GRAFTALEN™ SA EFFECTIVENESS AS POLYETHYLENE FLOW ENHANCER

This report is a guideline for effectiveness, dosation and processing of polyethylene (PE) and GRAFTALEN™ SA compounds, with the goal of decreasing viscosity (increasing melt flow index).

MATERIALS USED

Base PE: Resinex RWP 1304 Natural LLDPE  
Base MFI: 2,3 g/10 min

Flow Enhancer: GRAFTALEN™ SA

TESTS PERFORMED

To determine the effectiveness of our flow enhancer, we measured the melt flow index (MFI) of base PE with different amounts of flow enhancer added.

We added 3% and 5% of GRAFTALEN™ SA.

Mixtures were extruded on a laboratory scale extruder.

MFI of mixtures was measured at 190°C, 2,16 kg, in accordance with ISO 1133.
RESULTS

<table>
<thead>
<tr>
<th>GRAFTALEN™ SA Added [wt. %]</th>
<th>MFI [g/10 min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.3</td>
</tr>
<tr>
<td>3</td>
<td>4.0</td>
</tr>
<tr>
<td>5</td>
<td>5.6</td>
</tr>
</tbody>
</table>

The MFI increases with added GRAFTALEN™ SA, even at low amounts.

MFI increases in a polynomial fashion, according to:

\[ MFI = A \cdot x^2 + B \cdot x + MFI_{start} \]

- \( MFI \) = Melt flow index of mixture
- \( A, B \) = Constants, depending on the extrusion parameters
- \( x \) = Percentage of GRAFTALEN™ SA added
- \( MFI_{start} \) = MFI of base PE

The effectiveness of GRAFTALEN™ SA is increased by using the proper temperature profile:

<table>
<thead>
<tr>
<th>Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>Die</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp. [°C]</td>
<td>60</td>
<td>130</td>
<td>200</td>
<td>220</td>
<td>220</td>
<td>220</td>
<td>350</td>
<td>350</td>
<td>350</td>
<td>220</td>
<td>220</td>
<td>200</td>
<td>180</td>
<td>180</td>
</tr>
</tbody>
</table>
Material Report

The temperatures are much higher than usual, to ensure proper mixing and activation of GRAFTALEN™ SA.

CONCLUSIONS

- GRAFTALEN™ SA successfully increased the MFI of high viscosity PE by more than double with just 5% additive,
- MFI increases more with more GRAFTALEN™ SA added, and as such its effect is increased at higher dosation levels.
Material Report

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