

Silicone Solution Introduction

Silicone Masterbatch

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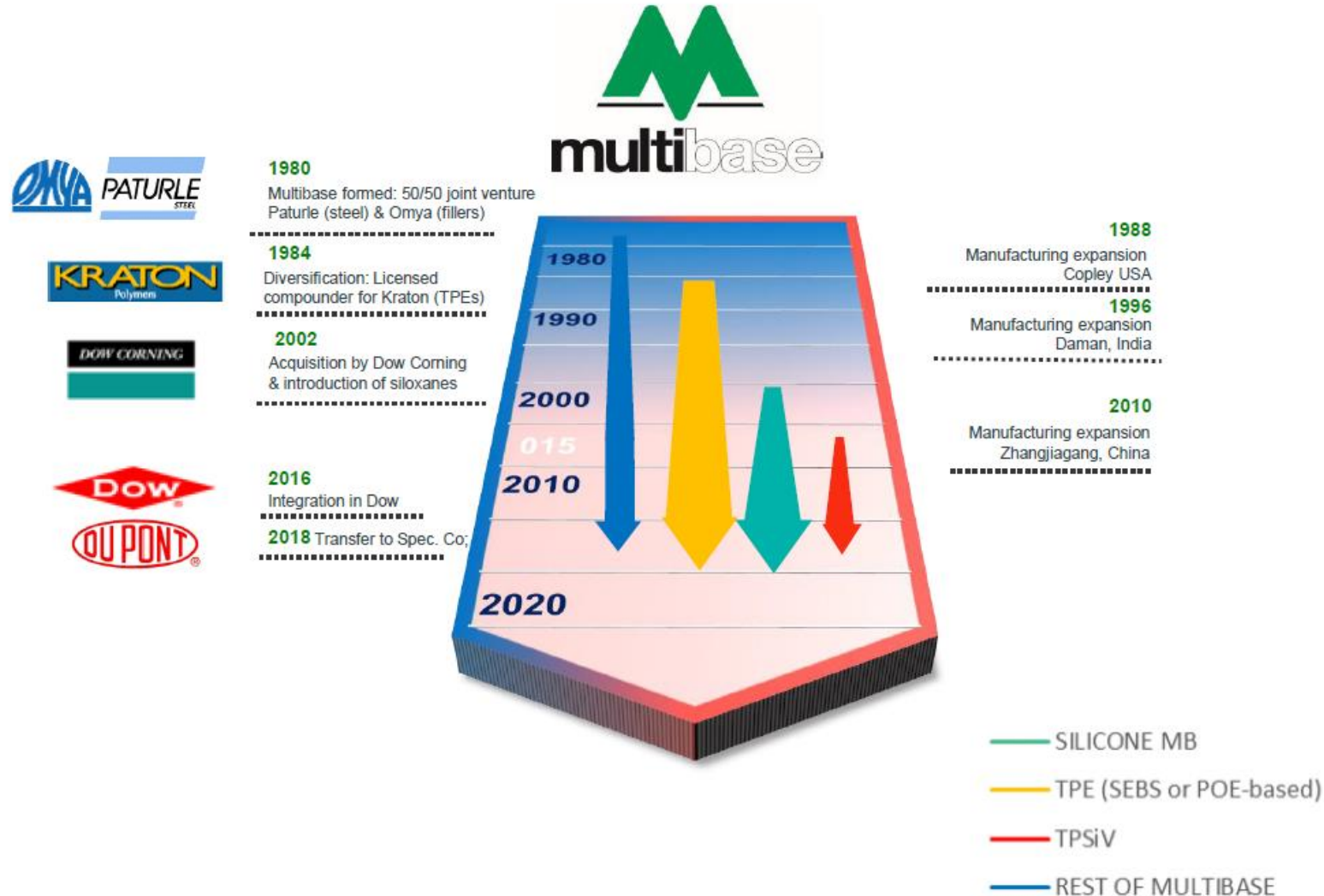
Agenda

- Introduction of Multibase
- SiMB

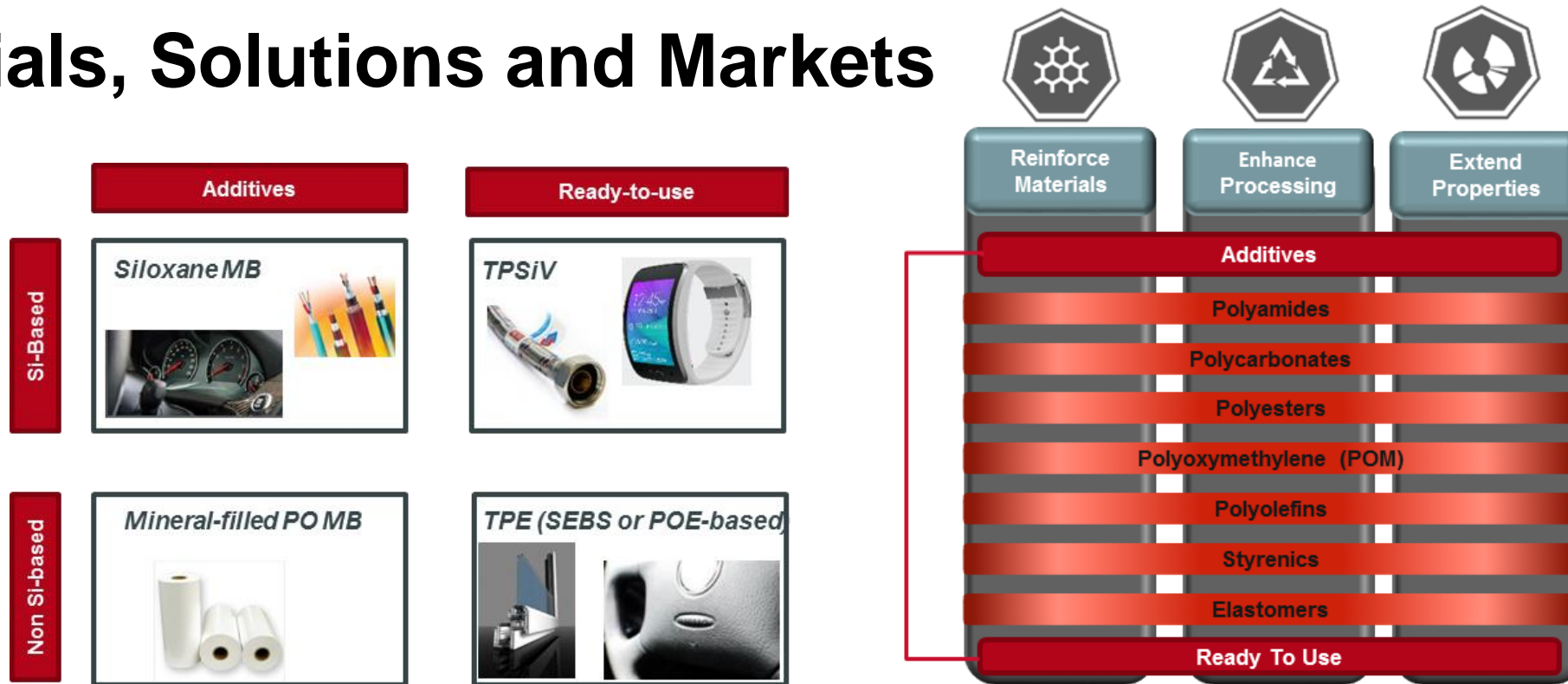
Multibase

Introduction and product line-up

Multibase innovation evolution through its owners



Materials, Solutions and Markets



| Transportation | Industrial | Consumer | Electrical/ Electronics | Medical |
|---|--|--|---|--|
| | | | | |
| Complementary products and value chain participation; more complete solutions for multi-material platforms. | Helping customers achieve higher manufacturing yields, productivity, quality and durability. | Enabling innovative and flexible designs that can be manufactured efficiently, safely and sustainably. | Helping deliver and distribute electrical power and electronic data efficiently, safely and reliably. | Delivering solutions that enhance drug delivery methods and pharma processing. |

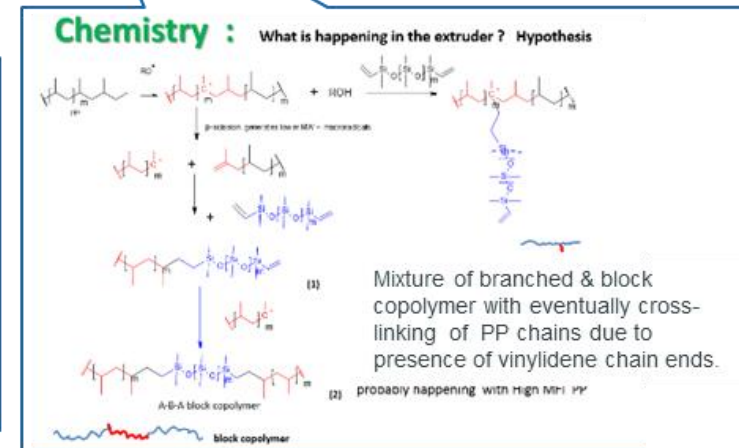
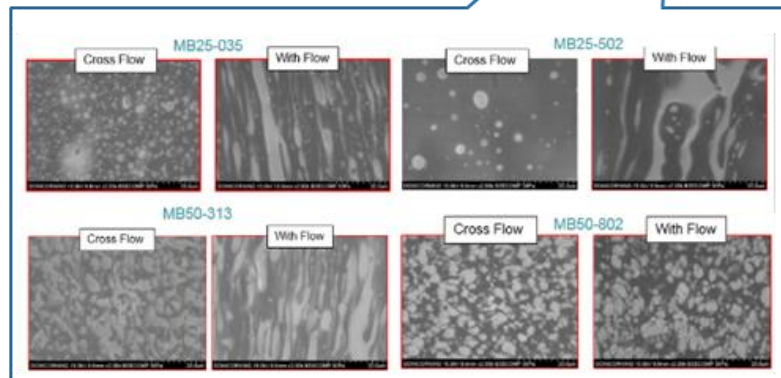
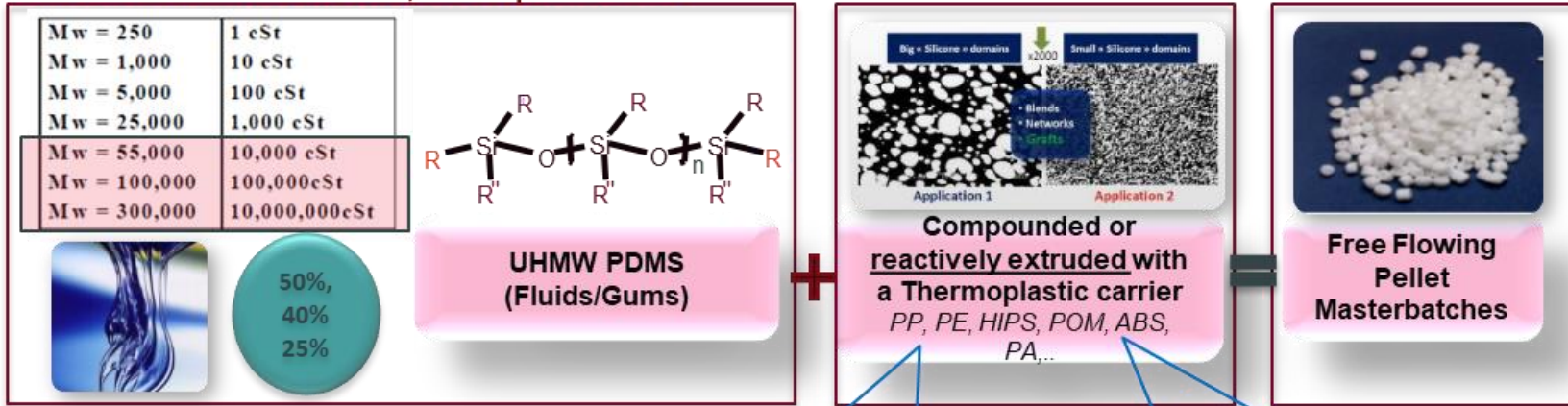


SiMB

Silicone Masterbatch

What are siloxane masterbatches (SiMB)?

SiMB = Masterbatch, composed of:



Our products improve materials in three ways

Our customers, and often their customers, can expect **multiple benefits** from our solutions, most often without **negative effect on physical properties.**



Dow Corning® brand additives help increase throughput and productivity, and they reduce torque, thereby improving your processing performance.

Die Droll or Plate-out Reduction • Extruder Throughput Increase • Film Production • Film Slip Improvement • Anti-blocking • Flowability • Mold Release • Higher Throughput • Torque Reduction • Power Consumption Reduction



Si Additives help you reinforce mechanical properties, such as filler polymer bonds, impact resistance and improve compatibility of formulations.

Compatibilizer • Dispersion Improvement (dispersion within the compound) • Grafting • Polymer Crosslinking • Hydrophobic Property • Impact Resistance • Impact Modifiers

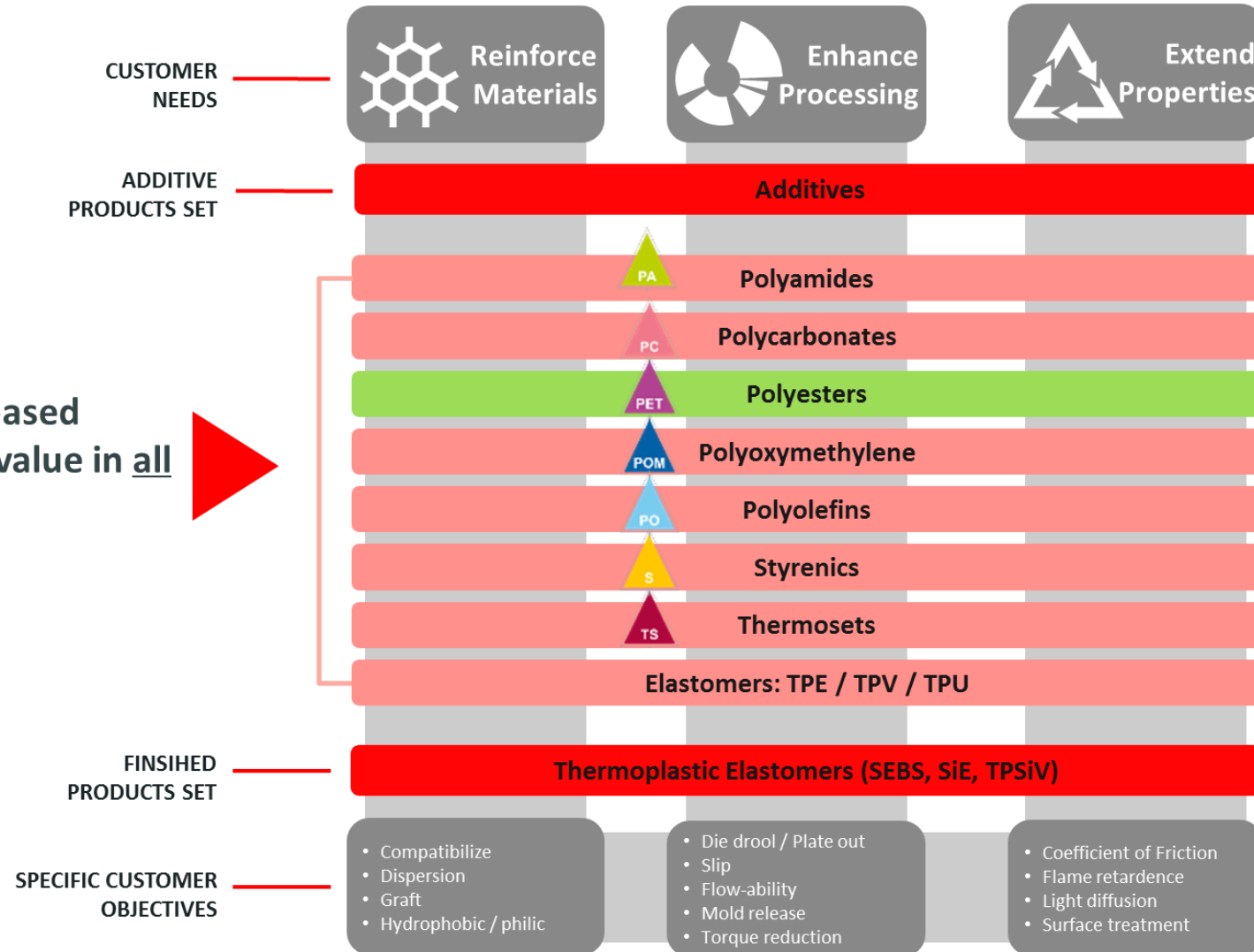


Extending surface quality, flame retardant performance and the consistency of light diffusion helps you create high-performing products.

Coefficient of Friction (increased slip) • Flame Retardancy • Light Diffusion • Surface Treatment (scratch, wear, mar) • Surface Look & Feel Quality

Our fit in polymer compounds

You will find our Si-based additives delivering value in all polymer families





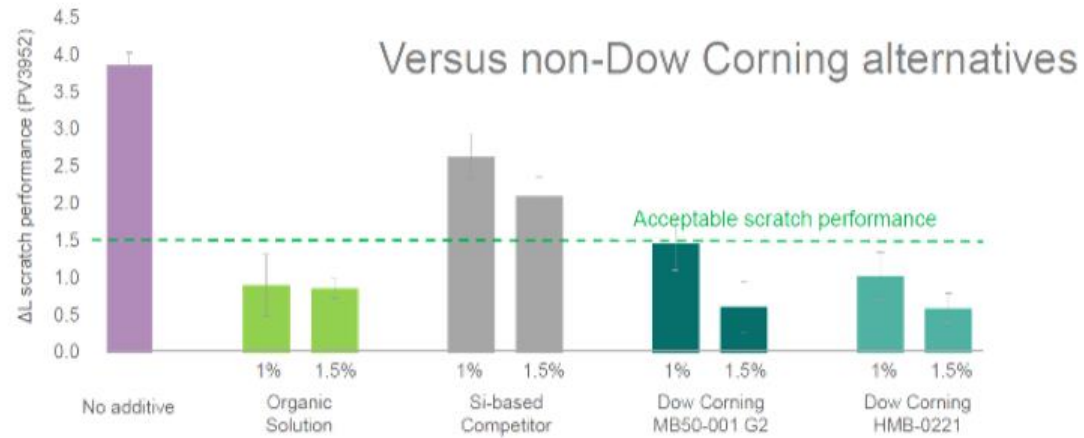
Extend Property

- Silicone Masterbatch for Anti scratch performance

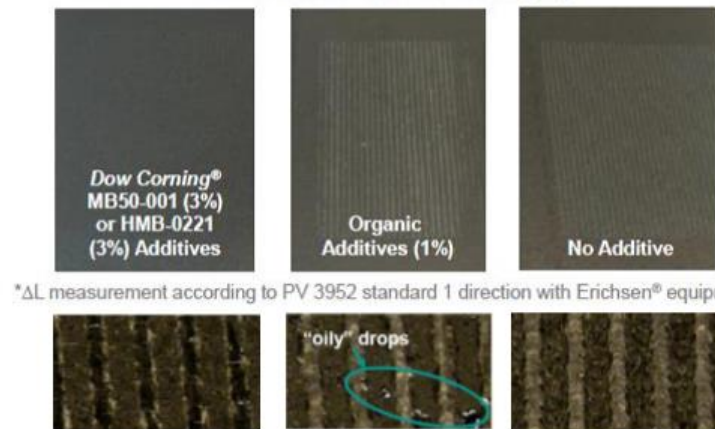
MB50-001

MB50-001 G2

HMB-0221



Scratch After 1500 Hours Aging





Relation between PDMS structure and surface properties

Siloxane MB

UHMW PDMS (Fluids/Gums)

Application 1 Application 2

Linear silicone polymer

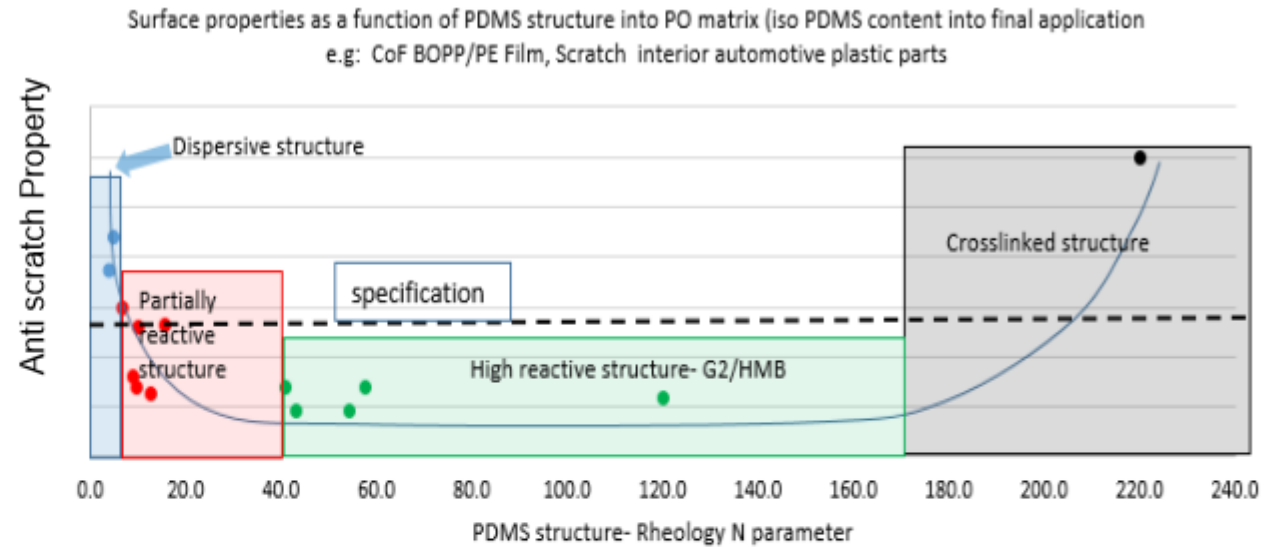
Organic TP resin

Pure blends Si-Polymer & HCR

Silicone polymers distributed in a thermoplastic resins (w/o reactions)

Reacted blends and "hyperbranched"

Reaction product of Silicone polymers and TP carrier



| | | | |
|----------|-------------|----------|----------------------|
| MB50-001 | MB50-001 G2 | HMB-0221 | <i>PP offerings</i> |
| MB40-006 | HMB-1103 | HMB-1903 | <i>POM offerings</i> |
| MB20-736 | | | |

SiMB efficiency is governed by PDMS structure created by compounding process and its chemistry.



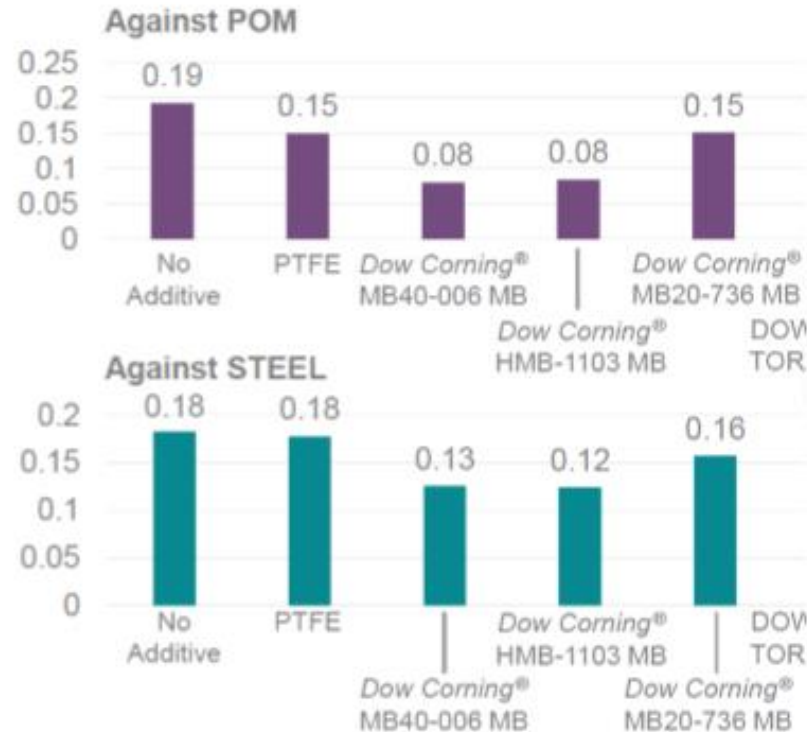
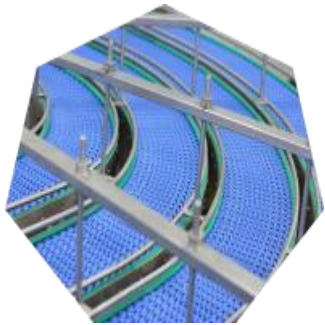
Extend Property

- POM Additives for low CoF, improved processing, noise reduction

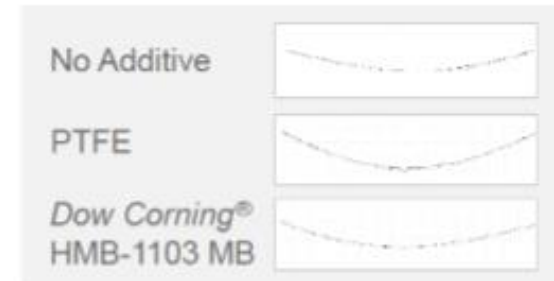
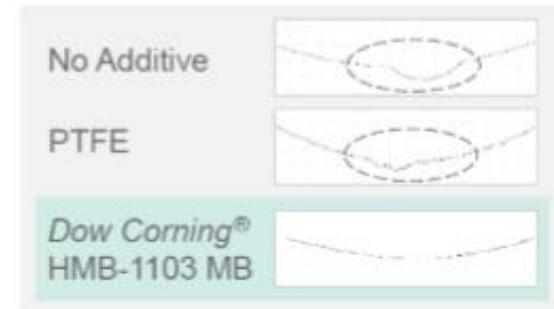
MB40-006

HMB-1103

MB20-736



*High Sliding Speed 4000 Cycles





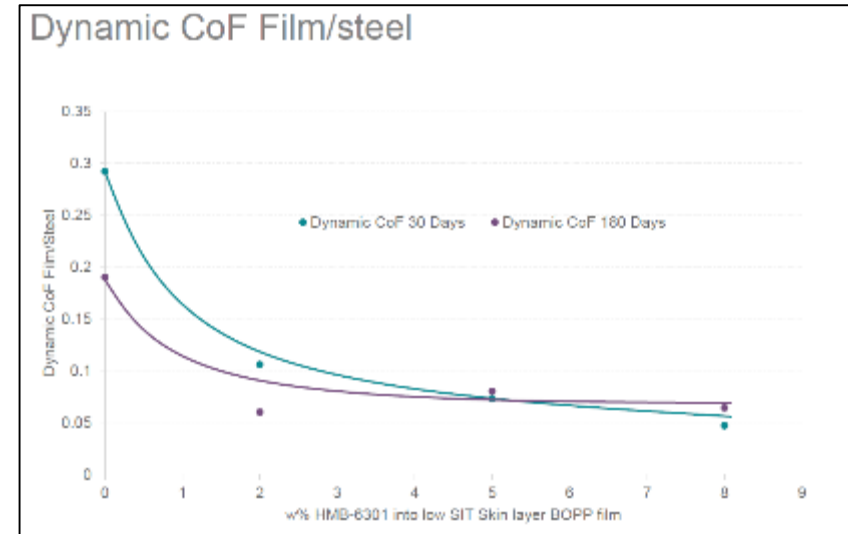
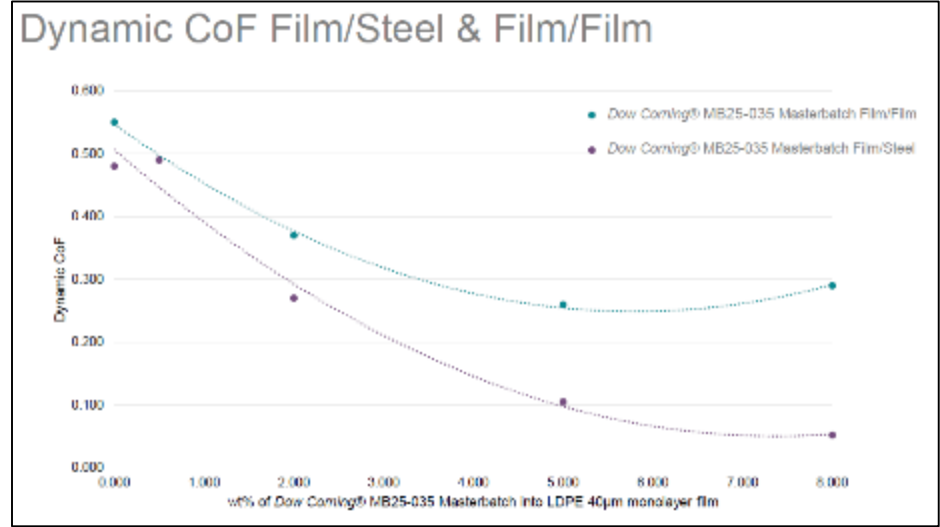
Extend Property

- Masterbatch additives for low CoF in film

MB25-035 – PE Film
FDA /GB Approved



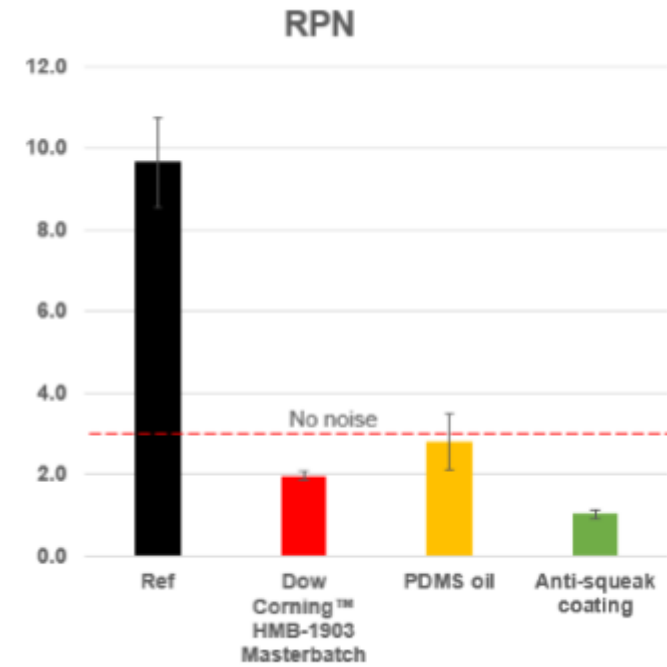
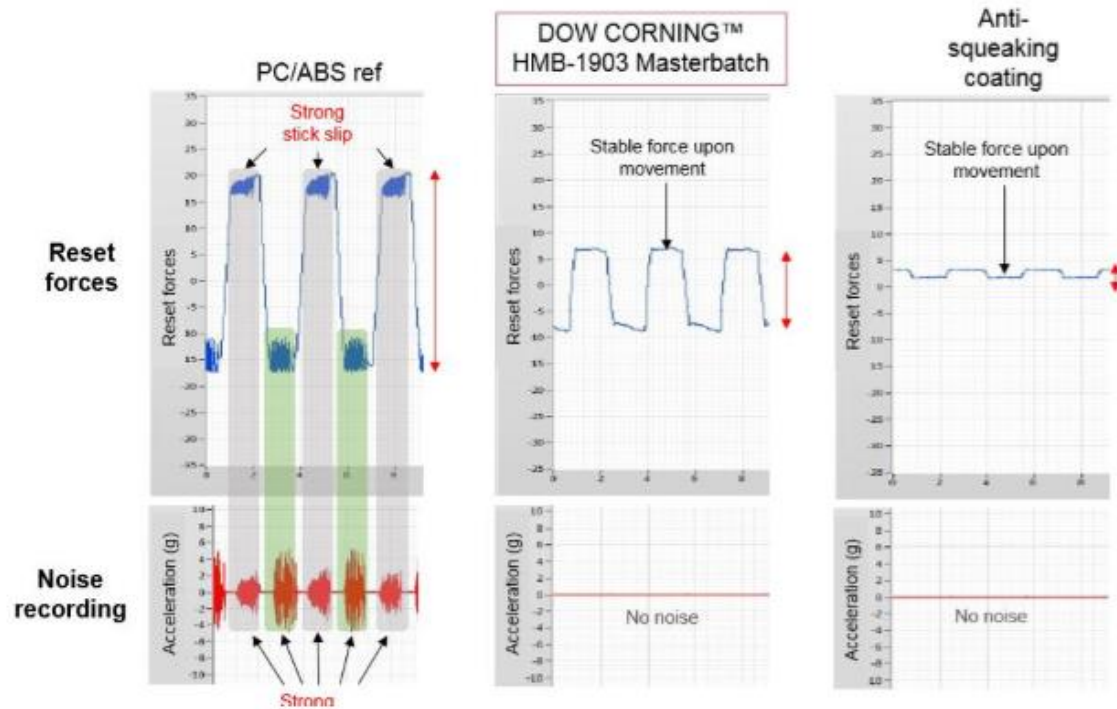
HMB-6301 – BOPP Film
FDA Approved



Extend Property

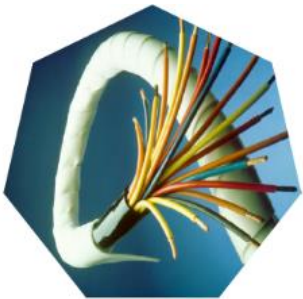
- SiMB for anti-squeaking performance

HMB-1903

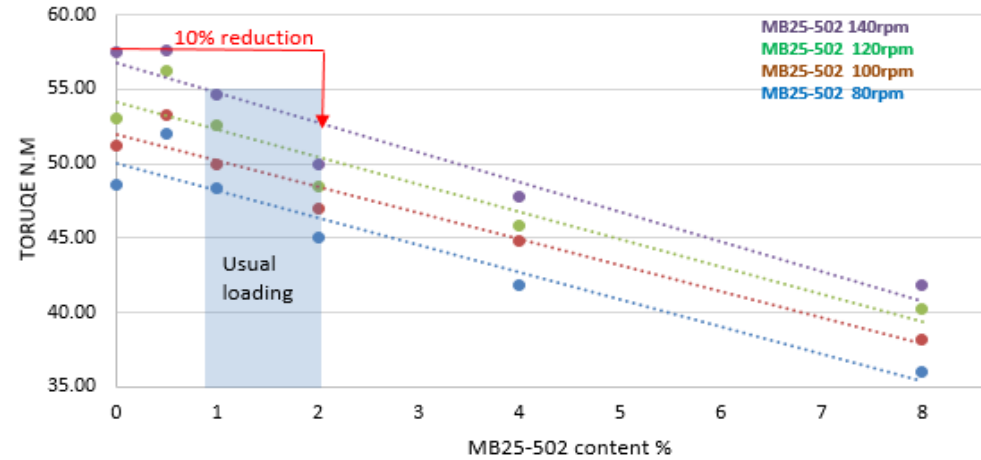


Enhance

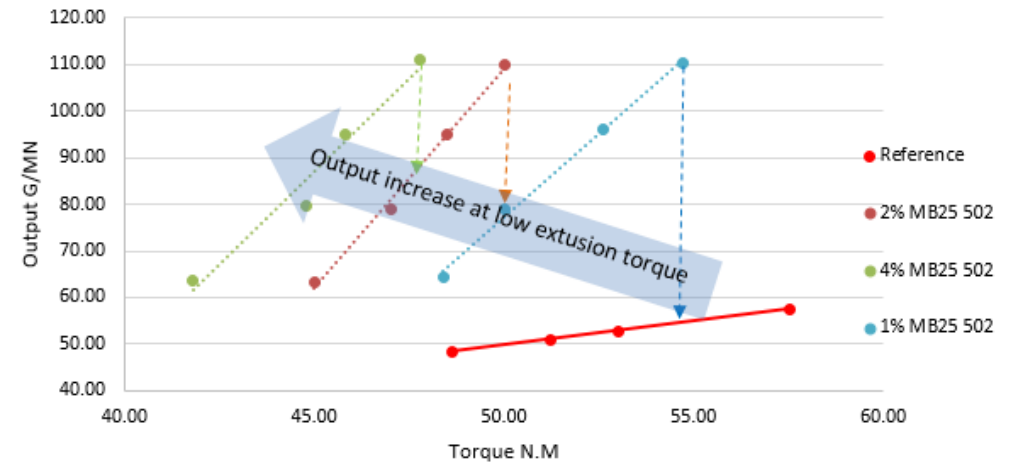
- Si Additives for low improved processing
 - MB50-011 (pellet)
 - MB25-511 (pellet)
 - MB50-002 (pellet)
 - MB25-502 (pellet)



Extrusion single swrew Torque LDPE mfi 0.2-55% CaCO3 at various rpm versus MB25-502 content



Output versus Torque (single screw extruder) when MB25-502 is added at varous amount into LDPE mfi0.2-55% CaCO3

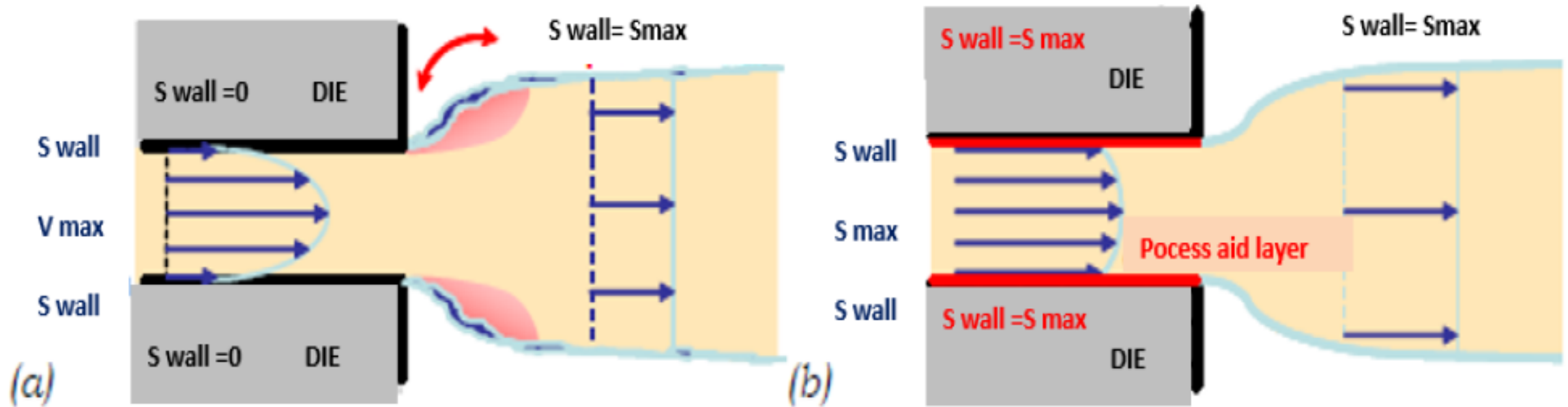


SiMB as processing aid agent



Processing aid effect on flow speed (S) of a melt phase extruded through a die: Shear and Flow speed gradient decrease

Melt instability and swelling/ melt relaxation



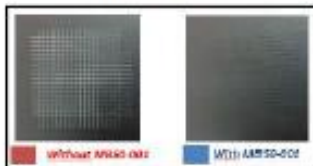
Claire Dubrocq-Baritaud Ingenieur SPCI ,thèse MECANISMES D'ACTION DE « POLYMER PROCESSING AIDS FLUORES DURANT L'EXTRUSION D'UN POLYETHYLENE BASSE DENSITE LINEAIRE : ETUDES EXPERIMENTALES ET INTERPRETATIONS; 17-12-2008, Ecole Nationale Supérieure des Mines de Paris

SiMB Main Applications

Scratch Improvement



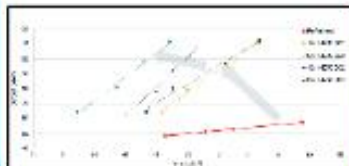
- ✓ Talc Filled TPO
- ✓ Auto Interior
- ✓ Injection Molded in color
- ✓ Reactively extruded additive is most efficient



Process Aid for W & C



- ✓ Highly-filled PE extrusion formulations
- ✓ Reduced torque
- ✓ Increased through put
- ✓ Reduced die build up



Slip Aid Optical Ducts



- ✓ Target very low CoF
- ✓ Allows improved installation
- ✓ Eliminates mess associated with external lubricants
- ✓ PE & PA wire & cable jacketing

| % SiMB | COF (Belcore test) |
|------------------|--------------------|
| Without additive | 0.2 |
| 4% MB50-002 | 0.08 |
| 5% MB50-002 | 0.05 |

Moving Parts



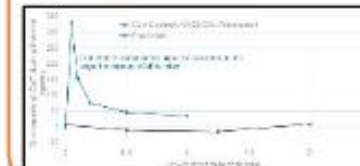
- ✓ Minimize friction on mating plastic parts
- ✓ Target very low CoF
- ✓ Lowers noise
- ✓ Maintains print and paint ability
- ✓ POM, GF PA






Film Slip Aid



- ✓ Non-migratory slip aid over time and temp
- ✓ Minimal impact to other properties
- ✓ Maintains printability and metallization
- ✓ PE blown film, BOPP



Silicone Masterbatch Grades

| Products* |  Extend |  Enhance |  Reinforce | Polymer Phase | Compatibility | Siloxane Concentration |
|--|--|---|---|---------------|---------------------------------|------------------------|
| Ultra-High Molecular Weight PDMS | | | | | | |
| MB50-001 | ■ | ■ | | PPH | PP, PE, TPO, TPE, TPV | 50 |
| MB50-001 G2 | ■ | ■ | | PPH | PP, PE, TPO, TPE, TPV | 50 |
| HMB-0221 | ■ | ■ | | PPH | PP, PE, TPO, TPE, TPV | Proprietary |
| MB50-002 | ■ | ■ | | LDPE | PA, PP, PE, TPO, TPE, TPV | 50 |
| MB50-004 | ■ | ■ | | HIPS | PS, HIPS, ABS, SAN | 50 |
| MB50-007 | ■ | ■ | | ABS | PS, HIPS, ABS, PC-ABS, SAN | 50 |
| MB50-008 | ■ | ■ | | SAN | PS, HIPS, ABS, PC-ABS, SAN, PVC | 50 |
| MB50-011 | ■ | ■ | | PA6 | PA | 50 |
| MB50-012 | ■ | ■ | | PET | Polyester | 50 |
| HMB-1103 | ■ | ■ | | EMA | POM, PA, PET, PBT, PP, PE, PVC | Proprietary |
| MB40-006 | ■ | ■ | | POM | POM | 40 |
| MB50-010 | ■ | ■ | | COPE | Polyester | 50 |
| MB50-017 | ■ | ■ | | TPU | TPU | 50 |
| Ultra-High Molecular Weight Functionalized PDMS | | | | | | |
| MB25-301 | ■ | ■ | ■ | PPH | PP, PE, TPO, TPE, TPV | 25 |
| MB50-321 | ■ | ■ | ■ | PPH | PP, PE, TPO, TPE, TPV | 50 |
| MB25-381 | ■ | ■ | ■ | Terpolymer | PP, PE, TPO, TPE, TPV | 25 |
| MB25-302 | ■ | ■ | ■ | LDPE | PP, PE, TPO, TPE, TPV | 25 |
| MB50-313 | ■ | ■ | ■ | LLDPE | PP, PE, TPO, TPE, TPV | 50 |
| MB50-314 | ■ | ■ | ■ | HDPE | PP, PE, TPO, TPE, TPV | 50 |
| MB50-320 | ■ | ■ | ■ | EVA | EVA, PVC | 50 |
| MB50-315 | ■ | ■ | ■ | PC | PC, PC-BLEND | 50 |



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