

SOLUTION DATA SHEET

# Aliphatic TPU for automotive, electronics, and sports and recreation applications



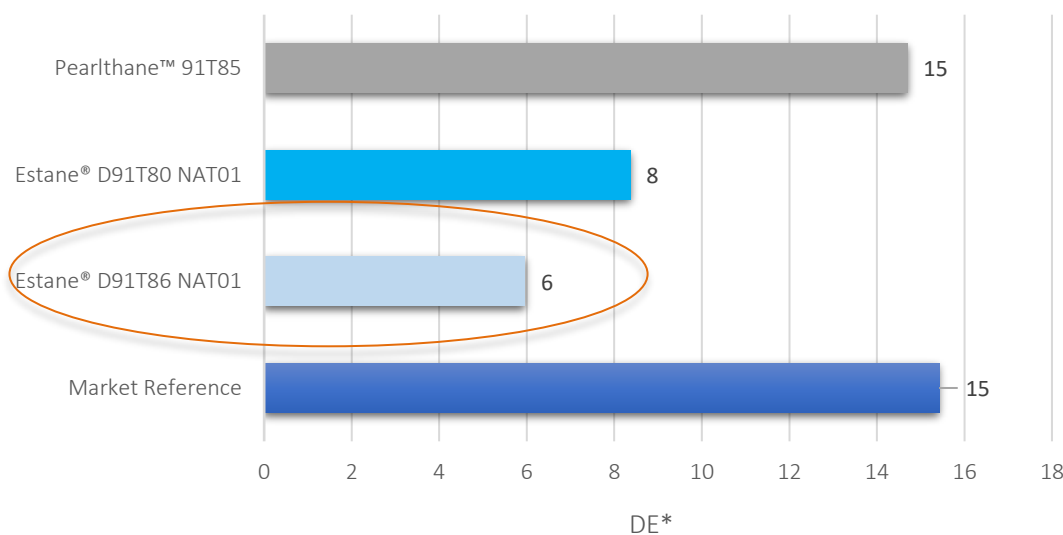
|                     |   |
|---------------------|---|
| <b>Markets</b>      | Transportation, industrial, electronics, compounding, sports and recreation   |
| <b>Polymer</b>      | Estane® and Pearlthane™ aliphatic thermoplastic polyurethane (TPU)  |
| <b>Key Benefits</b> | <ul style="list-style-type: none"> <li>• Less yellowing, even in clear and transparent parts</li> <li>• Improved processing performance</li> <li>• Superior chemical and hydrolysis resistance</li> </ul> |

For a high-class aesthetic finish, whether moulding or extruding light and/or dark coloured parts, manufacturers, designers and OEMs can rely on Lubrizol Engineered Polymers' aliphatic TPUs for improved staining resistance and strong colour stability upon UV exposure. Latest developments have focused on the improvement of the TPU structure and formulation to offer an aliphatic TPU solution with better thermal stability, chemical and hydrolysis resistance.

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**Estane D91T86** is the most recent aliphatic TPU grade, with a 90 Shore A hardness. It resulted from the work developed by R&D to improve the mechanical properties, elastic behavior and rebound performance of other TPU grades in the Pearlthane™ and Estane aliphatic product portfolio. The key objective was to enhance the aesthetic design of molded parts. Like other aliphatic TPU from Lubrizol, this grade has a long-term performance that ensures a superior chemical, hydrolysis and blooming resistance, while being a cost-effective manufacturing solution that includes fast cycling, high flow, and low-density properties.

In the staining test performed as per figure no. 1 below, **Estane D91T86 NAT01** showed an improved staining resistance after 3 hours, versus other grades from the same product range and a competitive material, as illustrated below:



**Figure 1:** Test of staining resistance after 3 hours (Immersion in vinegar at 65°C)

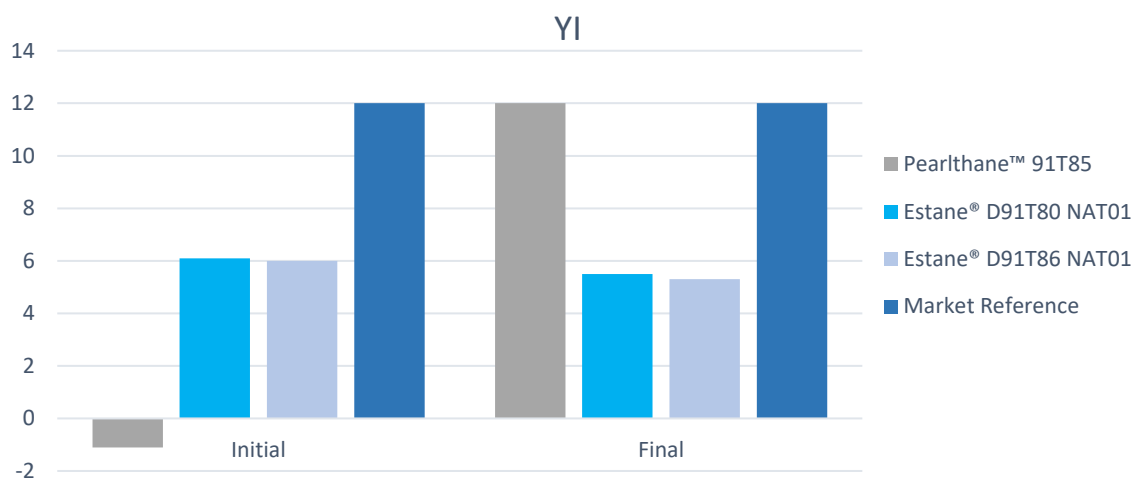
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Weatherability is an important feature for the selection of a material that will be used in outdoor applications. Main weathering forces that may cause degradation are sunlight, high temperature and moisture. The QUV accelerated tester exposes materials to alternating cycles of UV light and moisture at controlled, elevated temperatures. It simulates the effects of natural sunlight and artificial irradiance using fluorescent UV lamps to provide a radiation spectrum centred in the ultraviolet wavelengths. Both Estane D91T86 NAT01 and Estane D91T80 NAT01 achieved better results than the market reference in the test using the QUV weatherability test that can be seen below:

| Yellowness Index of Aliphatic TPU grades |                   |       |                      |       |                      |       |                  |       |
|--|-------------------|-------|----------------------|-------|----------------------|-------|------------------|-------|
|  | Pearlthane™ 91T85 |       | Estane® D91T80 NAT01 |       | Estane® D91T86 NAT01 |       | Market Reference |       |
|  | Initial           | Final | Initial              | Final | Initial              | Final | Initial          | Final |
| YI                                       | -1.1              | 12    | 6.1                  | 5.5   | 6.0                  | 5.3   | 12               | 12    |
| DE                                       | 7.3               |       | 0.5                  |       | 0.5                  |       | 0.5              |       |

Table 1: Yellowness Index of Aliphatic TPU grades under QUV weatherability test ASTM G154-06, ISO 105-A02 (72 hours, 6 cycles of 8 h. UV at 60°C, 0,89 W/m<sup>2</sup>\*nm and 4 h. condensation at 50°C)

Figure 2: QUV weatherability test



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### Summary of benefits obtained by using aliphatic TPU:

1. **Long-term performance:**
  - Superior abrasion/scratch resistance
  - High tear resistance and rebound resilience
2. **High-class finish aesthetics:**
  - Non-yellowing
  - Strong colour stability upon UV exposure
  - Adequate for both light and dark colours
  - Unique staining resistance
3. **Cost-effective manufacturing solution:**
  - Fast cycling
  - High Flow
  - Low density
  - Lower rejects



For more information, please visit our web: [www.lubrizol.com/Engineered-Polymers](http://www.lubrizol.com/Engineered-Polymers)

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