	4:1
Pipeclad Flowliner 930R HS (India)	76	4:1
Pipeclad Flowliner 930R HS Ultrasmooth	82	4:1
Pipeclad Flowliner 930R SF (solvent free, China)	100	3:1

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A COATING SYSTEM WITH GLOBAL TRACK RECORD

Abu Dhabi National Oil Company	Explorer Pipeline	Pioneer Natural Gas
ADOC (Abu Dhabi Oil Co.)	Fermaca	Pipesource
Air Products	Florida Power & Light	Pipe Exchange
AKA Energy	Fluor	Plains All American Pipeline
Alaska Gas Development Corporation	Formosa Plastics	PPC
Alliance Pipeline	Gazprom	PV Gas
American Midstream	GAIL India Ltd.	Qatar Petroleum
Anadarko	Gas Natural Fenosa	Questar Gas
Andeavor (formerly Tesoro)	GIGL (GSPL India Gasnet Ltd.)	Rangeland Energy
Antero Resources	Grupo Carso	Rice Energy
Apache	GWIL (Gujarat Water Infrastructure Limited)	Rimrock Midstream
Atmos Energy	HESS	Saddle Butte Pipeline
Baltimore Gas & Electric	Hilcorp (Harvest Pipeline)	Saudi Aramco
Bechtel	Houston Pipe Benders	SAUNI Yojana, India
BHP Billiton (Petrohawk Energy)	Howard Energy Partners	SCOP Iraq
Blue-Knight Energy Partners	Indian Oil Corporation Ltd.	Scotia Gas Networks
Boardwalk	INGL, Israel	SemGroup
BP (US, Alaska)	JD Fields	Sempra Utilities (Southern California Gas)
Buckeye Partners	Jemena Australia	Sempra Mexico (IENOVA)
Cabot Oil & Gas Corporation	Kern River Gas Transmission	SGN Commercial Services Ltd
CenterPoint Energy	Kiewit	Shell
Cheniere Energy	Kinder Morgan (Canada, CO2, Natural Gas, Products, El Paso, Copano Energy)	SilverBow Resources (formerly Swift Energy)
Chesapeake Energy	Koch Pipeline	South Jersey Gas
Chevron	Kuwait Oil Company	Southcross Energy
CHS Pipeline	Loop LLC	Southern Company Gas (AGL Resources)
Colorado Springs Utilities	Magellan Midstream Pipeline	Southern Star
ConocoPhillips	Mammoth Carbon Products	South Stream
Copano Energy	Marathon Petroleum (MarkWest)	Southern Gas Networks PLC
Crestwood Midstream	MDU Resources Group (WBI Energy)	Spire Energy (formerly LaClege)
Cuu Long JSC	Mecon Ltd	Subsea 7
DCP Midstream	Meritage Midstream	Suncor Energy
Denbury LLC	Michcon (DTE)	SWCC, KSA
Denbury Resources	Mid-States Supply	Tall Oak Midstream
Devon Energy	MRC	Tallgrass Energy
DistributionNow	National Fuel	TANAP
Dominion Transmission	NextEra Energy (NET Midstream)	Targa Resources
Dow Chemical	NGL Energy	Techint/Mexico
Dubai Petroleum	NiSource	Technip
Duke Energy (Piedmont Natural Gas)	Noble Energy	Tellurian LNG (Driftwood LNG)
Eastern Shore Natural Gas	NuStar Energy	Tengizchevroil
Edgen Murray	Occidental Petroleum	Texas Pipe
EIL - Engineers India Ltd.	OG&E	TexStar Midstream
Enable Midstream	ONEOK	TOTAL
Enbridge (US, Canada, Spectra Energy)	PNG (Pacific Northern Gas)	TransCanada (Columbia Pipeline Group)
Energy Transfer Partners (Regency, Sunoco Logistics)	Pembina	Trans Adriatic Pipeline
Enterprise Products Partners	Penn Virginia Corp.	UGI Corporation
EOG Resources	Petrojet Egypt	Universal Pagasus
EP Energy	Petroleum Development of Oman	Valero (Wilmington Refinery)
EQT Midstream	Petronas	We Energies
Excel Midstream	PG&E	WhiteWater Midstream
Excelerate Energy	Phillips 66	Williams (Access Midstream)
ExxonMobil		Xcel Energy

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APPROVED/COMPLIED WITH GLOBAL PIPELINE STANDARDS

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



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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.

SHERWIN-WILLIAMS®

protectiveemea.sherwin-williams.com
02/20 EMEA0274/V02

United Kingdom:

+44 (0)1204 556420
sales.uk@sherwin.com

Europe and Africa:

+44 (0)1204 556454
sales.uk@sherwin.com

Middle East:

+971 4 8840200
sales.me@sherwin.com

India:

+91 9871900878
pmsales.india@sherwin.com