



2010 PLACE CONFERENCE

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April 18-21, 2010
Albuquerque Marriott
Albuquerque, New Mexico USA



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Vistamaxx™ Propylene-based Elastomers

New Opportunities for your existing Film and Extrusion
Coating Applications

Presented by:

David R. Weisinger

Global Film Technical Leader

ExxonMobil Chemical Company



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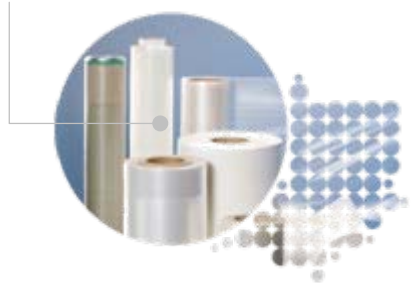
The Flexible Packaging
& Converting Industry's
Leading Resource








POLYMERS • LAMINATIONS • ADHESIVES • COATINGS • EXTRUSIONS

ExxonMobil
Chemical

Topics

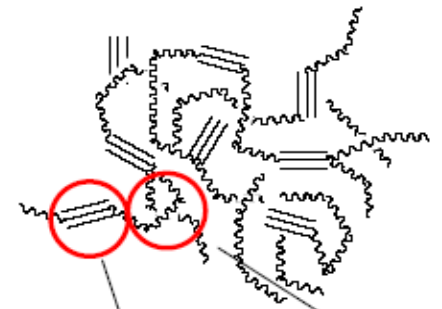
- Introduction to Vistamaxx™ propylene-based elastomers (designated here as "New propylene-based elastomers-**New PBE**")
- Applications and Value
 - Cast PP film sealants (cast film)
 - Elastic stretch hoods (blown film)
 - PP woven sacks (extrusion coating / extrusion lamination)
 - Stretch cling films (cast film)
 - Surface protective films (cast film)
- Conclusion and Q & A



	Cast PP	Stretch Hoods	Raffia modification	PP woven sacks	Stretch Cling	Surface Protection
						
Application description	Sealant resin	Elastic engine	hPP blend partner	Extrusion Coating & Lamination	Blend partner in skin	Adhesive resin in coextrusion

Introducing New PBE

- New PBE are olefinic specialty elastomers based on proprietary metallocene technology
- Semicrystalline copolymers of propylene and ethylene
- Bring **new capabilities** to the film industry
 - Unique combination of elasticity, flexibility, adhesion, drapability and toughness
 - Potential not seen in conventional elastomers or resins
- Can be **tailored for specific attributes** in different applications
- **Excellent compatibility** with many other polymers
- **Food law compliant**

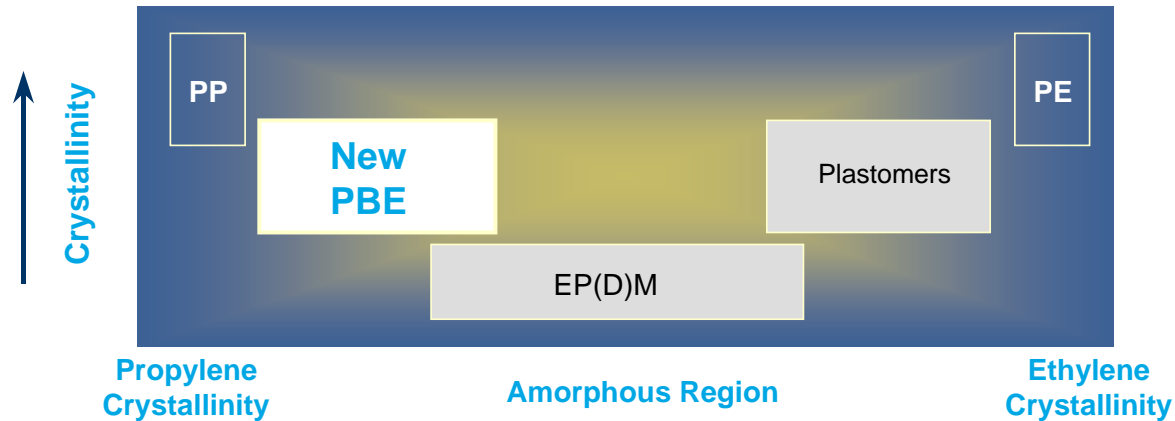


Isotactic PP Microcrystalline Region Amorphous Region

Elastic, Flexible, Adhesive and Tough

New PBE versus Ethylene Alpha Olefin Plastomers

Continuum of polymers with propylene and ethylene crystallinity



New PBE

Low crystallinity copolymers of propylene (>80wt%) and ethylene

Densities from 0.855 - 0.871 g/cm³

Markets: nonwovens, film, polymer modification

Strengths

- Elasticity
- Excellent compatibility with PP and PE
- Excellent adhesion to PP and PE
- Maintain clarity of PP

Shared Attributes

Toughness

Flexibility

Softness

Plastomers

Ethylene alpha olefin copolymers with butene, hexene or octene comonomer

Densities from 0.860 - 0.905 g/cm³

Markets: film, polymer modification

Strengths

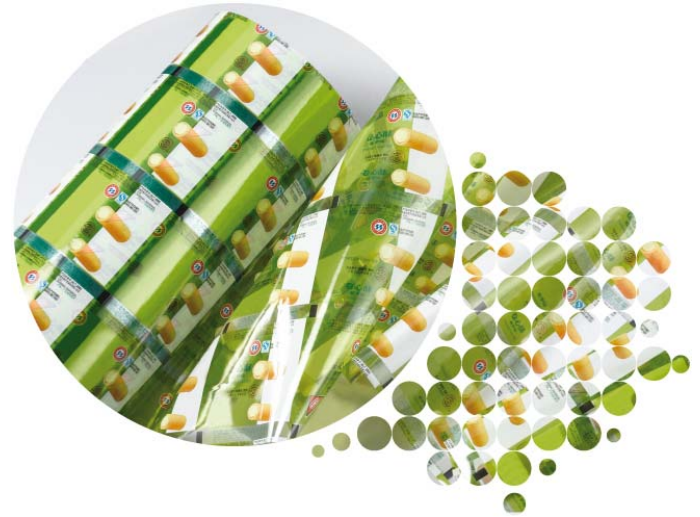
- Excellent low temperature ductility
- Broad polyethylene compatibility

New PBE Grade Slate (for Film applications)

new PBE grades	Typical Values						
	Wt.% C2	MFR (230°C) ¹ g/10 min	Density (g/cm ³)	Flex Mod ² (MPa)	Tensile ³ (MPa)	Hardness ⁴ 15 sec	Vicat Softening Point ⁵ , 200g (°C)
PBE 30 ⁶	11	7	0.871	40.2	18.2	86	64
PPE 0FL	11	2	0.873	46.5	>18.6	80	68
PBE 9FL	9	8	0.879	105.8	>18.6	86	80
PBE 1FL	16	3	0.863	8.5	>8.3	59	54
PBE 2FL	15	18	0.861	11.0	>7.3	61	48

1. g/10min, ASTM D-1238
2. 1% secant, @break, ASTM D-790
3. @break, ASTM D-412
4. Shore A, ASTM D-2240
5. ASTM D-1525
6. Not recommended for gel sensitive applications

These grades bracket the range of crystallinity and rheology useful in most film, extrusion coating and extrusion lamination applications.



New PBE as High Performance Sealants for Cast PP Films



New PBE in Cast Polypropylene Film

Application:

Heat sealable cPP lamination film for food, non-food and stationary product packaging. Hermetic seals for MAP.

Key points:

• Improved sealing performance

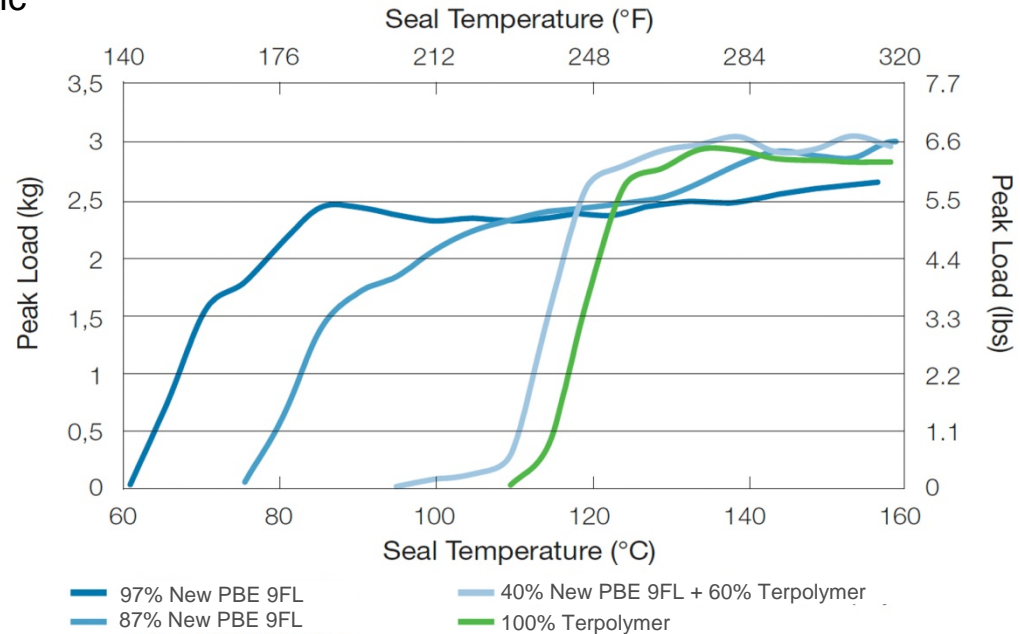
- Low and very low seal initiation temperature
- High hot-tack force
- Expanded range of sealing temperatures to improve hermetic seals

• Enhanced packaging line performance

- Increased packaging line speed up to 100%
- More efficient packaging operations and lower energy consumption
- Delayed investment in additional capacity

Recommended grade:

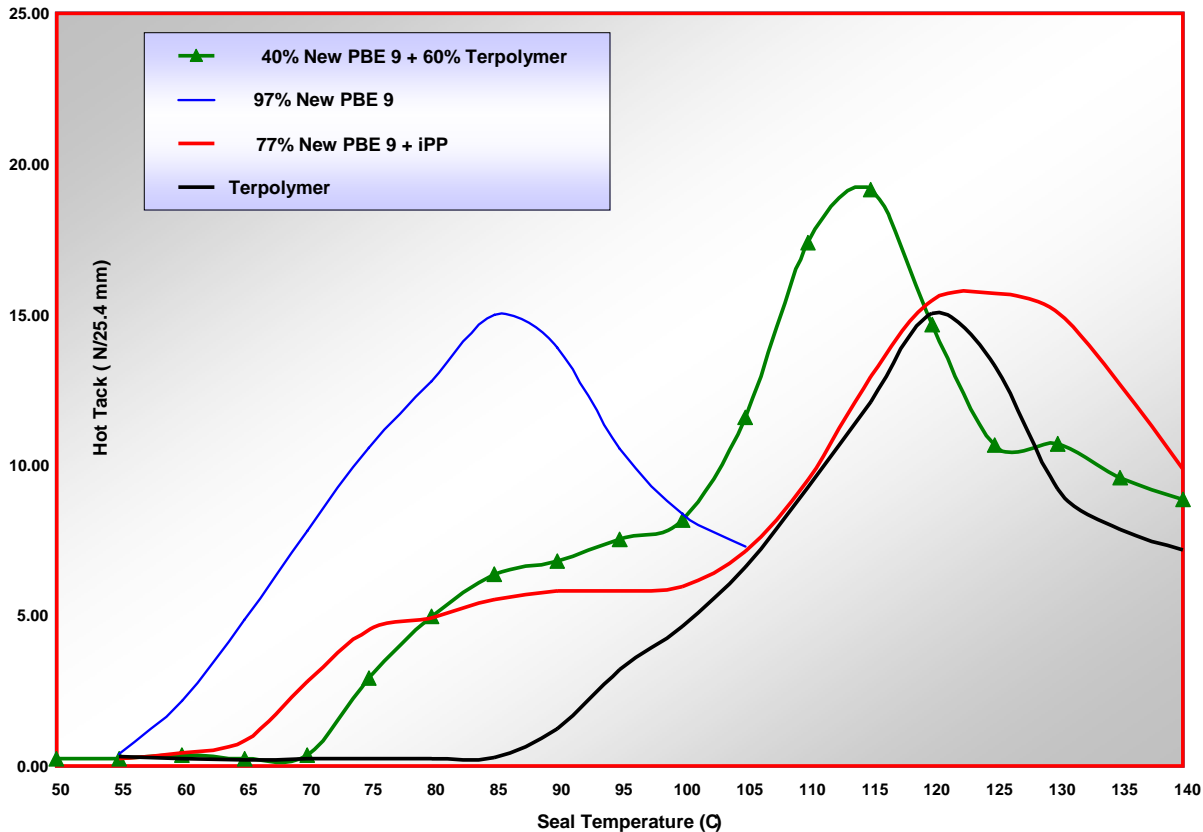
New PBE 9FL



Data from ExxonMobil Chemical.

Hot Tack Seal Performance

Faster packaging line speeds and broader operating range



Excellent hot tack

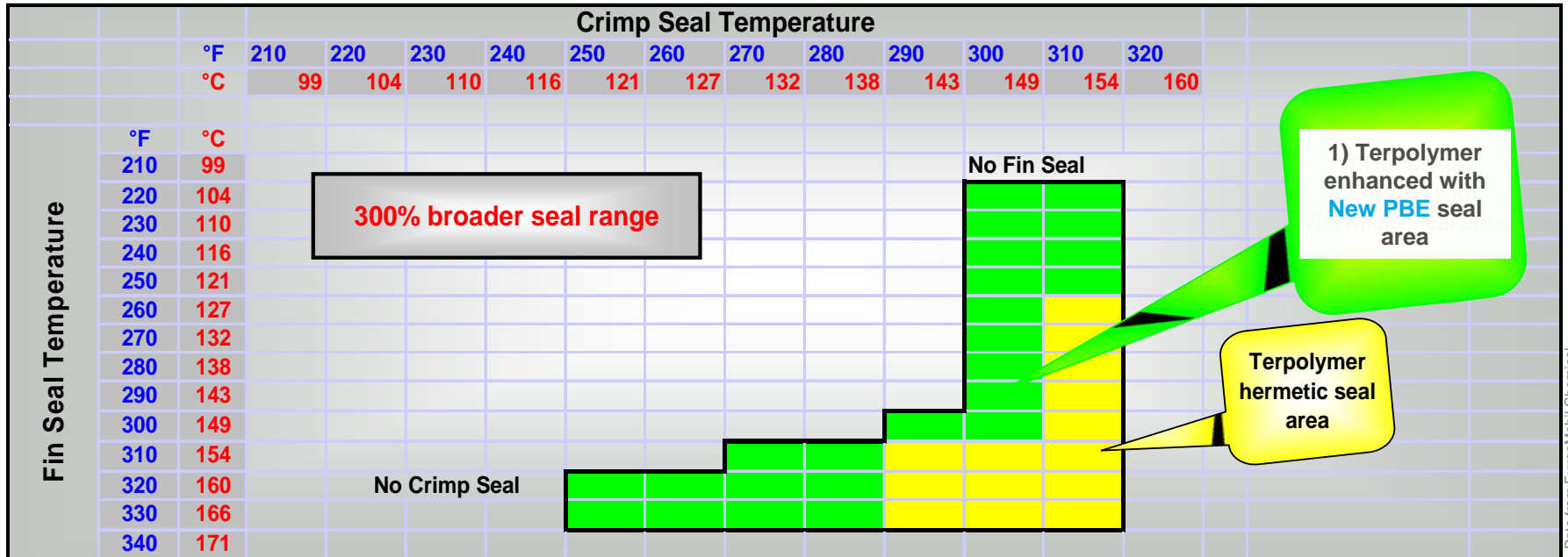
- New PBE can both lower and broaden hot tack seal performance compared to some terpolymer sealants
- Valuable in VFFS* packaging

*VFFS = vertical form fill and seal

New PBE enables very low hot tack initiation temperatures with excellent strength

Obtaining Hermetic Seal Performance

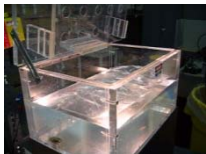
Hermetic seals = leak free and airtight packaging
Essential for MAP applications



Data from ExxonMobil Chemical

(1) 60% Terpolymer + 40% New PBE

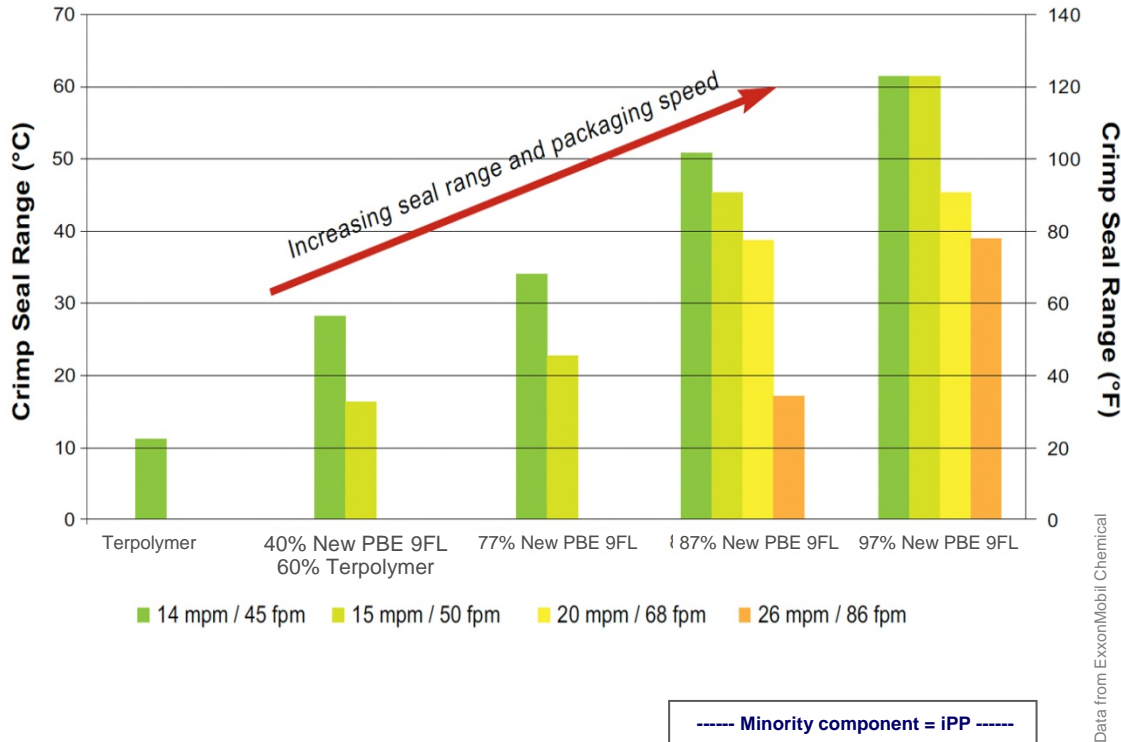
(1) the composition shown in green is a blend of 60% Terpolymer + 40% New PBE



Hermeticity Video

New PBE expands hermetic seal range by 300%

Packaging Line Performance



Testing on HFFS packaging machine indicates:

- Much wider operating range compared to terpolymer sealant. Valuable when:
 - accurate heat control is a problem
 - dwell times vary because of frequent machine speed changes
- Much faster line speeds are achievable
 - production output can be doubled without adding a new machine

New PBE increases packaging line capacity



New PBE

A new Versatile Polyolefin for Extrusion Coating Applications



Extrusion Coating Applications

These inherent attributes of New PBE

- Exceptional adhesion to PP substrates
- Very low temperature sealing, high seal strength
- Increased flexibility and softness
- Elasticity
- Toughness
- Anti-skid (high COF)
- High gas permeability
- Polyolefin / recyclable structure (non-PVC)

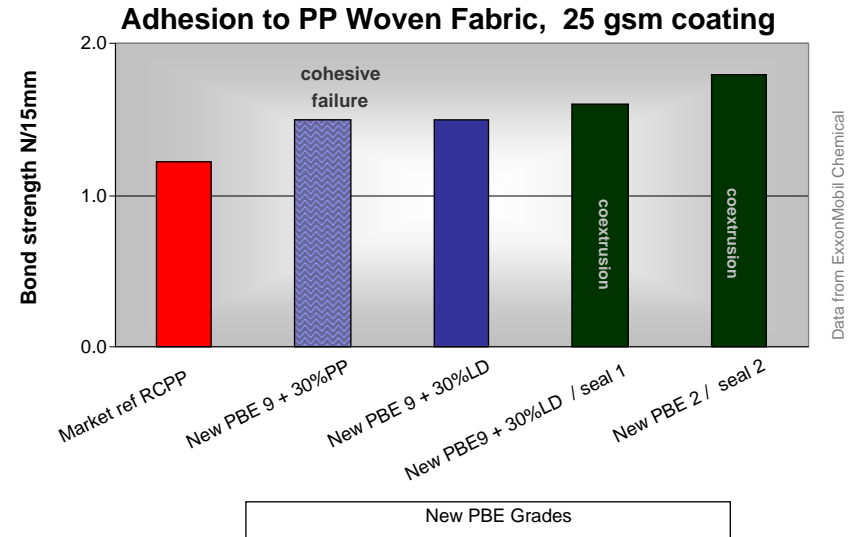
Can be applied to these structures ...

- Extrusion laminations for food packaging
- Oriented polypropylene film coatings
- Document plastification / thermal laminations
- Industrial fabric coatings
- Extensible coatings onto nonwoven fabrics
- Coatings onto woven PP fabrics
- Elastic laminates

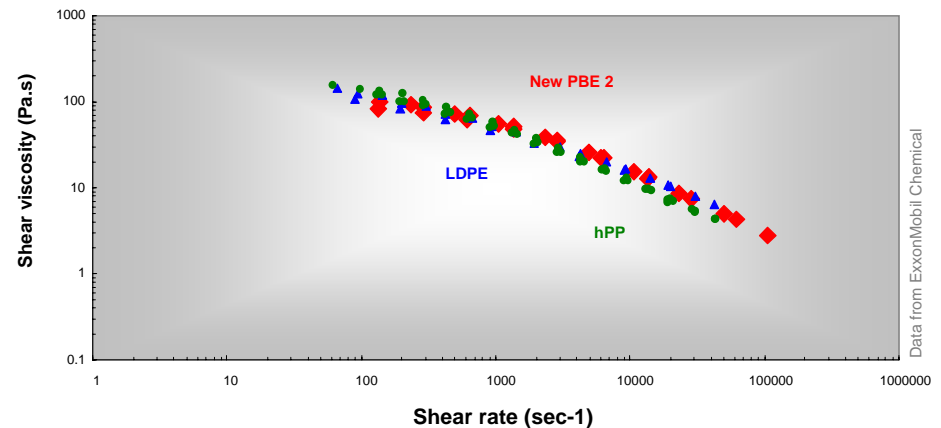
Extrusion Coating onto PP Woven Fabric

Key Benefits

- Better bond strength vs. hPP & RCP
- Downgauging of the coating layer
- Lower SIT and welding temperature
- Higher UV resistance vs. hPP
- Controlled anti-skid for better pallet stability
- No shrinkage in seal areas results in improved bag appearance
- Good blend partner with PP and PE
- **Easy processing on conventional extrusion coating line**
- **Excellent coextrusion with other PO's**



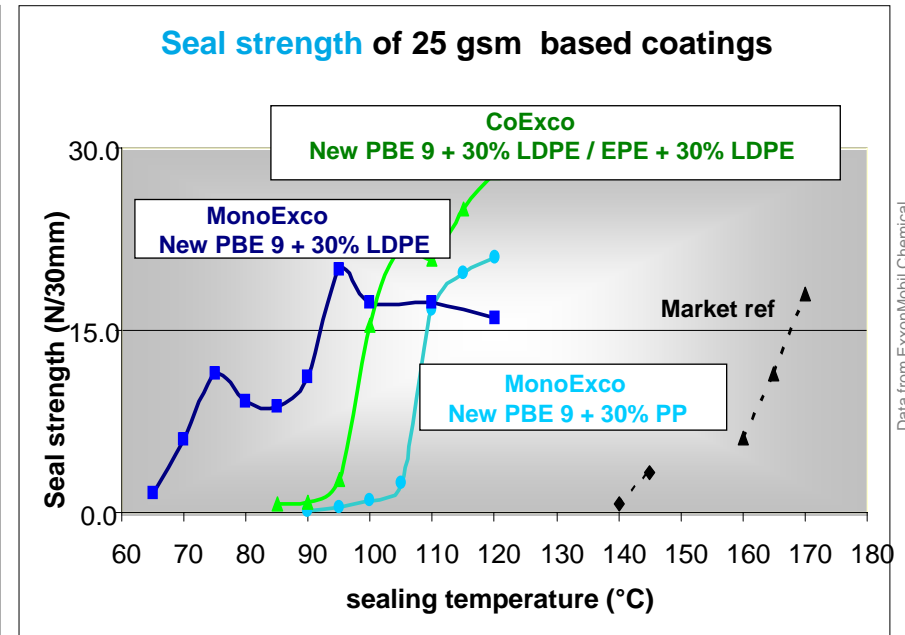
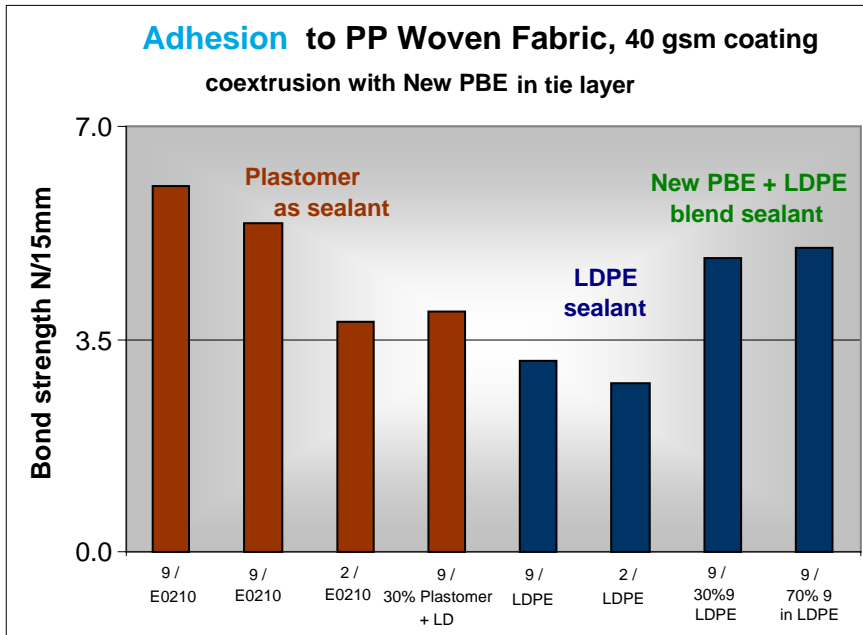
Rheology Mastercurve at 290°C



Extrusion Coating onto PP Woven Fabric

Coextruding New PBE as the **tie layer** provides outstanding **adhesion**

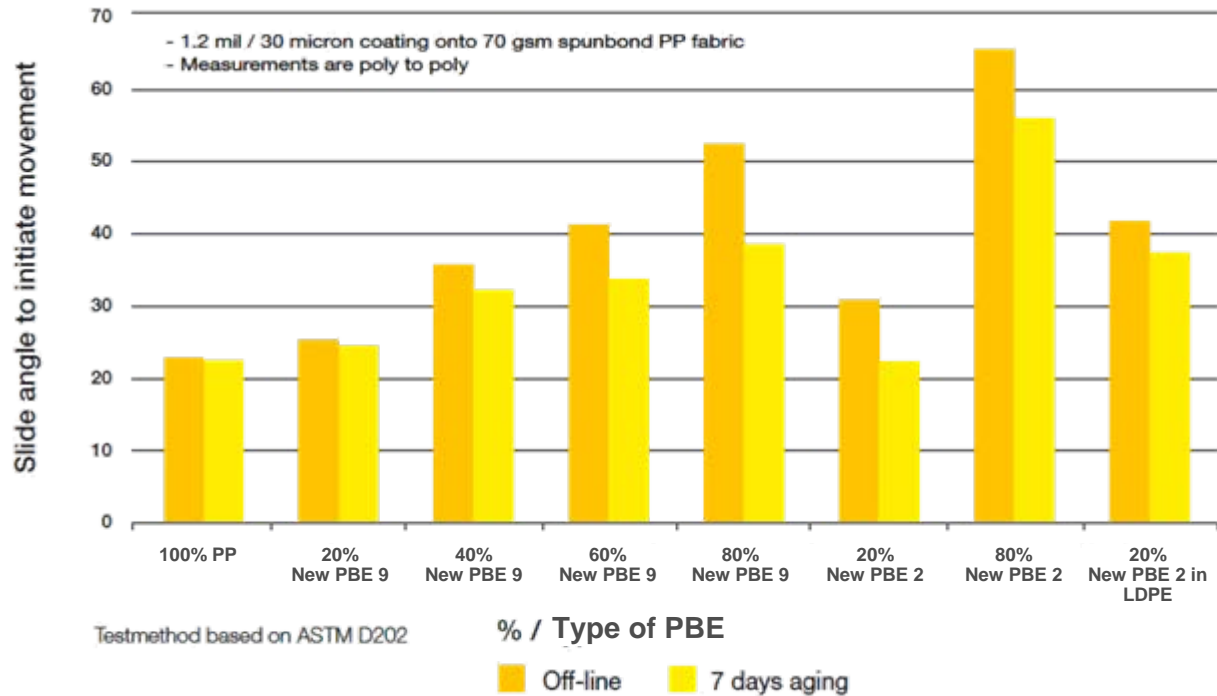
Use of New PBE as **sealant** significantly reduces SIT



- outstanding adhesion to the PP woven substrate
- low welding temp (hot air) with New PBE + PP blend as sealant
- very low SIT with New PBE + LDPE blend as sealant

Extrusion Coating onto Non Woven Fabrics

- Adding New PBE to PP (and PE) dramatically increases the extrusion coated fabric **anti-skid properties** (increased coefficient of friction)

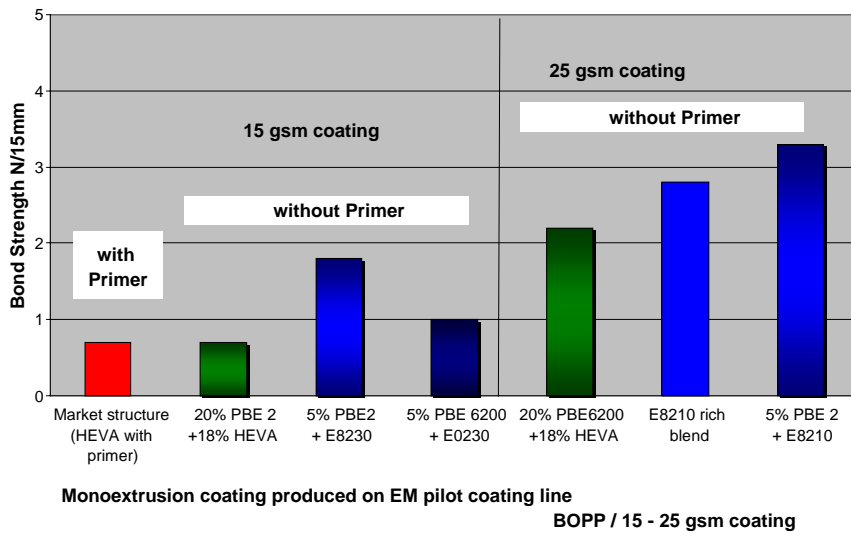


The vertical axis gives the angle at which a weight covered by the coated fabric starts sliding on an inclined surface covered with the same coated fabric. The higher the angle, the higher are the anti-slip properties of the coating (measures done based on ASTM D 202).

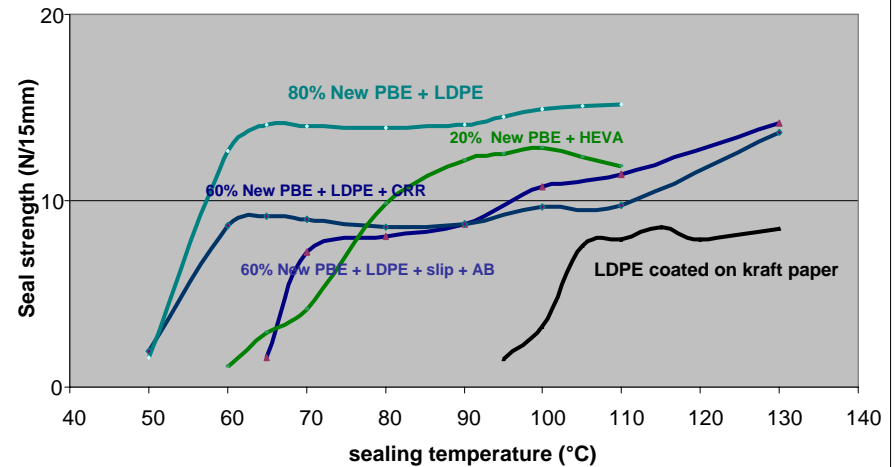
Extrusion coating onto OPP film

- Monoextrusion coating onto primerless OPP film

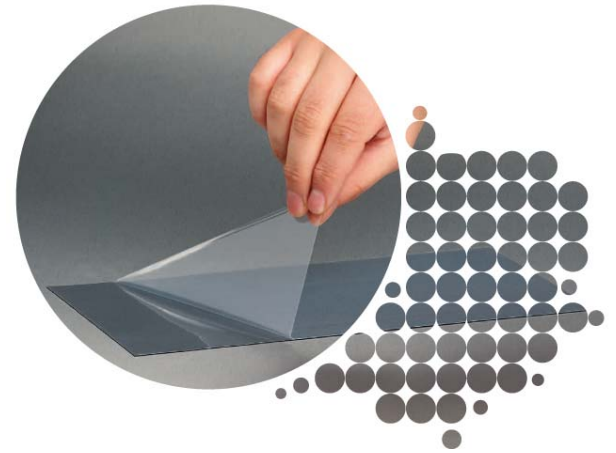
Adhesion to primerless OPP in monoextrusion coating



Seal strength of 25 gsm polymer coated to primerless OPP



- Outstanding adhesion without primer
- New PBE as adhesion improver in HEVA and Plastomer
- Seal initiation as low as 60°C for composition rich in New PBE
- Addition of chill roll release agent, slip and antiblock recommended



New PBE

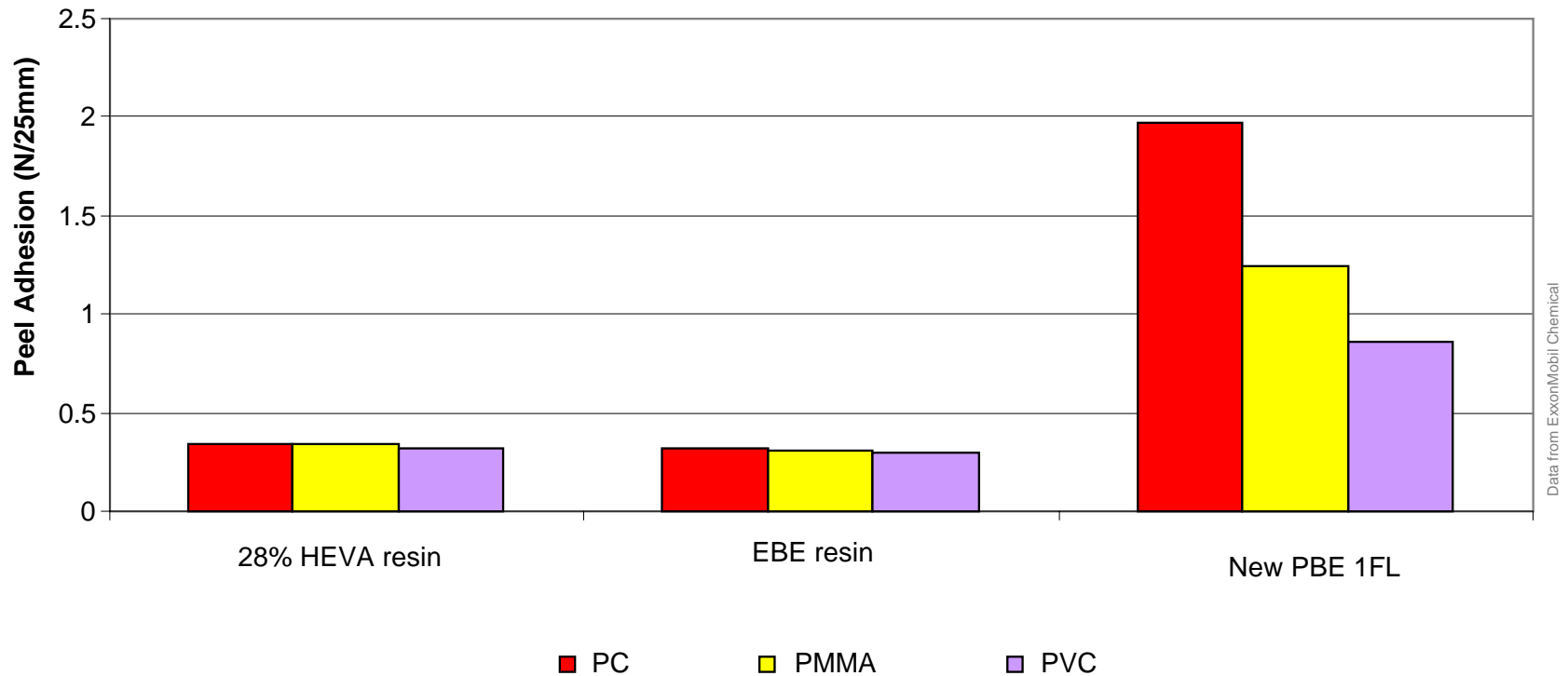
Adhesive Solutions for Surface Protection Film



New PBE as Coextruded Adhesive Layer

Film structure resins: A/B/C = adhesive layer / LDPE / LDPE = 20 / 40 / 10 μm = 70 μm total

Adhesion is measured on PC, PMMA and PVC following AFERA 4001 norm



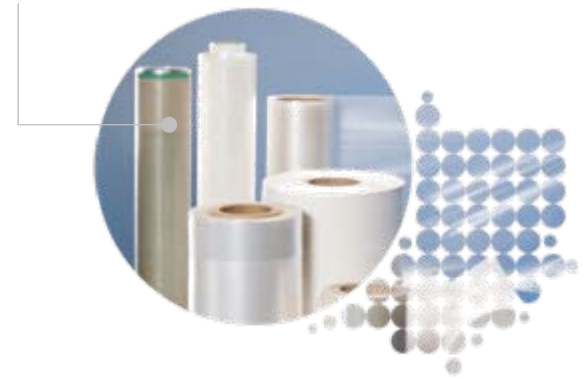
Data from ExxonMobil Chemical








New PBE offers high adhesive strength and can be coextruded on PE or PP

In Conclusion

New PBE's

- ✓ Enhance the performance of many film applications
- ✓ Suitable for cast film, blown film and extrusion coating
- ✓ Enable low SIT / high hot tack and strong seal strengths
- ✓ Can be processed on conventional extrusion equipment
- ✓ Compatible with most polyolefins
- ✓ Food Law compliant for food packaging applications



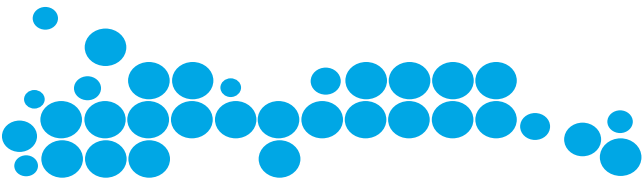
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Application description	Sealant resin	Elastic engine	hPP blend partner	Extrusion Coating & Lamination	Blend partner in skin	Adhesive resin in coextrusion

New PBE gives you countless ways to innovate

And Finally ...

Recognition goes to:

- **Linda Van den Bossche, my Belgian colleague and co-author for her contributions**



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Vistamaxx™ Propylene-based Elastomers

Thank you

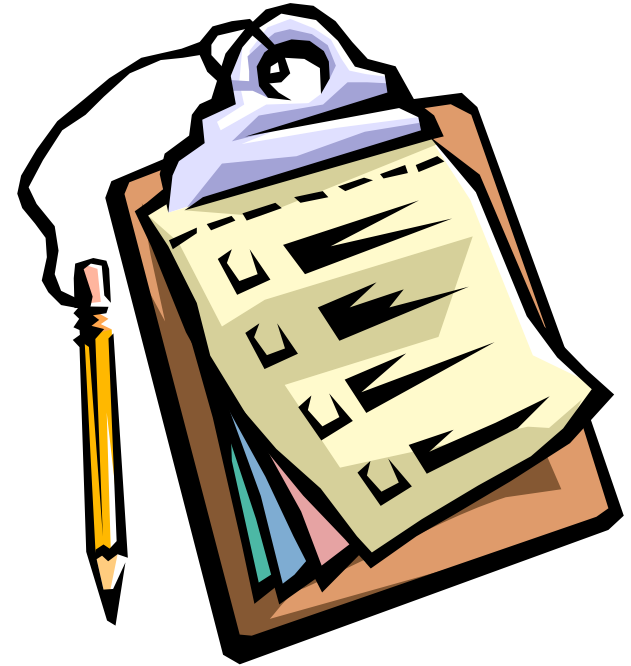
PRESENTED BY

David R. Weisinger

Global Film Technical Leader

ExxonMobil Chemical Company

David.R.Weisinger@ExxonMobil.com



*Please remember to turn in your
evaluation sheet...*



Test methods + References

Test Method	Test method based on	Test Method	Test method based on
Abrasion Resistance	ASTM D-1242A	Hardness : Shore A and D	ISO 868 / ASTM D-2240
Adhesion strength	ASTM D-1876	Heat Seal Force	EMC method
Apparent Density and Bulk factor	ASTM D-1895	Heraeus Muffle Furnace	EMC method
Basis Weight of nonwoven fabric	WSP 130.1	Heraeus oven UT 6120 : high temperature agglomeration	EMC method
Blocking - reblocking	ASTM D-3354	Hot Deformation test	BS 6469
Bond tester	EMC method	Hot Knife test	EMC method
Bottle compression - Top load	ASTM D-2659	Hot Set test	EMC method
Bottle drop impact tester	ASTM D-2463	Hot Stage Microscopy	EMC method
Ceast hollow punch dies	punch dies according ASTM , DIN, ISO,....	Hot Tack testing : Heat Seal Mode	ASTM F-1921
Clarity measurement	ASTM D-1746	Impact resistance by free-falling Dart : method A and B	ASTM D-1709
Coefficient Of Friction	ASTM D-1894	KBr Press	EMC method
Color measurement on Polymer Pellets	ASTM E-1331/ E-313 / D-6290	Zeiss microscopy	EMC method
Creep test for HD bag application by Termaks oven	EMC method	Limited Oxygen Index	ASTM D-2863
Density of Plastics by Gradient Technique	ASTM D-4703 / ASTM D-1505 / ISO 1183	Melt and Crystallization -transition temp measurement by DSC 7	ASTM D-3417 / D-3418
Di-electrical Constant and Dissipation Factor	ASTM D-150	Melt and Crystallization measurement by DSC Diamond	ASTM D-3417 / D-3418
Drawdown - Neck - in	EMC method	Melt Flow Rate : Davenport - Model 7	ASTM D-1238
Elastic Recovery	ASTM D-5459	Melt Flow Rate on Davenport melt indexer	ASTM D-1238 / ISO 1133B
Elastic Recovery Properties of nonwoven fabric	ASTM D-5459	Melt Flow Rate : Göttfert	ASTM D-1238 / ISO 1133B
Elmendorf Tear Strength.	ASTM D-1922-06a	n-Hexane extractables	EMC method
Environmental Stress Crack Resistance	ASTM D-1693	OCS gel count measurement	EMC method
F.T.I.R.	EMC method	Octagon 200 Sieve Shaker	EMC method
Fiber Size of nonwoven fabric	EMC method	Oil Resistance test	EMC method
Fiber tenacity	EMC method	Peel cling of stretch wrap film	ASTM D-5458
Film stiffness by two-point bending method	DIN 53121	Pendulum Impact test	ISO 180
Film thickness measurement unit Octagon GPA-C	EMC method	Pendulum Charpy Impact Test	ISO 179
Flexural Modulus	ASTM D-790A	Puncture Resistance	EMC method
Flexural Modulus	ISO 178	Puncture Resistance	ASTM D-5748
Fluorescence Measurement	EMC method	Flow behaviour- Capillary and Oscillatory Rheology	EMC methods
Gel Content test	ASTM D-2765	Seal Strength sample preparation : Heat Seal mode	ASTM F-2029
Gelbo Flex Tester	EMC method	Shopping Jogging tester	EMC method
Gloss 45°	ASTM D-2457	Shrink Forces measurement by Retramat	ISO 14616/DIN 53-369
Gloss measurement	ASTM D-2457	Shrinkage tester : Betex	EMC method

Test methods + References con'd.

Test Method	Test method based on
Single Core Burning test	IEC 332-1
Surface friction	ASTM D202
Storage Stability test	EMC method
Stretch hood test - MD tear propagation	EMC method
Stretch hood test TD	EMC method
Stress retention	ASTM D-5459
Surface resistivity testing	ASTM D-257
Swelling Ratio : Davenport - Model 7	ASTM D-1238
Temperature of deflection under load	ISO 75-1&2
Tensile Creep of Plastics	ASTM D-2990
Tensile Properties at low and high temperature	EMC method
Tensile Properties of diaper elastic part	WSP 110.4
Tensile Properties of nonwoven fabric	WSP 110.4
Tensile Properties on dumbbells	ASTM D-638
Tensile Properties on dumbbells	ISO R527-2/1B
Tensile Properties on film	ASTM D-882
Tensile Properties on non-woven	WSP 110.4
Tensile Properties on stretch film	ASTM D-882
Total Ash	EMC method
Total Haze measurement	ASTM D-1003
Trouser Tear Strength	ASTM D-1938
UV and Visible Light Transmission	EMC method
Vicat Softening Point	ISO 306 / ASTM D-1525
Volume Resistivity test	ASTM D-257
Water Absorption test	ASTM D-570
Water Vapor Transmission Rate	ASTM F-372
Wetting Tension of Polyolefins	ASTM D-2578