Utilizing Thermoplastics to Protect Industrial Assets From Internal Corrosion

USTS
UNITED SPECIAL TECHNICAL SERVICES

AMPP™ CHAPTER JUBAIL SAUDI ARABIA

Agenda

- Presentation (19:00 - 19:45)
  - Introduction to Rotolining
  - Introduction to Thermoplastic Tite Liner
  - Review Selection of Case Studies
- Q&A (19:45 – 20:00)
- Dinner (20:00 onwards)

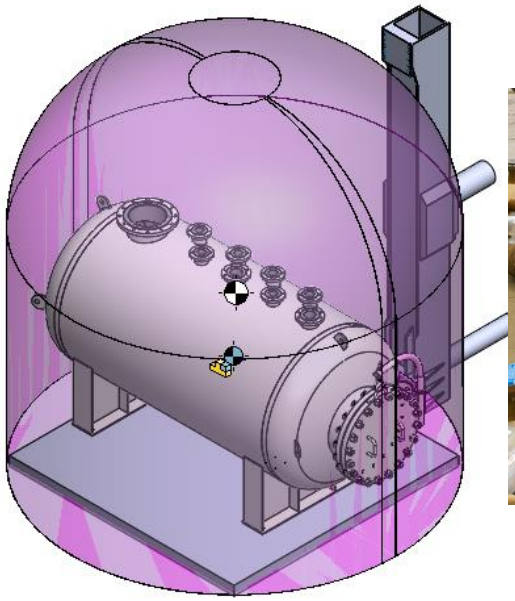
Introduction to Rotolining

Rotational Lining (roto-lining, rotolining)

- Performed in an oven
- Part slowly rotated bi-axially in oven
- Material distributes in powder form (no sloshing or centrifugal force)
- Offers thick, seamless liner
- Flange faces machined “post-line” and provide smooth sealing surface
- Lining thickness typically 0.188” or 4.8mm
- Durable finish
- Fully bonded to metal substrate
- Excellent bond strength to metal
- Lining materials

Rotolining – Size and Weight Limitations

- 2-inch to 60-inch diameter x 4-meter length (2500 Kgs.)
- 16-inch to 60-inch diameter x 3-meter length (5000) Kgs



Advantages of Rotolining

- Reduce or eliminate 100% of the failure modes of other lining methods
- Greatly reduce cost, especially when including lifetime operating and maintenance costs
- Long lasting internal corrosion protection solution

Material	Temperature	
PFA Teflon®	260ºC	500ºF
ETFE Tefzel®	150ºC	300ºF
PE	70ºC	158ºF

Thermoplastic Rotolining - Key Advantages

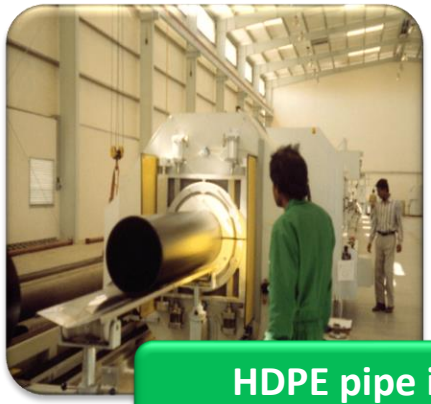
	Rotational Lining	Sheet Lining	Powder Coating	FRP/Dual Laminate	Epoxy Coating	Glass Lining	Exotic Alloy
Seamless Liner	✓		✓		✓	✓	
Mechanically-Bonded Liner	✓		✓		✓	✓	
Easily Line Complex Shapes	✓						✓
Thick Liner (>.188")	✓						
Abrasion Resistant	✓					✓	✓
Easily Repaired	✓	✓					✓
Impact Resistant	✓	✓		✓			✓
No Direct Internal Access Required	✓						✓
Reuse Existing Structures	✓	✓	✓		✓		

Additional Key Advantage : Rotolining available locally in Khobar KSA. Quick turn around, personalized service and technical support.

Introduction to Tite Liner

Tite Liner® Process Overview

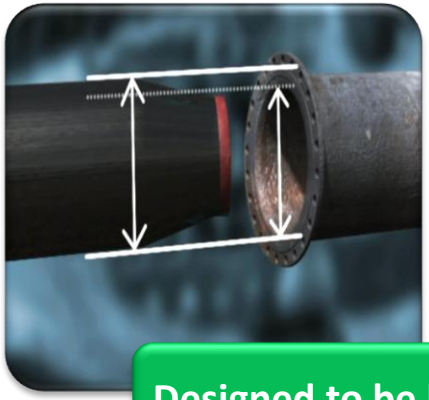
Tite Liner® Process Overview



HDPE pipe is manufactured to specification

Pipe is delivered to site

Pipe sticks are welded together in strings



Designed to be larger than the ID of host pipe

Pipe is radial compressed and installed in host pipe

Tite Liner® end connection is installed

Tite Liner® Applications

Oil & Gas

- Crude oil and oil emulsion
- Sour and wet gas
- Water injection and disposal systems
- Offshore (real-lay)
- CO2 production and injection

Mining

- Tailings & slurries
- Concentrate
- Acid
- Water

Industrial

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

Municipal

- Pressure sewer mains
- Water transmission lines

Review of Selected Case Studies

Case Study –Water Injection Pipeline Rehabilitation

Application

- Rehabilitation of 8” x 37,000ft of >20 year old pipelines

Location, Date

- KSA Abqaiq NWIP, 2012

Products

- HDPE Tite Liner
- Rotolined Fittings

Key Issue Solved

- Seawater injection line suffering from internal corrosion and leaks
  - Relining with HDPE Tite Liner and PE Rotolined tee
  - Leaks and internal corrosion stopped

Case Study – Rotolining for Brine Handling at Petrochemical Plant

Application

•Rotolining for Petrochemical plant handling brine medium

Location, Date

•Kingdom of Saudi Arabia, 2014

Product

•Utilized polyethylene materials

Key Issue Solved

•3” – 10” piping systems suffering from extreme internal corrosion due to brine service

Case Study – Rotolining Rehabilitation for a Process Vessel

Application

- Rehabilitation of Vessel and Strainer

Location, Date

- Kingdom of Saudi Arabia SABIC, 2022

Product

- Rotolining Technology to refurbish the existing contactor shell and strainer.
- ETFE is selected as a lining material due to aggressive fluid conditions

Key Issue Solved

- Extend life of existing vessel - thorough cleaning and surface preparation then rotoline.
- Complete lining activity completed in 48 hours.

Case study –Tailing application

Application

•Rotolining for tailings pipeline/piping system

Location, Date

•KSA, Maaden Phosphate – Turaif, 2021

Product

•PE is selected as the lining material as it has a high abrasion resistance

Key Issue Solved

•4” – 10” piping systems suffering from extreme internal corrosion due to thickened tailings and slimes
•Lined up to the drain in the pits

Case Study – Offshore Caisson, Rotolining with Anti-Microbial

Application

- Lining using rotational molding (rotolining) technique for offshore caissons
- Seawater & antifouling

Location, Date

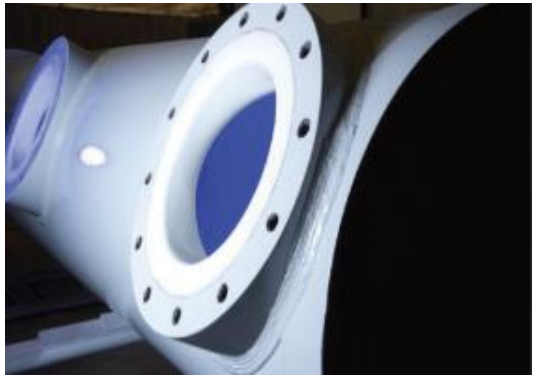
- Gulf of Mexico, 2013

Product

- Custom compounded polymer (polyethylene based) with antimicrobial additive

Key Issue Solved

•Offshore platform having 16 caissons used for distribution of seawater. Previously, Super Duplex 2507 was used. Rotationally molded polyethylene on carbon steel was tested and qualified. Antimicrobial additive blended with PE to resist marine life. Lead time reduced from 50 weeks (Duplex) to 18 weeks (CS + Roto) and project savings of ~$5M USD



Case Study - End -to-End Internal Corrosion Protection Solution

Application

- Sea Water Injection system

Location, Date

- KSA Safiniya, 2021

Products

- Used SABIC polyethylene materials
- Tite Liner for long sections
- PreFIT HDPE shop lining for spools and small sections
- Rotolining for Tees, Elbows and Manifolds

Key Issue Solved

- Complete system solution with end-to-end thermoplastic corrosion protection.
- Very short turnaround time
- 100% KSA built solutions with major raw material component and application within The Kingdom