

## **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**

|                                | Norm                      | Unit             | HDPE<br>Values     | PP<br>Values   |
|--------------------------------|---------------------------|------------------|--------------------|----------------|
| Density                        | ASTM D 1505               |                  | 0,95 +/- 0,01      | 0,90 +/- 0,01  |
| Elongation at yield stress     | ASTM D 638                | %                | >8                 | >10            |
| <b>Elongation at break</b>     | <b>ASTM D 638</b>         | %                | <b>&gt;800</b>     | <b>&gt;120</b> |
| Flexural Modulus               | ASTM D 790                | MPA              | 800-950            | 900-1100       |
| Ball indentation hardness      | ISO 2039                  | N/mm2            | 44 +/-4            | 45 +/- 2       |
| <b>Shore hardness</b>          | <b>ASTM D 2240</b>        | <b>868 3 sec</b> | <b>60-61</b>       | <b>65-67</b>   |
| Tensile Strength at yield      | ASTM D 790                | MPA              | 21-22              | 23-24          |
| Impact Strength                | ISO 179<br>23°C           | KJ/m2            | no fracture        | no fracture    |
| <b>Impact Strength</b>         | <b>ISO 179 -<br/>30°C</b> | <b>KJ/m2</b>     | <b>no fracture</b> | <b>55</b>      |
| <b>Notched Impact Strength</b> | <b>ISO 179<br/>23°C</b>   | <b>KJ/m2</b>     | <b>24</b>          | <b>31</b>      |
| <b>Notched Impact Strength</b> | <b>ISO 179 -<br/>30°C</b> | <b>KJ/m2</b>     | <b>8</b>           | <b>2</b>       |
| <b>Heat Resistance</b>         | <b>ISO 75 A</b>           | <b>°C</b>        | <b>42</b>          | <b>75</b>      |
| 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             |
| <b>Transport/Handling</b> |  | <b>0°C</b> | <b>perfect</b>   | <b>sensitive</b>    |
|                           |  | 20°C       | perfect          | perfect             |
| <b>Weldability</b>        |  | <b>0°C</b> | <b>sensitive</b> | <b>not possible</b> |
|                           |  | 20°C       | perfect          | good                |

**Pipe properties**

|                              |  |           | HDPE                          | PP                      |
|------------------------------|--|-----------|-------------------------------|-------------------------|
| <b>Wear Resistance</b>       |  | <b>*1</b> | <b>less than PP</b>           | <b>better than HDPE</b> |
| 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      |                         |

**\*1 Most important property differences of both materials compared on same pipe design**