

## Polybutene-1 in Polyolefin Applications

Tim Schloemer

Business Development Manager

Polybutene-1 – The Americas



# PB-1 Unique Properties

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- Polybutene-1 is a Polyolefin like PE and PP, PB-1 is not PIB
- High Miscibility and Compatibility in PP
  - Allows for increased flexibility and impact of PP as well as lower SIT
- Low Miscibility and Compatibility in PE, but Easily Dispersible
  - PB-1 incompatibility with PE realized in peelable sealants
- Unique Solid-State Re-Crystallization
  - Allows for long open and workable times in Hot Melt Adhesives
- Shear Thinning Rheology with Easy Processability
  - PB-1 can be used to viscosity modify PP to increase MFR without visbreaking
  - PB-1 helps to wet and stabilise filler particles, preventing re-agglomeration
    - Amorphous content of PB-1 Koattro grades >50% allows for high filler loadings
- Low Melting Temperature and Heat of Fusion
  - PB-1 tends to melt first in extruder to allow plenty of time for homogenization
  - Allows for very low setting-temperatures and potential to compound heat and shear sensitive additives
- Excellent Creep, Stress Crack, Chemical, and Wet Abrasion Resistance
- Thermal Expansion and Conductivity lower than PP and PE



# PB-1 Compounding Benefits

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- Polybutene-1 (high MFR grade PB0801M) used as part of the carrier in the pigment masterbatch, significantly **reduces the presence of pigment agglomerates**
- PB0801M as carrier resin for a TiO<sub>2</sub>-MB provides the **highest color yield** with the **lowest agglomerates**
- Best **pigment dispersion** of organic red when using a masterbatch with PB-1 as carrier resin
- PB-1 as a **migration promoter** of additives
  - PB-1 is more apolar compared to PP or PE
  - PB-1 accelerates the migration of fluorochemical surface-modifying additives to the surface of PP fibers
- PB-1 improves the **flowability** of low MFR polymers, so that the necessity to visbreak (or crack) can be avoided and mechanical properties are maintained
- PB-1 can be used as a **property modifier** in PP (Increase flexibility, Lower SIT, etc.)
- Good retention of optical properties in BOPP using copolymers
  - no negative effect on clarity and haze by using up to 30 w% PB-1
- Dramatic **creep resistance improvement** of blown-PE film modified with polybutene-1
- Very limited influence of fillers on flow behavior of PB-1
- PB-1 can be used as an **ESCR improver** as it does not show any failures after 15,000 hours immersion in 10% Igepal C0630 solution at 50° C (ASTM D1693)

# PB-1 Markets and Applications

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- Peelable Sealants for Easy Open Packaging
  - Meat and Cheese Flexible Packaging
- Extrusion Blow Molding
  - Hot Water Heater Liners
- Hot Melt Adhesives
- Compounding and Masterbatches
- Fibers
- Low Seal Initiation Temperature Sealants
  - BOPP Film
- Purging Compounds
- Piping Systems
  - Plumbing
  - Underfloor Heating

# Main exploitable PB-1 attributes by LYB customers

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***...or what makes PB-1 different for our customers... :***

- Creep resistance.....pipes, pressure tanks, ...
- Env. Stress Crack Resistance.....powder coatings, boilers, ...
- Rheological behaviour..... compounds, MBs, fibers, ...
- Slow crystallization.....fibers, hot melt adhesives (HMA), ...
- Dispersability in PE.....easy opening packaging, ...
- Compatible in PP..... compounds, MBs, PP modification, ...
- Good molecular cohesion.....adhesives
- Wet abrasion resistance.....hoses, mining, TPV, ...
- Flexible without a rubber phase

# Toppyl & Koattro Polybutene-1 Modifiers

Product type	MFR*	Comonomer	Tm1 (*C)	Flexural Modulus (MPa)	Density (g/cm <sup>3</sup> )	Typical customer applications	PB-1 Type
<i>Toppyl</i> PB0110M	0.4	-	128	450	0.915	Easy-open Blown PE film, HDPE retortable blends, Extrusion Coating	Homo Polymer
<i>Koattro</i> PB0300M	4.0	-	128	450	0.915	Easy-open Cast PE film, HDPE retortable blends	
<i>Koattro</i> PB0801M	200	-	128	410	0.915	Compounding & Masterbatch	
<i>Toppyl</i> PB8640M	0.9	Low	114	250	0.906	Easy-open Blown PE film, Extrusion Coating, General use	Copolymer
<i>Toppyl</i> PB8340M	4.0	Low	114	270	0.906	Easy-open Cast PE film General use	
<i>Toppyl</i> PB8220M	3.0	Med	97	120	0.901	Low SIT for BOPP	
<i>Koattro</i> DP8310M	2.0	High	90	100	0.897	Film Modification (MAP, Breathable)	
<i>Koattro</i> DP8510M	40	High	90	65	0.895	MB Compounding, HMA Modification	
<i>Koattro</i> DP8911ME	200	High	90	60	0.895	Fiber, HMA Modification	
<i>Koattro</i> PBM1000M	1000	Med	100	340	0.908	Fiber, HMA Modification	

\* MFR measured at 190° C/2.16 kg

# For Additional Information Please Contact

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- Tim Schloemer

[Tim.Schloemer@lyb.com](mailto:Tim.Schloemer@lyb.com)

513-530-4012 (office)

513-368-5688 (cell)

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