



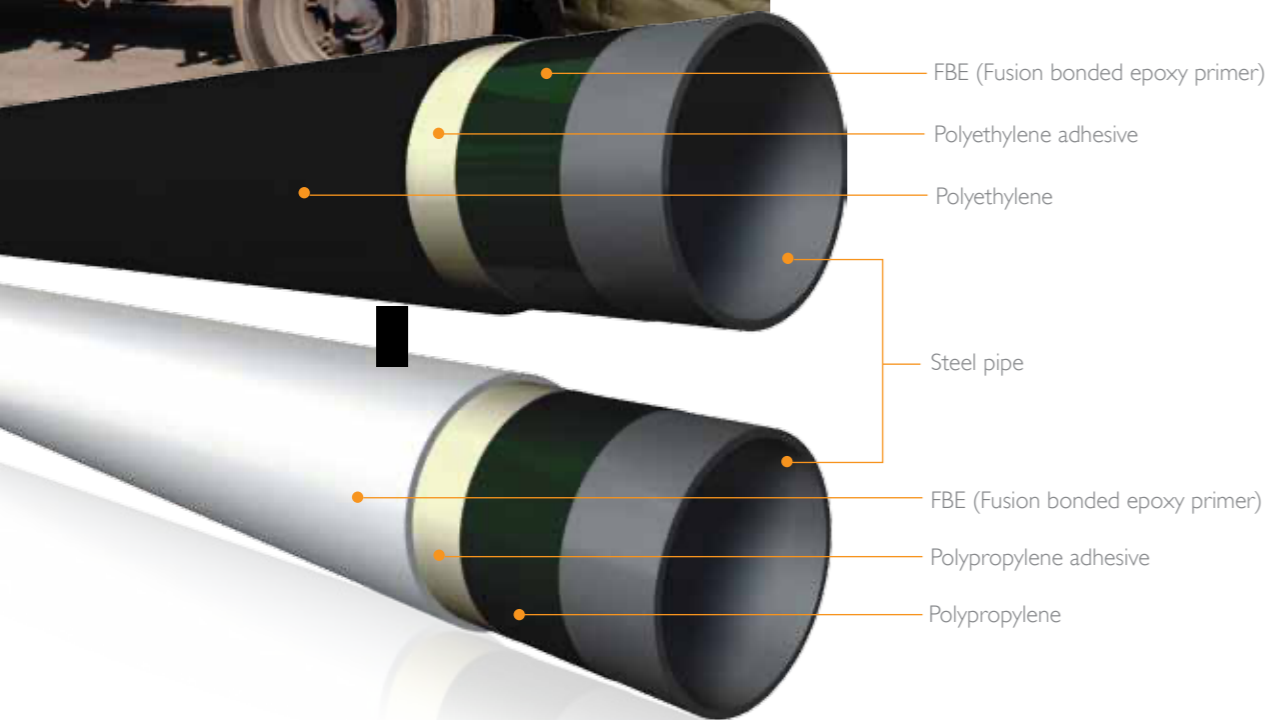
Plastykote®

Three layer polyethylene / polypropylene anti-corrosion coating system.

Plastykote® is a high mechanical resistance anti-corrosive coating for steel pipes.

Plastykote® is the recommended option for pipeline laying in aggressive or stony soils when there is high risk of damage for an anti-corrosive coating of epoxydic type.

Its two versions respond to different levels of service temperature:



THREE LAYER POLYETHYLENE

The three layer polyethylene system is used when the pipeline operation temperature is no higher than 80°C. It is made up of a first epoxy layer, applied directly on the previously blasted and heated steel, a layer of adhesive, whose function is to achieve adherence between this first layer and the third one and the last one of polyethylene. Its usual thickness is from 1.5 mm to 3 mm.

THREE LAYER POLYPROPYLENE

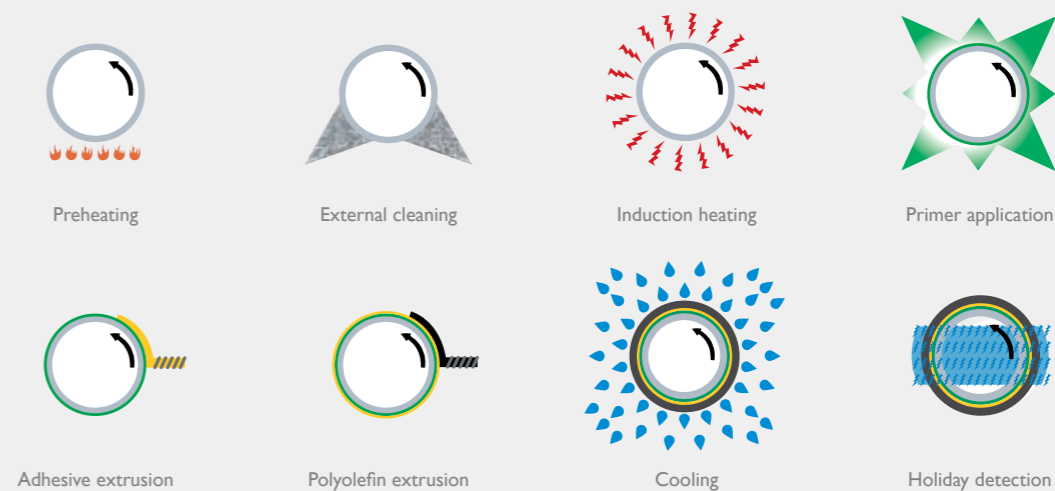
Should a pipeline with a higher service temperature range be coated, this is the option to consider. It is made up of a first epoxy layer, applied directly on the previously blasted and heated steel, a layer of

adhesive whose function is that of achieving the bonding between this first layer and the third one and the last one of polypropylene. The adhesive, like the external layer, is based on polypropylene instead of polyethylene. It can be used with service temperatures of up to 140°C and its usual thickness is of 1.5 mm to 3 mm.

PRODUCTION PROCESS

The method is similar for all the Plastykote® coatings. The pipe surface is blasted, heated and electrostatically covered with an epoxy primer. Next, a layer of copolymer and another one of polyolefin are applied by extrusion in an enveloping manner.

Application processes



Plastykote®

Three Layer Polyethylene Coating (3LPE) TECHNICAL DATA

HIGH DENSITY POLYETHYLENE PHYSICAL PROPERTIES

Typical Properties ¹	Standard ²	Unit	Value ³
Density	ASTM D 792 Method B ISO 1183 Method A	g/cm ³	0.95 to 0.96
Melting Point	ASTM D 3418	°C	≥ 125
Melt Flow Index	CSA Z 245.21	g/10 min	0.4 to 0.7

3LPE COATING MECHANICAL PROPERTIES

Adhesion Resistance @ 20 ± 3 °C	CSA Z 245.21	N/mm	≥ 20
Impact Resistance @ -30 ± 3 °C	CSA Z 245.21	J/mm	≥ 7
Indentation	DIN 30670	mm	≤ 0.2 at 23 °C ≤ 0.3 at 70 °C
Flexibility @ -30 ± 3	CSA Z 245.21	-	No cracking of polyethylene
Hardness @ 20 ± 2 °C	ASTM D 2240	Shore D	≥ 60
Tensile Strength at Yield @ 20 ±	ASTM D 638	MPa	≥ 17
Elongation at Break @ 20 ± 2 °C	ASTM D 638	%	≥ 400
Heat Ageing Aged @ 100 ± 3 °C / 2,400 ± 24 h Tested @ 20 ± 2 °C	CSA Z 245.21	%	Tensile at yield after heating ≥ 65% of the original value. Elongation at break ≥ 150%
Light Ageing Total radiant exposure of 7 GJ/m ²	DIN 30670	%	Melt flow rate after heating shall not deviate more than 35% of the original value.
Cathodic Disbondment @ 48 hours / 65 ± 3 °C / -1.5V / NaCl (3%)	CSA Z 245.21	mm	≤ 3
Cathodic Disbondment @ 28 days / 20 ± 3 °C / -1.5V / NaCl (3%)	CSA Z 245.21	mm	≤ 5
Cathodic Disbonding @ 28 days / 65 ± 3 °C / -1.5V / NaCl (3%)	CSA Z 245.21	mm	≤ 12
Coating Resistivity Exposed @ 23 ± 2 °C / 100 days	DIN 30670	Ωm ²	≥ 10 ⁸

(1): Typical properties are listed in this document. Please advice if additional properties are requested.

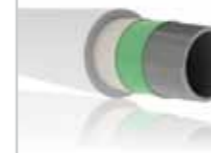
(2): Each test is performed in accordance to internal procedures which are based on the standards listed in this column.

(3): These are nominal values. They have not to be considered as specification limits.



Tubing Protection

3LPP is also typically used as anti-corrosive coating in Water Injection Tubings. With a 8.0 mm coating thickness, it also acts as mechanical protection for couplings (coated with FBE) due to the 3LPP greater OD than couplings. With this, no damage on FBE coated couplings is guaranteed during installation.



Main Characteristics:

- Impermeability to gases and liquids.
- Excellent bonding to steel.
- High resistance to mechanical stresses (impact, indentation, peeling, bending and abrasion)
- Maximum operation temperature: 110 °C.
- Great resistance to chemical agents associated to oil exploration.

Three Layer Polypropylene Coating (3LPP) TECHNICAL DATA

POLYPROPYLENE PHYSICAL PROPERTIES

Typical Properties ¹	Standard ²	Unit	Value ³
Density	ISO 1183/A	g/cm ³	0.89 – 0.91
Melting Point	ASTM E 794	°C	≥ 160
Melt Flow Index	ASTM D 1238 / ISO 1133	g/10 min	0.8 to 1.1
Water Absorption (PP @ 250 bar / 120 °C / 125 days)	ASTM D 570	%	≤ 0.5

3LPP COATING MECHANICAL PROPERTIES

Adhesion Resistance	DIN 30678 NFA 49-71 I	N/mm	≥ 20 at 23 °C ≥ 4 at 110 °C
Impact Resistance 15 - 25 °C	NFA 49-71 I	J/mm	≥ 10
Indentation @ 15 - 25 °C	NFA 49-71 I	mm	≤ 0.1 at 20 °C ≤ 0.4 at 110 °C
Flexibility	NFA 49-71 I	-	No cracking of polypropylene
Hardness @ 20 ± 2 °C	ASTM D 2240	Shore D	≥ 60
Tensile Strength at Break @ 20 ± 2 °C	ASTM D 638	MPa	≥ 17
Elongation at Break @ 20 ± 2 °C	ASTM D 638	%	≥ 400
Compressive Strength @ 10 % strain	ASTM D 695	MPa	≥ 20
Heat Ageing For 2,400 ± 24 h	DIN 30678	%	Δ MFI ≤ 35 %
Light Ageing For 800 hrs	NFA 49-71 I	%	Δ Elongation at Break ≤ 25
Cathodic Disbondment @ 48 hours / 65 ± 2 °C / -1.5V / NaCl (3%)	NFA 49-71 I	mm	≤ 3
Cathodic Disbondment @ 28 days / 23 ± 3 °C / -1.5V / NaCl (3%)	NFA 49-71 I	mm	≤ 5
Cathodic Disbonding @ 28 days / max. operating temp. / -1.5V / NaCl (3%)	NFA 49-71 I	mm	≤ 12
Coating Resistivity Exposed @ 23 ± 2 °C for 100 days	DIN 30678	Ωm ²	≥ 10 ⁸
Abrasion (CS 17 Wheel / 1,000 cycles)	ASTM D 4060-95	mg	≤ 25