



Fortezza da Basso • FLORENCE (Italy)



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30th September • 2nd October 2019

Pipe Preservation during Trenchless Installations: There's no Need to Take unnecessary Risks

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CORROSION IS RESPONSIBLE FOR 25% OF GAS PIPELINE FAILURES IN EUROPE

European Gas Pipeline Incident Data Group (EGIG) – 10th Report (1970-2016)



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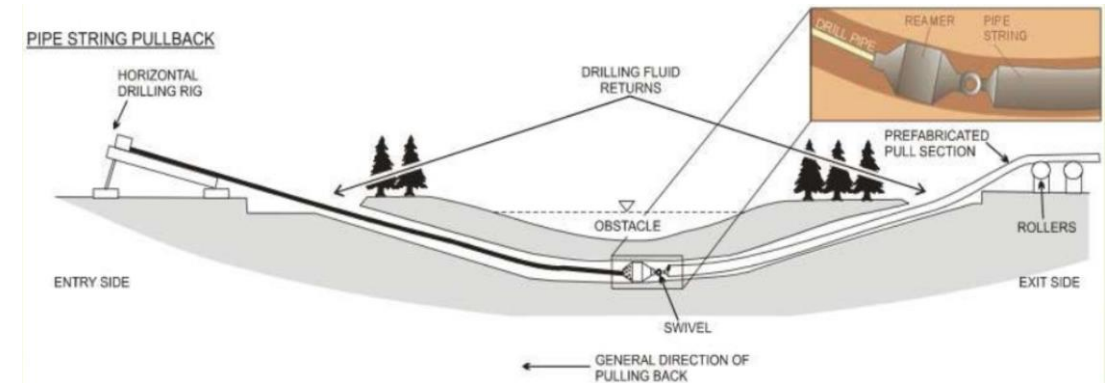


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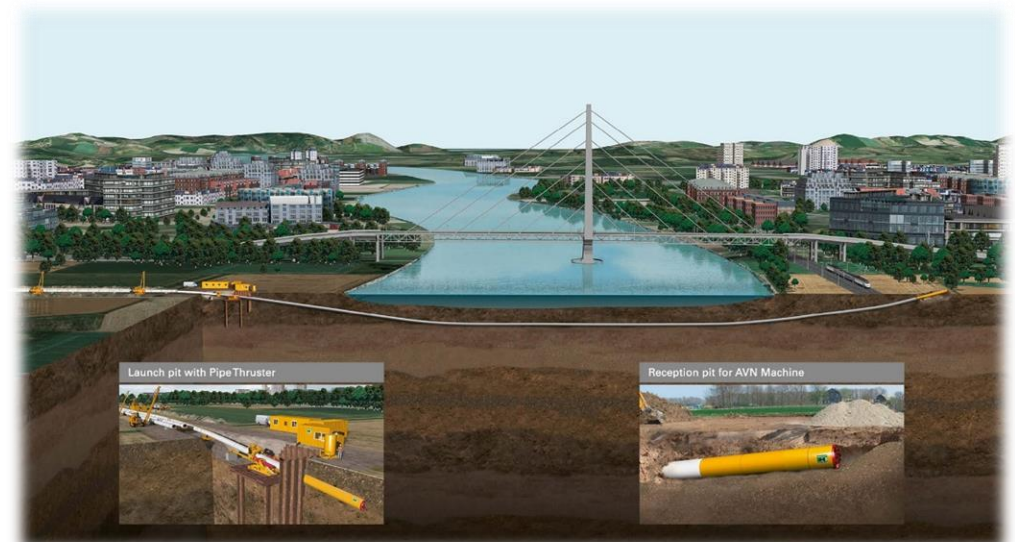
Trenchless Process:

- Geological Survey
- Engineering & Planning
- Pipeline Strings Fabrication
- Borehole Drilling
- Pipeline String Pulling/Pushing
- Mechanical Testing
- **Anticorrosion Coating Damage Survey**

Horizontal Directional Drilling



Direct Pipe®



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First Approach: Conventional Pipeline Coatings Modified for Trenchless use

Extra Thickness Fusion Bonded Epoxy

- Flexibility compromised
- Low impact resistance
- Limited to 600 microns thickness
- Handling damages not avoided

Dual Layer Fusion Bonded Epoxy (ARO)

- Higher application costs
- Low lubricity
- Limited to 1.5 mm thickness

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First Approach: Conventional Pipeline Coatings Modified for Trenchless use



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Intuitive Approach: Conventional Pipeline Coatings Modified for Trenchless use

Thick Three Layer Polyethylene

- Soft material - very low abrasion resistance
- Frequent cutback disbondment
- No gouging resistance
- Susceptible to cracking
- Not thicker than 5 mm

Thick Three Layer Polypropylene

- Susceptible to cracking (internal stresses)
- Frequent cutback disbondment
- No gouging resistance
- Problematic field joint
- Not thicker than 10 mm

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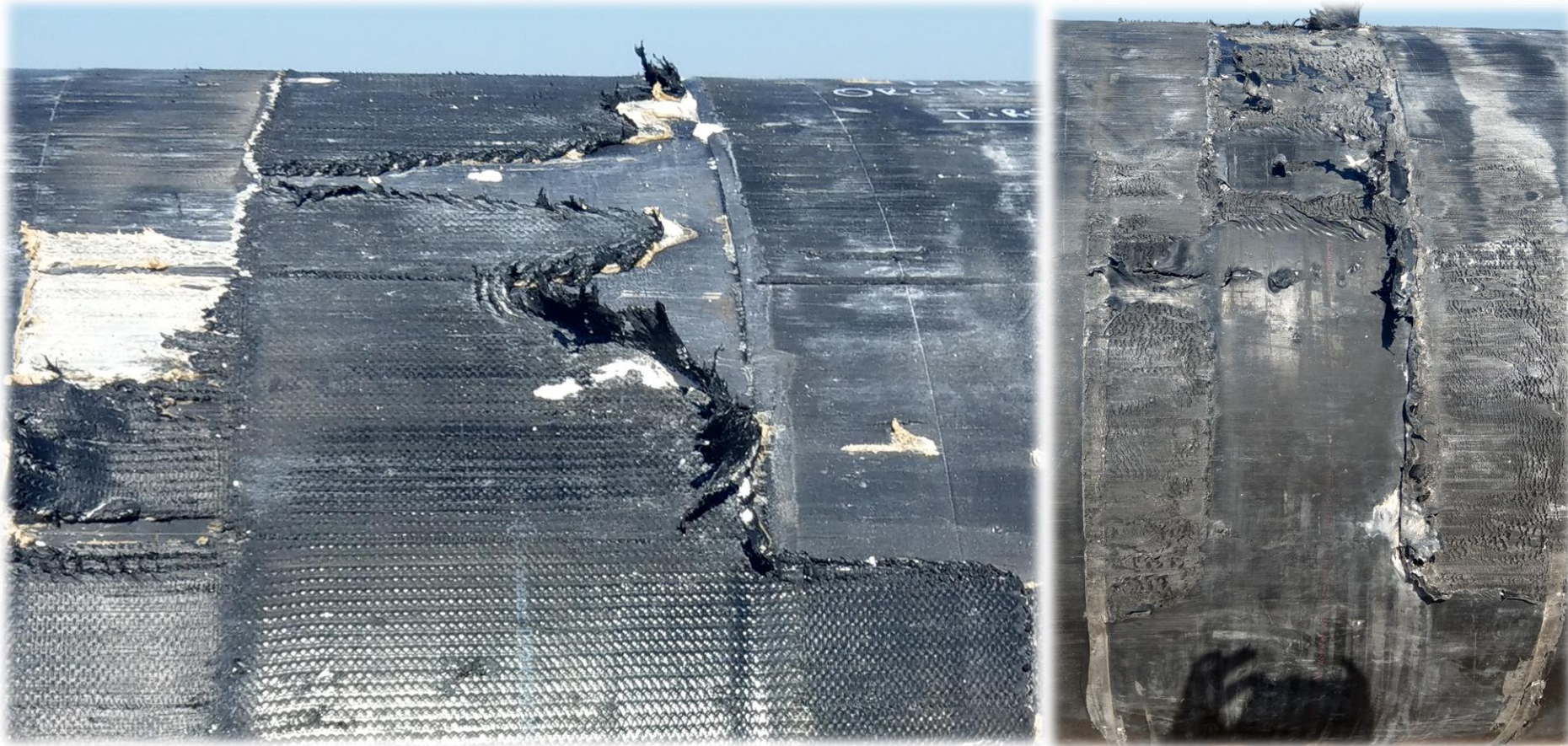
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First Approach: Conventional Pipeline Coatings Modified for Trenchless use



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Engineered Product: Glass Reinforced Polyester

Borehole/Pipe Interaction

Long Distances

Low Bending Radius

Minimize Pull/Push Force

Sharp Objects in the Borehole

Impacts with Hard Surfaces

Shear Stress with Borehole and Pipe Thruster

Cathodic Protection

Field Joint at Site Conditions

High Resistance to Abrasion

No Limitation to Applied Thickness

Flexible

**Smooth Surface (Low Friction Coefficient) &
Low Weight**

High Gouging Resistance

Hard

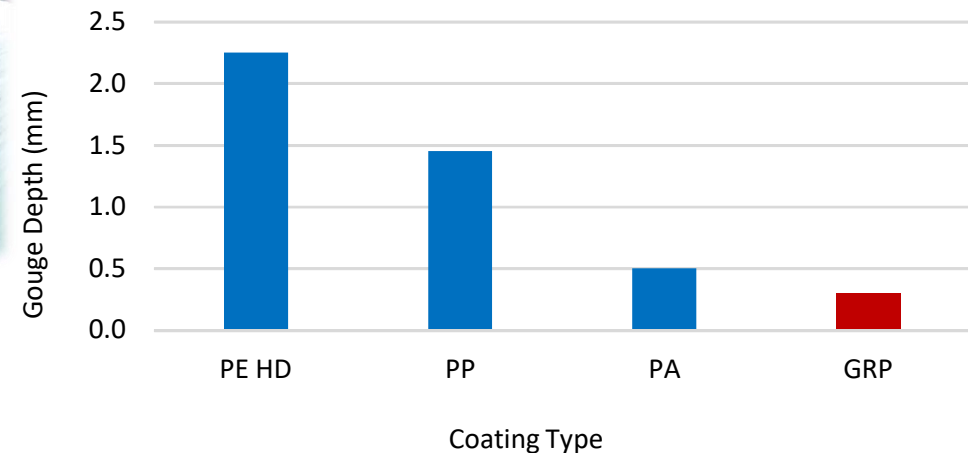
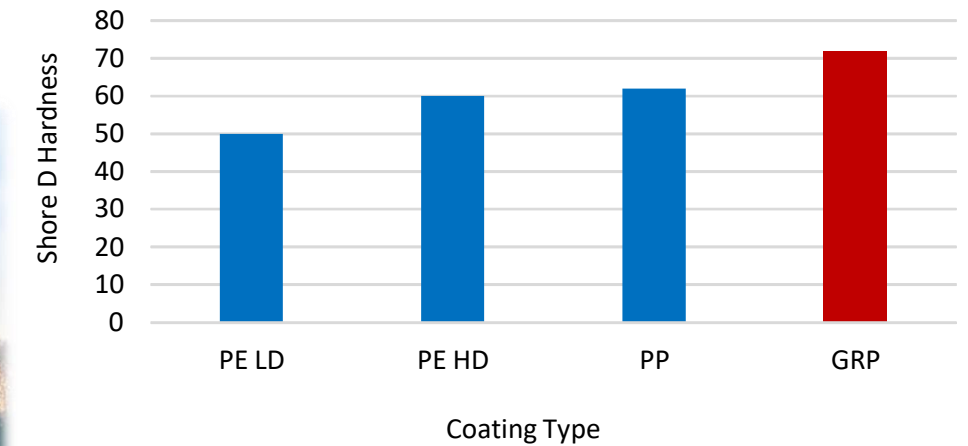
High Mechanical Connection with Pipe

Failure Mode Compatible with CP

**Flexible, Fast and Reliable Field
Applied System**

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Engineered Solution: Glass Reinforced Polyester for Trenchless Installations



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Engineered Solution: Glass Reinforced Polyester for Trenchless Installations

Thickness of laminate

≥ 5.0 mm

Barcol Hardness Type 934-1

≥ 40

Elongation at break

$\geq 2.5\%$

Shear resistance GRP/PE ¹

≥ 130 N/cm²

Abrasion resistance ²

≤ 1.0 mm (70 kg Single Cut Burr)

Impact resistance ³

≥ 15 J/mm at +20°C and -5°C

Indentation resistance

$\leq 10\%$ of layer thickness
(10 N/mm² / 80°C)

Operating temperature range

-30°C to +70°C

Density

1700 kg/m³

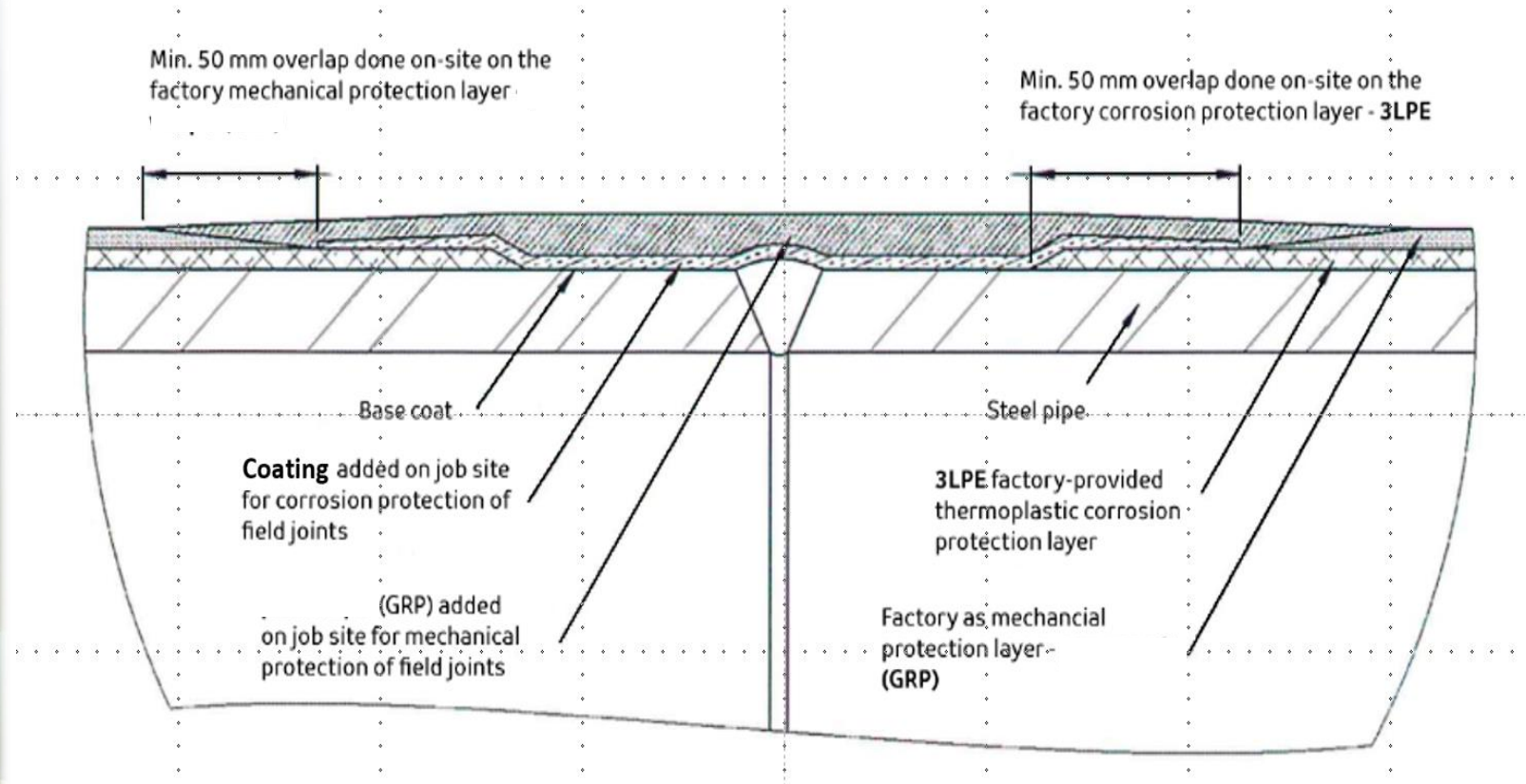
¹ Acc. GW 340 ² Acc. NACE TM0215-2015 ³ Acc. ISO 21809-3

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Technical Comparison between Trenchless Mechanical Protection Systems

	Test Method	Unit	HDPE	PP	FBE+ ARO	3LPE+ GRP
Typical Thickness HDD	-	mm	4	6	1.5	9
Maximum Thickness	-	mm	5	8	2	13
Shear Strength	DVGW GW 340	MPa	>> 5	>> 5	N/A	> 1.3
Gouge Resistance	NACE TM 0215 - 50 kg	mm	2.2	1.5	0.35	0.30
Thk. Reduction at Maximum Thickness	-	%	44	19	23	2
Recommended Curve radius at Max. Thk	-	-	40D	50D	60D	40D
Hardness	ASTM D 2240	Shore D	60	65	85	73
Plant/Field Coatings Adhesion	ASTM D 4541	MPa	< 3	< 3	> 20	> 5

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Engineered Solution: Glass Reinforced Polyester for Trenchless Installations



ELBE River Crossing (NEL Pipeline) – 2011 – 1078 m x 56" - HDD



Aliakmonas River Crossing (TAP Pipeline) – 2018 – 540 m + 600 m x 48" – Direct Pipe®

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WARNING – NOT ALL GRP SOLUTIONS ARE DESIGNED FOR TRENCHLESS APPLICATIONS



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