HDPE and PP pipe material comparison for internal PT Ducts

General Informations

We hereby want to provide a comparison of HDPE and PP raw material properties related to the use for corrosion protection ducts in internal PT applications.

HDPE (high density polyethylen) and PP (polypropylen) are both polyolefin polymer materials.
Basic properties as yield stress, impact strength at standard temperatures, form stability, chemical resistance and thermal expansion coefficients are more or less identical.

Advantages of HDPE

Perfect flexibility, perfect impact strength at low temperatures, perfect handling and weldability properties in a wide temperature range.

Advantages of PP

Higher Shore Hardness, better heat resistance, better wear resistance.

Price Comparison

PP is more expansive than HDPE

HDPE versus PP Pipe Material Data Comparison

Relevant Material Data for internal PT plastic ducts

			HDPE	PP
	Norm	**Unit**	**Values**	**Values**
Density	ASTM D 1505		0,95 +/- 0,01	0,90 +/- 0,01
Elongation at yield stress	ASTM D 638	%	>8	>10
Elongation at break	**ASTM D 638**	**%**	**>800**	**>120**
Flexural Modulus	ASTM D 790	MPA	800-950	900-1100
Ball indentation hardness	ISO 2039	N/mm2	44 +/-4	45 +/- 2
Shore hardness	**ASTM D 2240**	**868 3 sec**	**60-61**	**65-67**
Tensile Strength at yield	ASTM D 790	MPA	21-22	23-24
Impact Strength	ISO 179 23°C	KJ/m2	no fracture	no fracture
Impact Strength	**ISO 179 - 30°C**	**KJ/m2**	**no fracture**	**55**
Notched Impact Strength	**ISO 179 23°C**	**KJ/m2**	**24**	**31**
Notched Impact Strength	**ISO 179 - 30°C**	**KJ/m2**	**8**	**2**
Heat Resistance	**ISO 75 A**	**°C**	**42**	**75**
ESC	ASTM D 1693	h	> 1500	>192

Pipe handling and installation properties

			HDPE	PP
Min bending radius		**0°C**	50 x da	75 x da
		10°C	35 x da	50 x da
		20°C	20 x da	30 x da
Transport/Handling		**0°C**	**perfect**	**sensitive**
		20°C	perfect	perfect
Weldability		**0°C**	**sensitive**	**not possible**
		20°C	perfect	good

Pipe properties

			HDPE	PP
Wear Resistance		***1**	**less than PP**	**better than HDPE**
Flexural Behaviour		*1	better than PP	less than HDPE
Duct Flexibility		*1	better than PP	less than HDPE
Lateral Load Resistance		*1	better than PP	less than HDPE
Longitudinal Load Resistance		*1	better than PP	less than HDPE
Bond Behaviour			depending on pipe design only	
Friction Parameter			both materials identical	
Corrosion Protection			both materials identical	
Leak Tighness			both materials identical	
Electrical Resistance			both materials identical	

Bolt properties have most important differences
***1 compared on same pipe design**