



AGILITY™ PERFORMANCE LDPE IN BLENDS ELEVATES FILM MECHANICALS AND EXTRUSION OUTPUT TO THE NEXT LEVEL



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FEBRUARY 2017

Agility™
performance LDPE



OUTLINE

- AGILITY[™] LDPE Products
- LDPE Applications
- Characterization of High Output LDPEs
- Blown Film Processability
- Film Physical Properties
- Output Performance of Blends
- Summary



HIGH PERFORMANCE LDPE



AGILITY™ Performance LDPE Resins are elevating the performance standards of the LDPE category through:



SPEED: Enables higher throughput on existing extrusion equipment



STRENGTH: Requires less LDPE in LDPE/LLDPE blends, improving physical properties while maintaining output



AESTHETICS: Delivers improved optics and high shrink to meet the growing need for more transparent packaging



FLEXIBILITY: Offers solutions for multiple markets – extrusion coating, blown & cast film, and polyolefin foams



VERSATILITY



AGILITY™ Performance LDPE Resins represent a new generation of LDPEs designed to offer converters a broad family of versatile products – bringing the best performance attributes of conventional autoclave and tubular LDPEs into one pellet. This allows customers to challenge the limits in extrusion throughput and physical properties through enabling less LDPE usage in blends.

Common Market Applications:

- ~ Extrusion coating
- ~ Performance polyolefin foams
- ~ Lamination films
- ~ Décor
- ~ Shrink films for beverages
- ~ Agricultural films
- ~ Frozen food packaging
- ~ Stand-up pouches



HIGH PERFORMANCE AGILITY™ LDPE RESINS

Commercial Product	Film Applications	Melt Index (g/10 min, 190°C)	Density (g/cm ³)	Product Additives	Extrusion Technology
AGILITY™1000 Performance LDPE	Agricultural, lamination, shrink	0.18	0.920	None	Blown Films
AGILITY™ 1200 Performance LDPE	Agricultural lamination, shrink	0.25	0.919	None	Blown Films
AGILITY™1001 Performance LDPE	Stretch films for logistics packaging	0.65	0.920	None	Blown Films
AGILITY™1002 Performance LDPE	Food packaging and lamination films	0.65	0.921	AB	Blown Films
AGILITY™ 1021 Performance LDPE	Protective foams, food packaging and lamination films	1.85	0.920	None	Blown and Cast Films
AGILITY™1022 Performance LDPE	Food storage bags	1.85	0.921	S/AB	Blown and Cast Films



HIGH PERFORMANCE AGILITY™ LDPE RESINS

Commercial Product	Film Applications	Melt Index (g/10 min, 190°C)	Density (g/cm ³)	Product Additives	Extrusion Technology
AGILITY™ 2001 Performance LDPE	High clarity retail collation shrink film	0.4	0.924	None	Blown Films
AGILITY™ EC7000 Performance LDPE	Board laminates, food sachets, pouches, release liners for labels, imaging paper, medium to high density foams for protective packaging	3.9	0.919	None	Extrusion Coating, Lamination, Polyolefin Foams
AGILITY™ EC 7200 Performance LDPE	Paper & board coating & lamination for liquid board laminates and pouches, very low density foams for protective packaging	1.5	0.918	None	Extrusion Coating, Lamination, Polyolefin Foams
AGILITY™ EC 7080 Performance LDPE	Very high speed / lights weights for extrusion coating & lamination	8.0	0.918	None	Extrusion Coating, Lamination,



LDPE APPLICATIONS

SILAGE/AGRICULTURAL FILM



HEAVY DUTY SHIPPING SACKS



FROZEN FOOD



LAMINATION FILMS



COLLATION SHRINK FILMS





AGILITY™ 1200 PERFORMANCE LDPE
FOR HIGH THROUGHPUT LDPE BLENDS

Agility™
performance LDPE

FASTER PROCESSING LDPES AND LLDPEs



Higher Output on Blown Film lines - a major need from film converters

- Equipment Technology
- Polymer Technology

Output on a blown film line:

- Cooling capacity
- Winder speed
- Bubble stability



Many film formulations are blends of LLDPE and LDPE resins

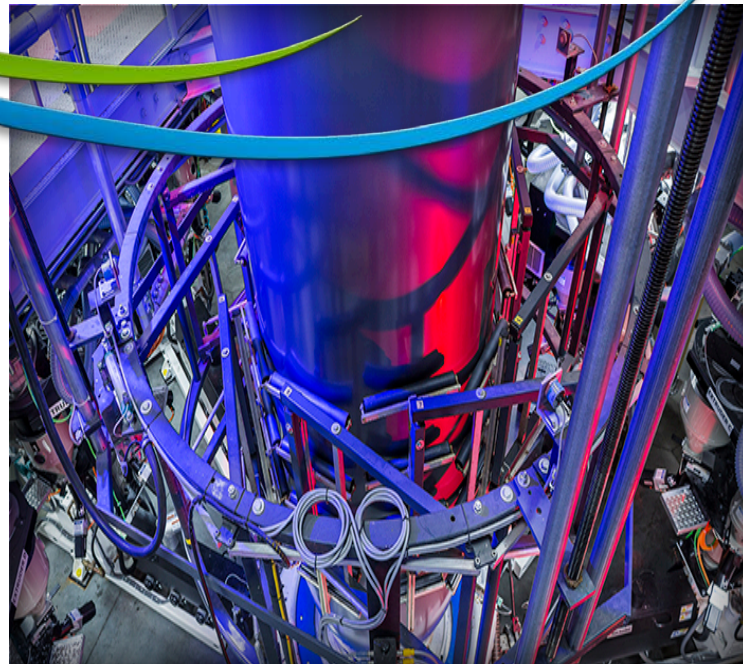
- Anywhere from 10% to 50% LDPE blended with LLDPE



THE NEWEST LDPE INNOVATION – AGILITY™ 1200 PERFORMANCE LDPE



- ~ Higher throughput
- ~ Improved bubble stability even with large layflats
- ~ Less gauge variation
- ~ Enhanced physical properties
- ~ Maintain optics
- ~ Secure supply with asset flexibility



BENCHMARK LDPE RESINS

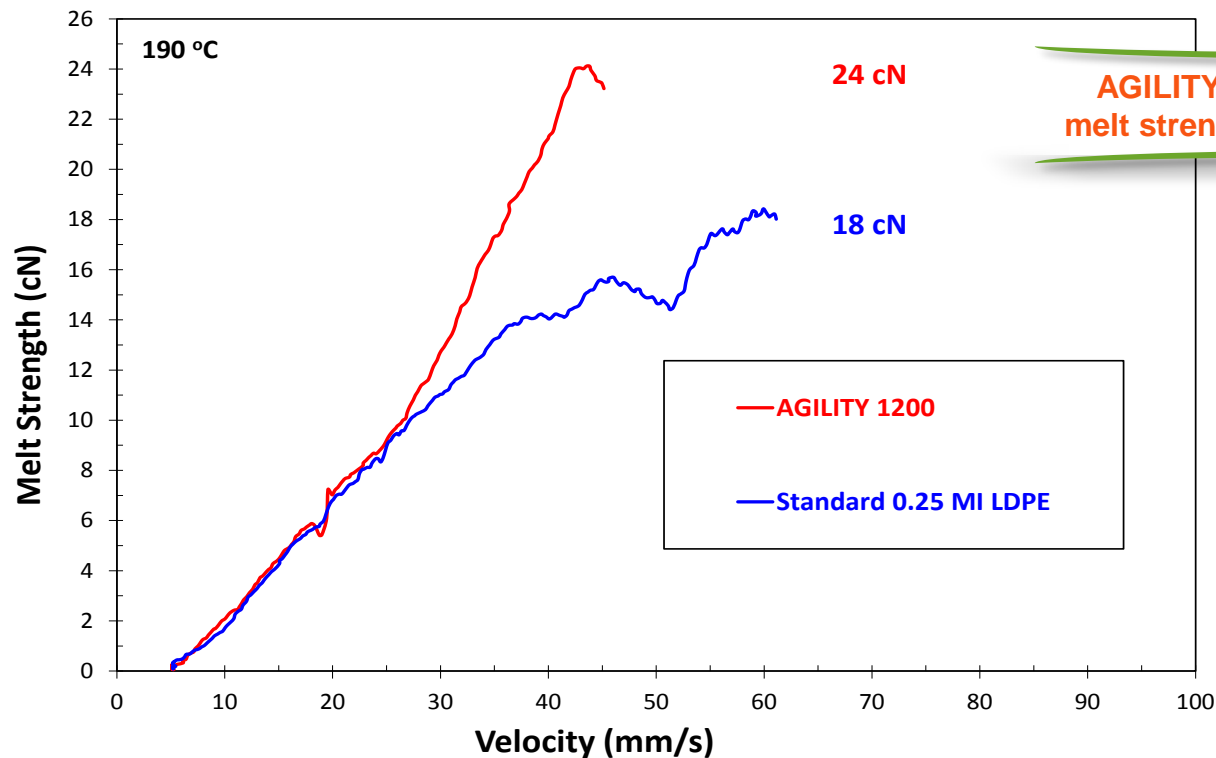
Resin	MI	Density
AGILITY™ 1200 Performance LDPE	0.25	0.9195
DOW™ LDPE 132i	0.25	0.921

NEW!

Recent discoveries in LDPE have enabled us to disassociate conventional rules for melt strength and melt index.



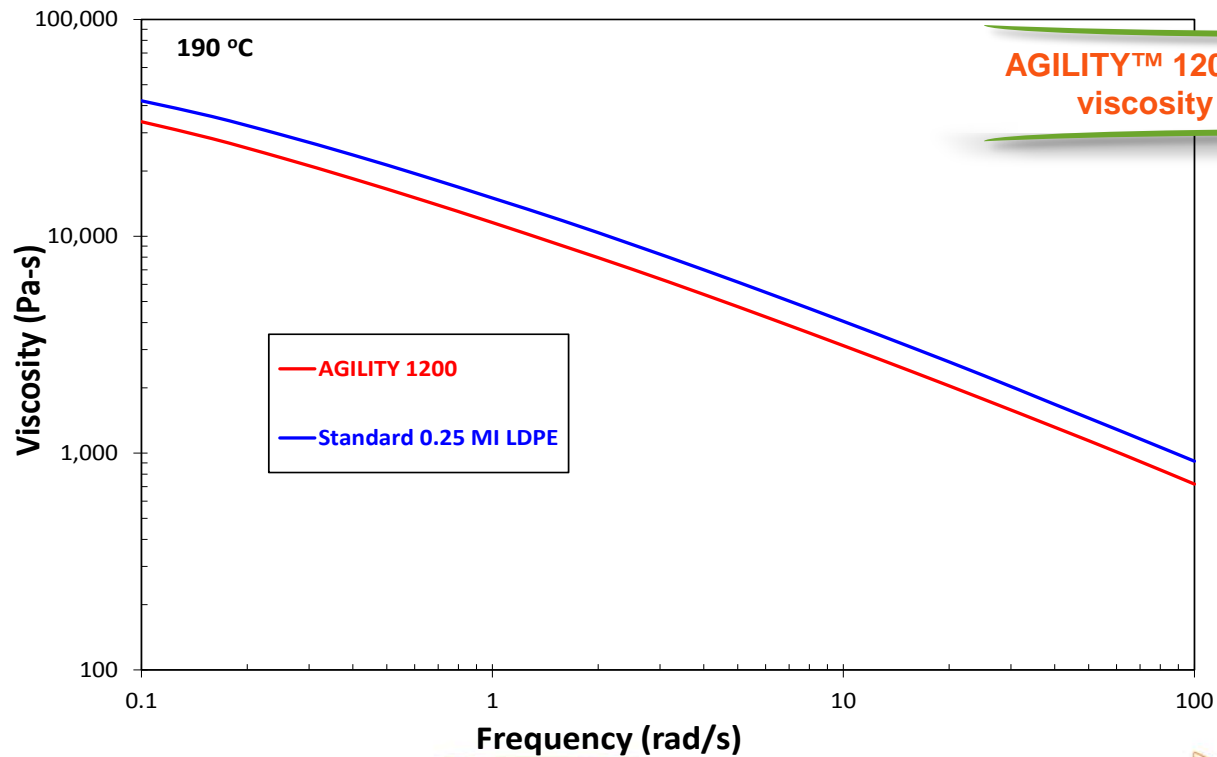
MELT STRENGTH



AGILITY™ 1200 shows 33% improved melt strength over Standard 0.25 MI LDPE



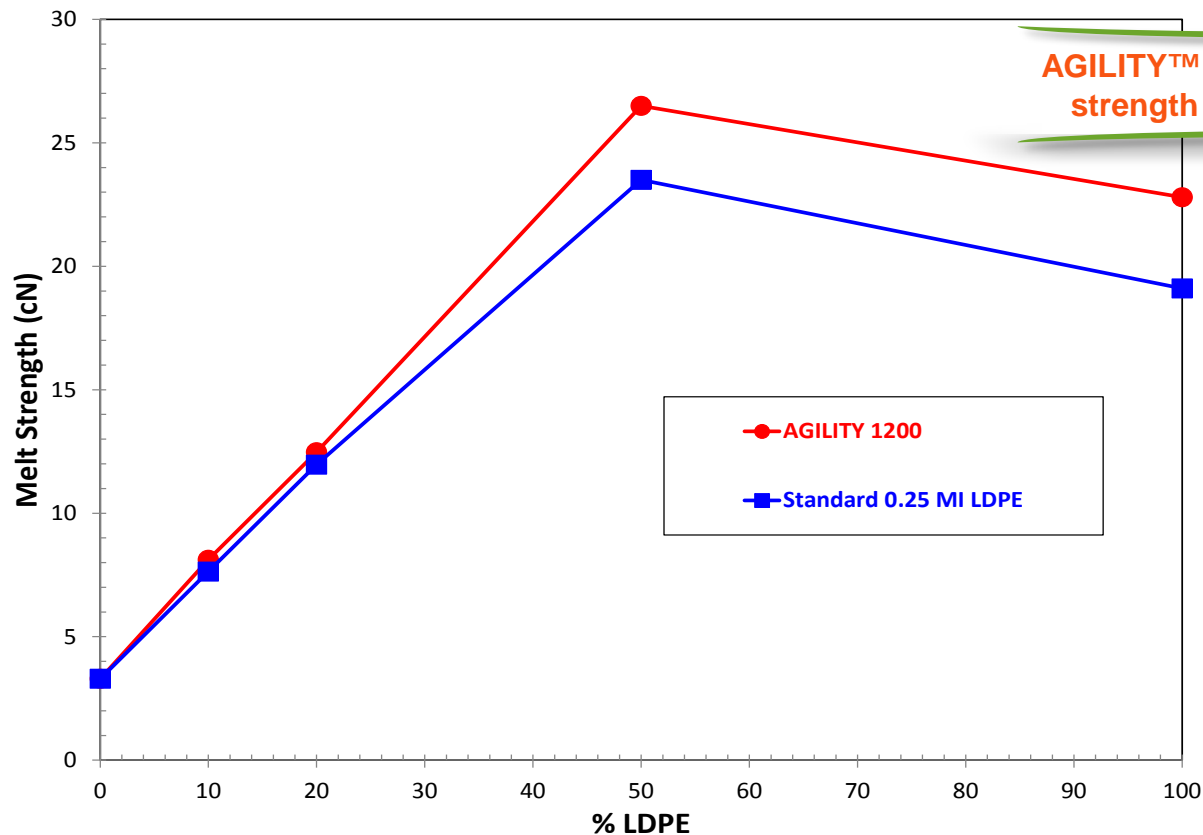
MELT VISCOSITY



AGILITY™ 1200 has reduced and improved viscosity over Standard 0.25 MI LDPE



MELT STRENGTH OF BLENDS



AGILITY™ 1200 improved blend melt strength over Standard 0.25 MI LDPE



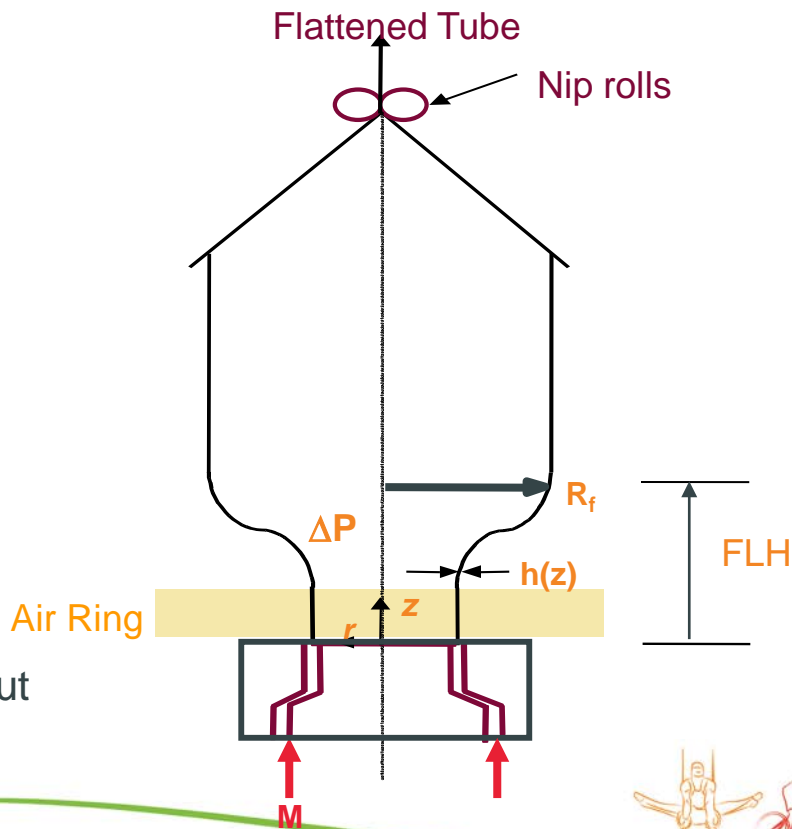
MEASUREMENTS OF MAXIMUM OUTPUT

Bubble Stability

- Internal bubble cooling
- External Air
- Temp. profile- Melt Temp.
- Frost line height (FLH)

Max. rate criterion

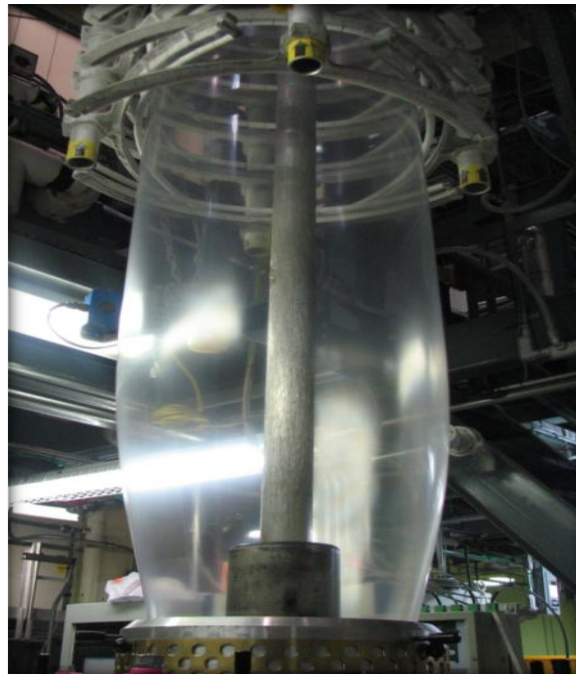
- Maximize IBC
- Maximize External Air
- Increase screw RPM
 - Bubble Shape
 - Bubble breathing in & out
 - (Layflat)
 - FLH stability
 - Gauge control



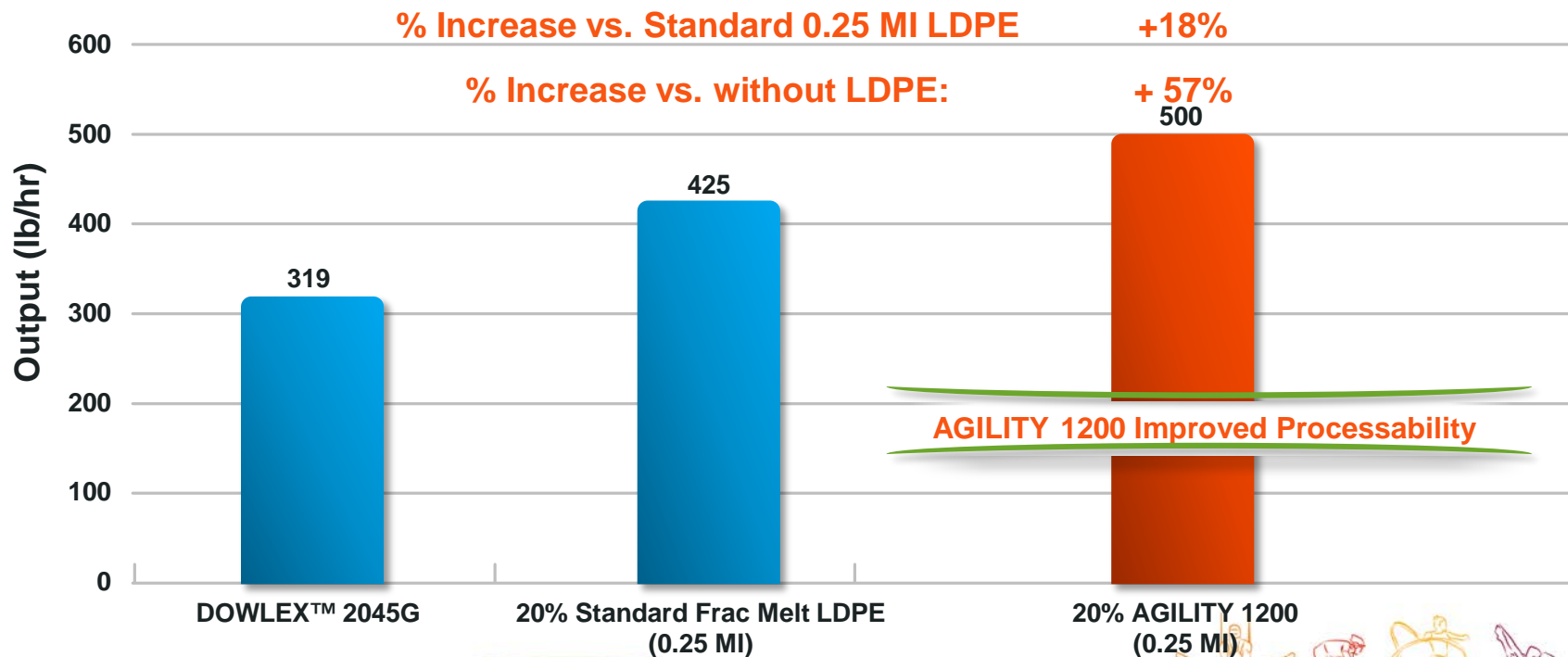
EXPERIMENTAL PARAMETERS

Monolayer blown film line, Freeport, TX

- Dual lip air ring
- Die size = 8 inch
- Die gap = 70 mils
- Blow up ratio (BUR) = 2.5:1
- IBC
- Melt Temp. Range of 420-450°F (216-232°C)
- Film gauge = 2 mil
- Film samples
 - Standard rate
(10 lbs/hr/inch of die circumference)
 - Maximum rate



AGILITY™ PERFORMANCE LDPE TECHNOLOGY DELIVERS UNPRECEDENTED THROUGHPUT

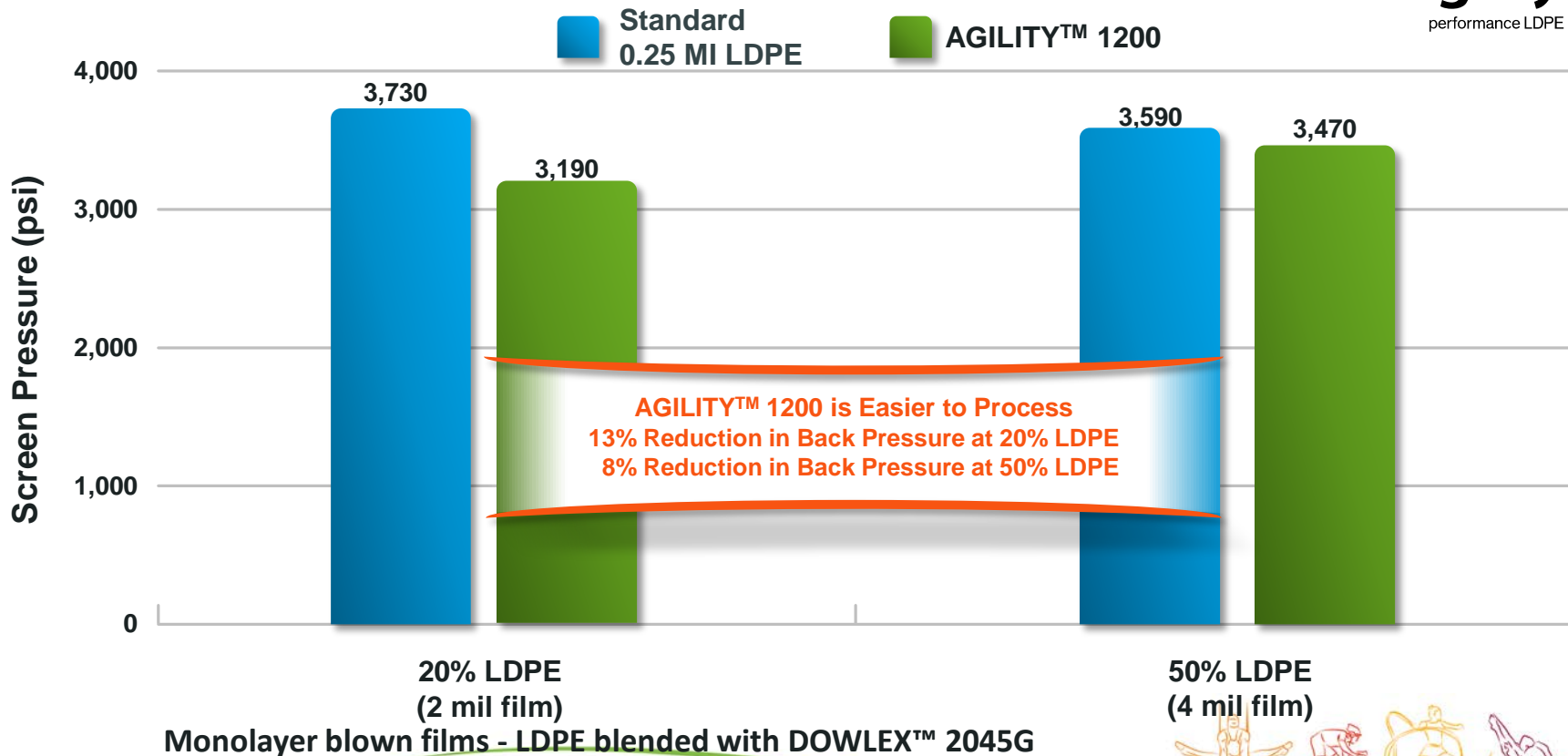


2 mil monolayer blown film – LDPE blended with DOWLEX 2045G

Processing Conditions: 8" die, 70 mil die gap, 2.5 BUR, Dual lip air ring & IBC, 420-450 °F melt temp.



SCREEN PRESSURE REDUCTION VS. STANDARD 0.25 MI LDPE

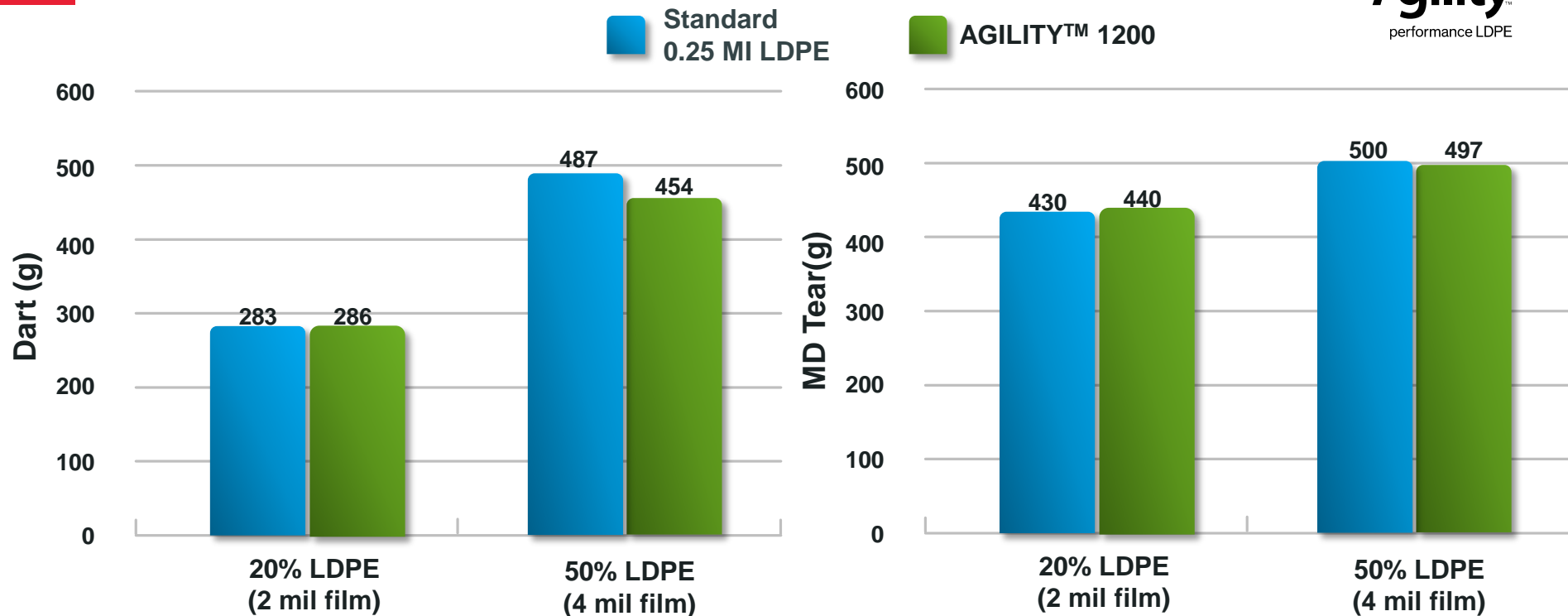


Processing Conditions: 8" die, 70 mil die gap, 2.5 BUR, Dual lip air ring & IBC, 410-440 °F melt temp.

2 mil film: 10 lb/hr/inch die circ. | 4 mil film: 12 lb/hr/inch die circ.



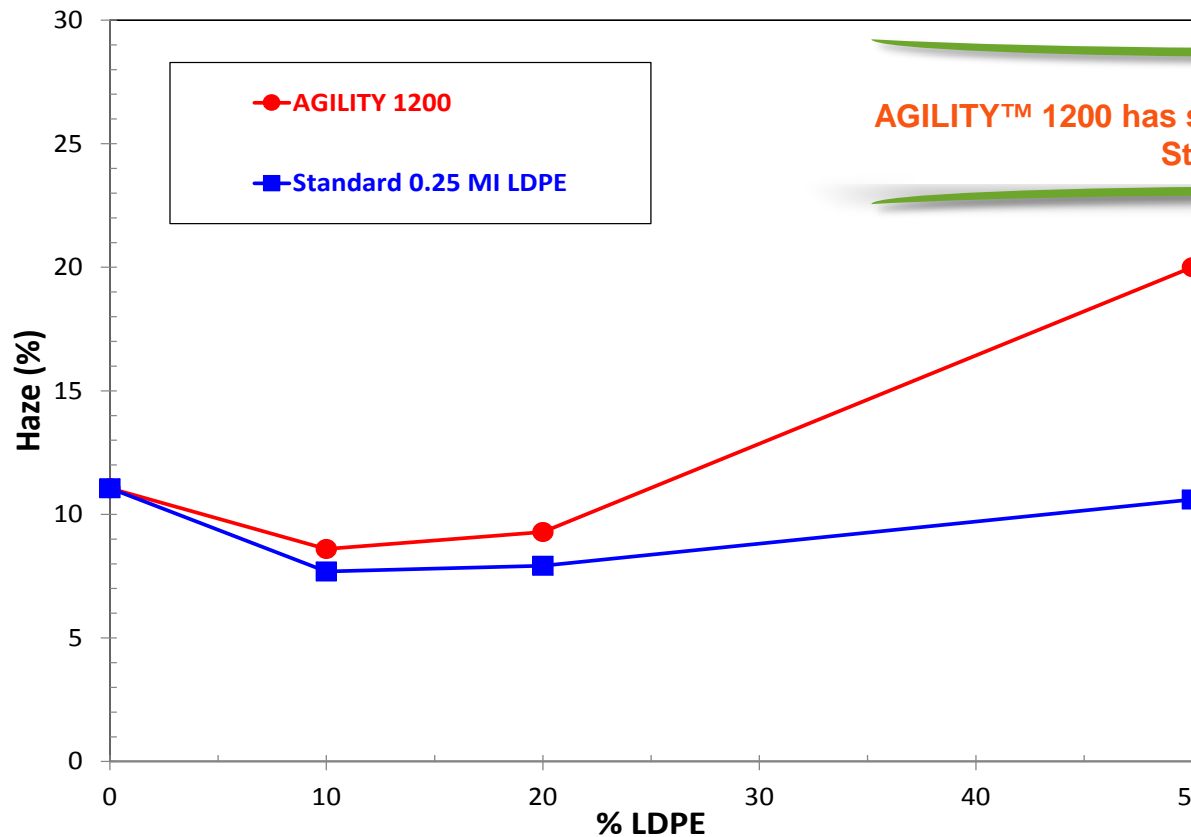
NO TOUGHNESS TRADEOFFS VS. STANDARD 0.25 MI LDPE



AGILITY 1200 has similar dart and MD tear to Standard 0.25 MI LDPE



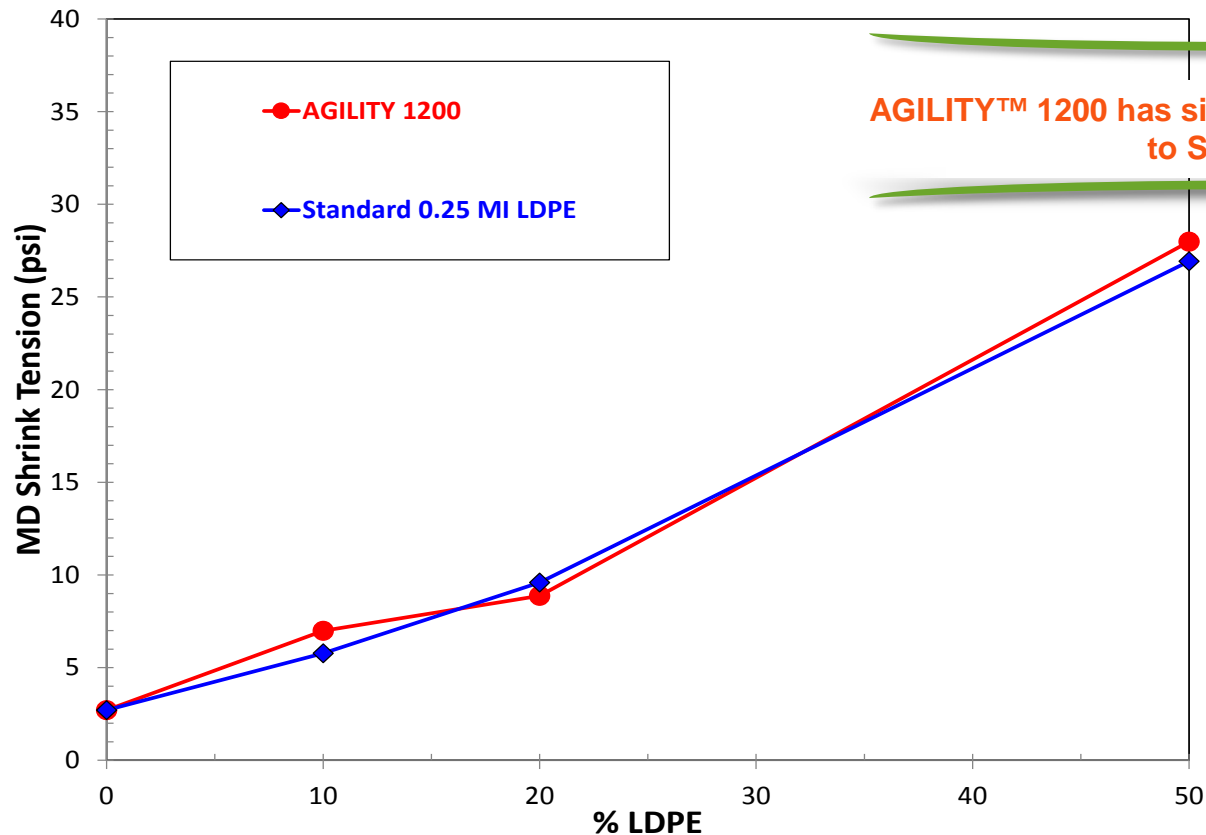
OPTICS



AGILITY™ 1200 has slightly reduced optics compared to Standard 0.25 MI LDPE



SHRINK TENSION (MD)



AGILITY™ 1200 has similar shrink tension (MD) compared to Standard 0.25 MI LDPE



BLENDING WITH INNATE™ RESINS



Raw talents and special abilities of extraordinary nature.

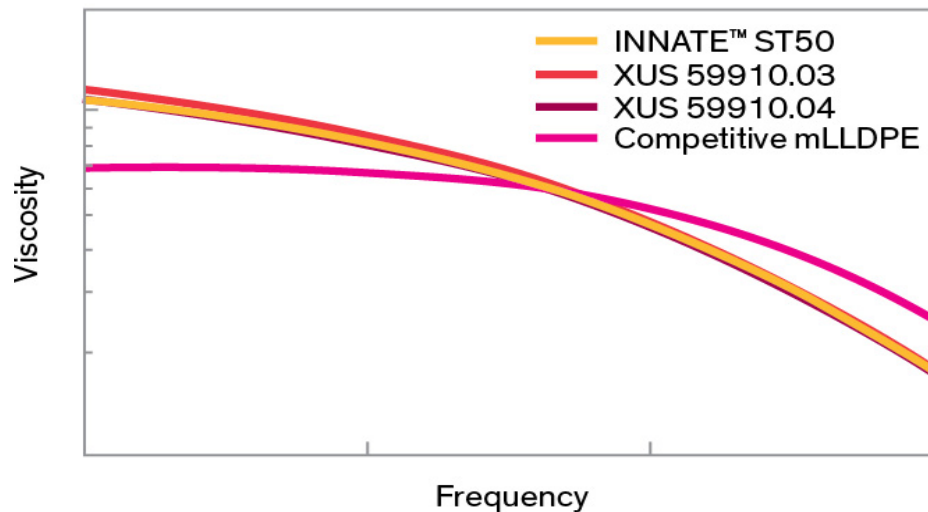
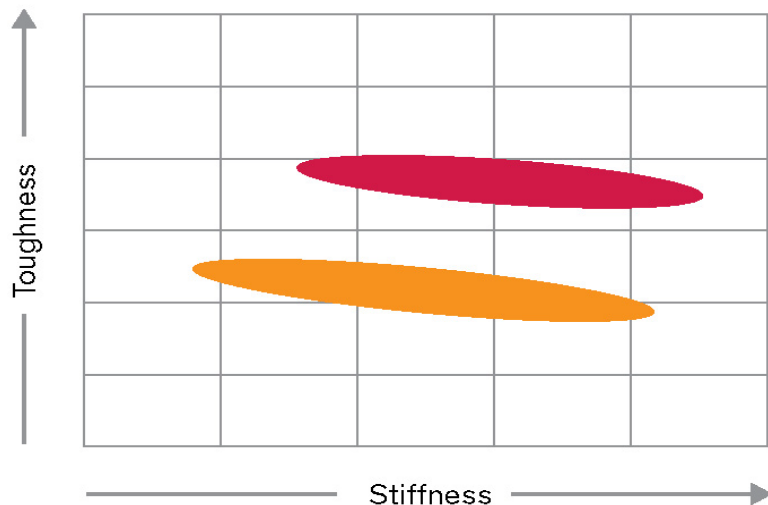
The chemistry behind INNATE resins allows scientists to accurately control and dial-in precise and *extraordinary* properties like never before.

Elemental or essential to success.

INNATE resins are building blocks for innovative packaging.

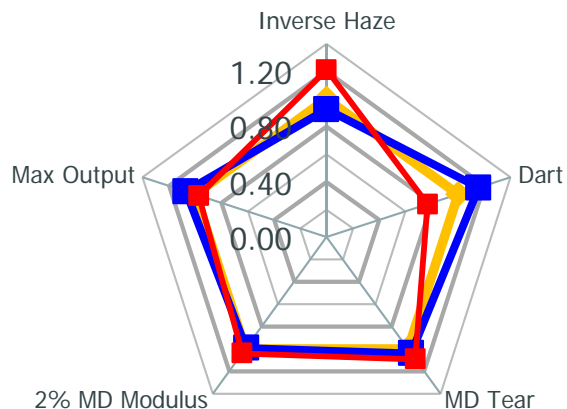


Improved Stiffness/Toughness Balance with Excellent Processability

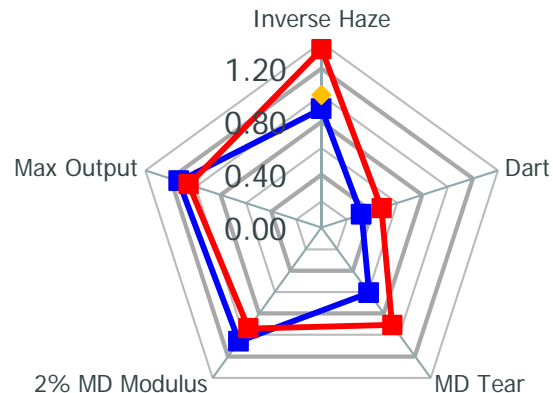


OPTIMUM INNATE™-AGILITY™ PROPERTY BALANCE

10% LDPE loading



20% LDPE loading



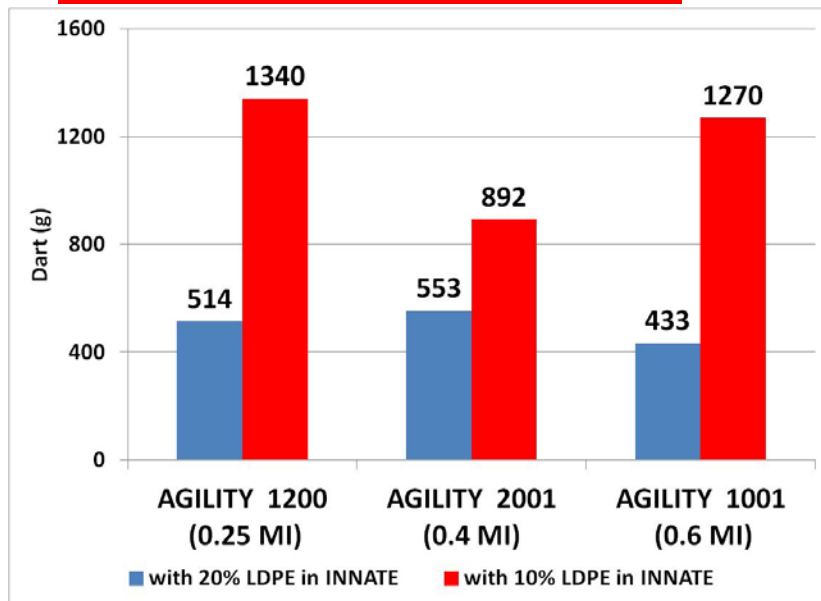
- At 10% loading, the **AGILITY 1200** shows the best balance of properties.
- At 20% loading, the **AGILITY 1200** shows the best abuse-output balance.
- At 20% loading, the **AGILITY 2001** shows the best abuse-optics balance.



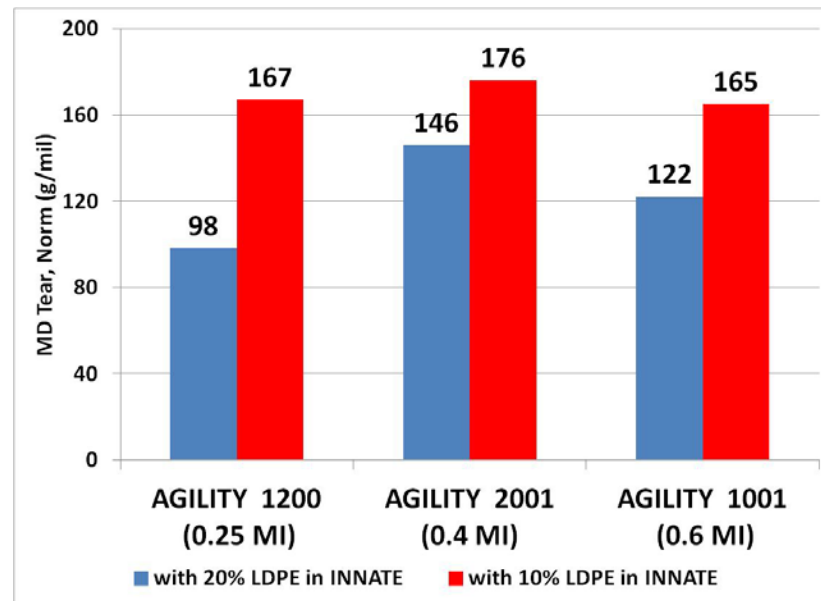
INNATE™-AGILITY™ BLENDS FOR SUPERIOR ABUSE AND HIGH PROCESSABILITY



> +60% Improved Dart



> +20% Improved Tear



- Use less AGILITY LDPE to maintain output and provide higher abuse performance
- All films at 1 mil and blended with INNATE ST50
- 10% LDPE blends with >20% improved output without LDPE
- 20% LDPE blends with >30% improved output without LDPE



OTHER APPLICATIONS: FOAM & EXTRUSION COATING

AGILITY™	1021	(1.85 MI, 0.920d)
AGILITY	EC 7000	(3.9 MI, 0.920d)
AGILITY	EC 7080	(8.0 MI, 0.918d)

PROTECTIVE PACKAGING



EXTRUSION COATING



AGILITY™ 1200 Performance LDPE

A Good Balance of Processing & Film Properties



Improved *Processability*



33% Higher Melt Strength than Standard 0.25 MI LDPE



18% Improved Output in Blown Film at 20% LDPE loading levels



Efficient Blend Partner with INNATE™ resin for superior toughness with less LDPE and downgaugability





THANK YOU FOR YOUR ATTENTION

For more information or to discuss your application, please feel free to contact us:

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AgilityTM
performance LDPE

