Milliken®
DeltaMax™
Performance Modifiers for Polypropylene
**DELTAMAX™**

**Performance Modifiers for Polypropylene**

DeltaMax™ Performance Modifiers are a family of masterbatch products designed for use in injection molded applications of virgin polypropylene impact copolymers and recycled polypropylene resins. While polypropylene is a cost-effective material, it is limited with respect to providing a balance of high impact with stiffness and melt flow making it difficult to cost-effectively formulate, design, and process parts. This is particularly the case for recycled polypropylene resins, which typically lack high melt flow and impact properties required for many injection molded applications within consumer, industrial, and automotive markets.

DeltaMax Performance Modifiers maximize the physical properties and processability of polypropylene in a way that transforms the virgin and recycled PP markets. The technology enables converters to enhance the impact and melt flow of their ICP or rPP resins by adding a masterbatch at injection molding machine-side. The net effect is the ability to design parts with higher impact and thinner profiles, run machines with faster cycle times or lower temperatures, reduce the use of costly impact modifiers, and reduce inventory of multiple ICP resins. Additionally, DeltaMax Performance Modifiers allow for the use of recycled PP at equal or better performance levels compared to virgin resins. This creates an opportunity to improve the circular economy and promotes more sustainable manufacturing practices.
## HOW IT WORKS

<table>
<thead>
<tr>
<th>BASE RESIN</th>
<th>DELTAMAX MECHANISM</th>
<th>NET EFFECT</th>
<th>RESULTING VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Med-High Impact ICP</td>
<td>Branching of rubber and PP</td>
<td>Smaller, more evenly distributed rubber domains improve impact properties.</td>
<td>Higher impact, better flowing resin that is easier to process.</td>
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<tr>
<td>Low Impact ICP</td>
<td>Branching of rubber and PP</td>
<td>With little rubber available, DeltaMax modifies flow properties more than impact.</td>
<td>Higher flowing resin that reduces production costs without sacrificing impact.</td>
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**DELTMAX PERFORMANCE MODIFIERS**
DeltaMax™ i300 Impact Enhancer

DeltaMax™ i300 is a high performance impact enhancer designed for use in injection molded applications of polypropylene impact copolymers and recycled polypropylene resins. DeltaMax i300 maximizes impact performance while optimizing melt flow rate (MFR) for improved physical properties and processability of polypropylene.

DeltaMax™ a200 All Purpose Modifier

DeltaMax™ a200 is a high performance impact and melt flow modifier designed for use in injection molded applications of polypropylene impact copolymers and recycled polypropylene resins. DeltaMax a200 provides a strong balance of impact, stiffness, and melt flow rate (MFR) to maximize the physical properties and processability of polypropylene.

DeltaMax™ m100 Melt Flow Modifier

DeltaMax™ m100 is a high performance melt flow modifier designed for use in injection molded applications of polypropylene impact copolymers and recycled polypropylene resins. DeltaMax m100 increases the melt flow rate (MFR) while providing equal or better impact performance to maximize the physical properties and processability of polypropylene.
CASE STUDIES

Maximize Impact Properties
An industrial bucket and pail manufacturer is attempting to formulate a high impact, non break solution for a leading retailer.

- IMPACT FROM 13 TO 43
- 3X IMPROVEMENT IN IMPACT
- MFR FROM 17-30
- IMPROVEMENT IN MFR
- STIFFNESS FROM 830-800
- MINIMAL CHANGE IN STIFFNESS

Maximize Melt Flow Properties
A housewares manufacturer must reduce production costs by optimizing operating efficiencies and increasing processing speeds.

- DECREASED MOLDING TEMPERATURE 6% FROM 425°F TO 400°F
- IMPROVED COST SAVINGS/PROFIT IMPROVEMENT $190/T
- CYCLE TIME REDUCTION 11%

Maximized Sustainability
Based on a new sustainability initiative, a leading housewares manufacturer has been tasked with increasing the amount of recycled plastics being used without sacrificing physical properties.

- IMPACT FROM 75 TO 91
- 20% IMPROVEMENT IN IMPACT
- MFR FROM 11-26
- IMPROVEMENT IN MFR
- STIFFNESS FROM 1176-1090
- MINIMAL CHANGE IN STIFFNESS

- 2.5X IMPROVEMENT IN MFR
- 100% RECYCLED PP and landfill waste reduction
- 7% reduction in CO2 emissions
- 11% CYCLE TIME REDUCTION
- $190/T IMPROVED COST SAVINGS/PROFIT IMPROVEMENT
- 6% DECREASED MOLDING TEMPERATURE FROM 425°F TO 400°F

DEL TAMAX PERFORMANCE MODIFIERS
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