Polymer Processing Aids

A little something to give you big ideas!
The Arkema fluorinated processing aids: Kynar Flex® PPA

The Kynar Flex® PPA resins offer a range of fluorinated processing aids which have the ability to improve in many ways the manufacturing of:

- Film products (blown, cast)
- Extrusion blow moulding
- Pipes and tubing (PEX, HDPE, ...)
- Extruded fibres
- Wire and cables

Final Product benefits

The Kynar Flex® PPA resins bring the following benefits

- Elimination of Melt fracture (shark skin)
- Improvement of film transparency
- Improvement of smoothness and surface aspect
- Improvement of product appearance
- Improvement of mechanical properties
- Reduction of gels.

Processing benefits

The Kynar Flex® PPA resins are specially designed to enhance the efficiency of operating conditions:

- Maintenance time reduction
- Reduction of die build-up
- Consistency of production
- Smoother extrusion conditions
- Lower energy consumption
- Reduction of cycle times and quicker transition
- Reduction of potential negative interaction with other film additives such as antiblock and Hals.

The Kynar Flex® PPA resins are mainly used as additives at 200-1000 ppm levels to overcome the processing problems encountered with polyolefins.

For such low level of content, it is highly recommended to use PPA in the form of a masterbatch for an accurate and a uniform dosing.

Most Kynar Flex® PPA resins are safe for applications involving contact with food articles and meet US FDA and European food contact regulation.
**Kynar Flex® PPA reduces the extrusion pressure and optimises the process efficiency**

**How to use Kynar Flex® PPA**

The two main requirements to get the best out of Kynar Flex® PPA products are:
- a good dispersion;
- a uniform dosing at the typical low concentration level needed with Kynar Flex® PPA.

For a converter, this is achieved by using:
- either a resin that already contains Kynar Flex® PPA;
  [many resin producers propose polyolefin grades which contain Kynar Flex® PPA with appropriate and uniform dosage and good dispersion];
- or a masterbatch:
  - containing typically from 2% to 5% of Kynar Flex® PPA;
  - which can be diluted into their standard resin;
  [many masterbatch manufacturers propose PPA masterbatches based on Kynar Flex® PPA].

**Technical and sales support for Kynar Flex® PPA**

From process improvements to product visuals, Arkema has dedicated equipment and field personnel able to bring technical assistance to achieve complete solutions to challenging issues.
Today neither poor appearance nor reduced output is acceptable when extruding polyolefins but both problems can be easily solved. By eliminating the surface defects and allowing a higher operating output, Kynar® PPA improves both the quality and profitability of the extrusion process.

Kynar® PPA eliminates melt-fracture also called shark-skin (LLPE blown film).

Kynar® PPA improves the surface appearance and the smoothness.
Typical results of **Kynar additive** (@450 ppm) in linear low density polyethylene blown film extrusion

![Graph showing Reduced Pressure vs Melt Temperature]

### Higher Output, Reduced Power

<table>
<thead>
<tr>
<th></th>
<th>Melt Temp (°C)</th>
<th>Screw Speed (RPM)</th>
<th>Output (lbs/hr)</th>
<th>Required Power (Amps-% of Max)</th>
<th>Extruder Head Pressure (PSI)</th>
<th>Film Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LLDPE</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>(control)</td>
<td>196</td>
<td>34</td>
<td>66(a)</td>
<td>17</td>
<td>5,400</td>
<td>Clear no melt fracture</td>
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<tr>
<td>No Additive</td>
<td></td>
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<tr>
<td><strong>LLDPE</strong></td>
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<tr>
<td>(control)</td>
<td>200</td>
<td>80</td>
<td>150</td>
<td>22</td>
<td>5,500</td>
<td>Continuous melt fracture</td>
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<td>No Additive</td>
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<tr>
<td><strong>LLDPE</strong></td>
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<tr>
<td>with 450 ppm</td>
<td>200</td>
<td>80</td>
<td>155(b)</td>
<td>18</td>
<td>4,300</td>
<td>Clear no melt fracture</td>
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<tr>
<td><strong>Kynar® Additive</strong></td>
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<tr>
<td>with 450 ppm</td>
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<td>102(c)</td>
<td>204</td>
<td>22</td>
<td>5,000</td>
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</tbody>
</table>

(a) Onset of melt fracture observed above this output level.
(b) No attempt was made to increase output.
(c) Maximum screw speed on available equipment.
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