THE CAST IS GETTING BIGGER

INTRODUCING THE NEWEST INNATE™ PRECISION PACKAGING RESINS

EXPANDING THE TALENTS
NEEDED FOR PACKAGING SUCCESS

Strength … Stiffness … Toughness … Durability … Processability … Sustainability … Blendability … These characteristics – essential to today's packaging applications – are the heart, the DNA, of Dow's family of INNATE™ Precision Packaging Resins.

The first offerings in this ensemble showcased unprecedented combinations of stiffness, toughness, and efficiency in a variety of film applications.

Now, Dow is pleased to open the curtain on an exciting new cast of performers – two new developmental products and a newly commercialized resin – ready to help expand the potential for packaging films across a wide range of applications.

INNATE™ resins are born from a breakthrough patented molecular catalyst coupled with advanced process technology that allows accurate and consistent control of the resin chemistry, offering performance levels and combinations of film properties like never before.

INNATE™ resins address many needs of the packaging value chain, specifically targeting critical performance gaps in the marketplace, and can help deliver lighter, stronger, more durable packaging films for:

- Food packaging
- Non-food consumer packaging
- Industrial packaging
- Heavy-duty shipping sacks
- Pallet containment
- Silage wrap
- Specialty packaging
- Components for artificial turf

More Performers. More Performance.

Table 1 presents an overview of the current developmental and commercialized resins in the family of INNATE™ Precision Packaging Resins. All INNATE™ resins offer the ability to precisely "dial in" desired properties in a manner never realized before.

Innate™
precision packaging resins by
DOW®

Valuable Versatility for the Entire Value Chain

The family of INNATE™ resins presents numerous processing and end-use advantages that deliver uncommon versatility, allowing use across a range of applications and offering valuable benefits to the entire value chain.

Converters

- Unprecedented downgauging possibilities due to the unique molecular structure
- Outstanding film toughness while maintaining stiffness (Figure 1)
- Versatility in formulations, including excellent blending capabilities to enhance film performance
- Ease of processability, with excellent bubble stability versus traditional metallocene resins – even for thick films

Brand Owners

- Advanced performance characteristics
- Potential for packaging differentiation
- An excellent sustainability profile, due to material reduction potential, while maintaining or exceeding performance requirements
- Outstanding film protection and packaging optimization
- New opportunities for packaging efficiencies through material substitution

Retailers

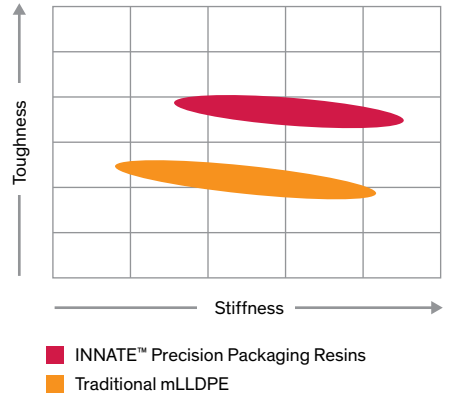
- Increased packaging reliability
- Improved package integrity for excellent shelf life
- Less product damage and fewer returns

Table 1: Current products in the INNATE™ Precision Packaging Resins family[2]

Product	Melt Index (g/10 min)	Density (g/cm³)	Applications
XUS 59910.03[1]	0.85	0.912	• Low temperature • Liquid bag-in-box • Medium performance sealant
XUS 59910.04[1]	0.85	0.915	• Liquid bag-in-box • Medium performance sealant • Protective packaging
INNATE™ ST50	0.85	0.918	• HDSS • Construction film • SUP • Protective packaging • General converter films

[1] Developmental product of The Dow Chemical Company
[2] Dow testing. Typical properties, not to be construed as specifications. Users should confirm results by their own tests.

Figure 1: Redefining the Stiffness/Toughness Balance



EXCELLENT PROCESSING & PRECISION PERFORMANCE FOR MANY APPLICATIONS

Figure 2: Comparative Heat Seal Performance[2]

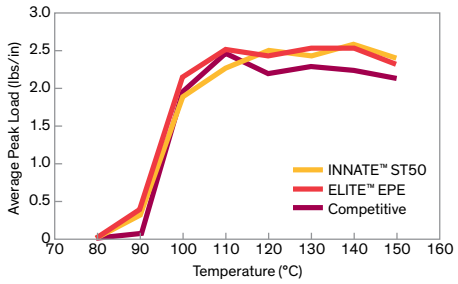


Figure 3: Advantages in Melt Strength vs. Competitive Resin[2]

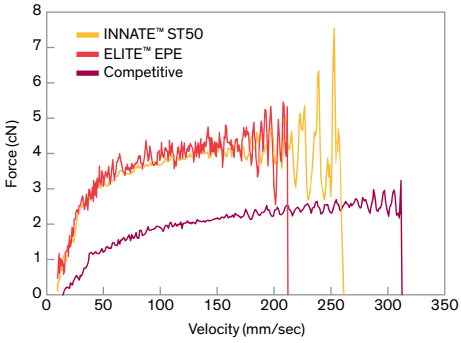
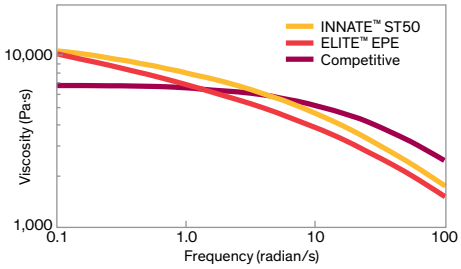


Figure 4: Improved Viscosity Profile vs. Competitive Resin[2]



INNATE™ Precision Packaging Resins address performance gaps in traditional packaging films through previously unknown combinations of processing ease, blending opportunities, "tunable precision," and drop-in convenience – together with excellent end-use characteristics across a range of applications.

INNATE™ resins have excellent heat seal performance, similar to a competitive mLLDPE (1 MI, 0.918 d) and to ELITE™ Enhanced Polyethylene (EPE) (Figure 2). For HDSS applications, as well as liquid packaging, where dependable seals are imperative, INNATE™ Precision Packaging Resins can be counted on for robust seal performance.

INNATE™ ST50 Precision Packaging Resin has demonstrated higher melt strength when compared to a competitive mLLDPE (Figure 3). That means improved processability and output rates.

What's more, INNATE™ Precision Packaging Resins exhibit more shear thinning than the competitive mLLDPE (Figure 4) – leading to lower melt temperatures, amps, and back pressure.

Fresh to Table

Durability and abuse resistance, with efficient processing by itself and in blends, make INNATE™ Precision Packaging Resins an excellent fit for food packaging in particular, and consumer product packaging in general.

They offer:

- Film toughness for enhanced package optimization
- Film stiffness needed for efficient filling, displaying, and storing of packages like stand-up pouches
- Improved toughness in combination with excellent flex crack resistance – advantageous for liquid packaging
- Excellent durability for package and product protection
- Outstanding toughness at refrigeration and frozen temperatures (Figure 5)
- Superb processability
- Down-gauging potential up to 25% while achieving similar or improved toughness (structure dependent)

For customers who need improved film mechanics in low temperature food packaging, INNATE™ resins such as XUS 59910.03[1] and XUS 59910.04[1] provide superior stiffness/toughness balance vs. mPE with excellent processability.

[1] Developmental product of The Dow Chemical Company
[2] Dow testing. Typical properties only, not to be construed as specifications. Users should confirm results by their own tests.

Figure 6 illustrates the robust flex crack performance and toughness required for bag-in-box liquid packaging. XUS 59910.03[1] and XUS 59910.04[1] developmental resins provide excellent stiffness/toughness balance vs. mPE with down-gauging potential of up to 18%* and offer:

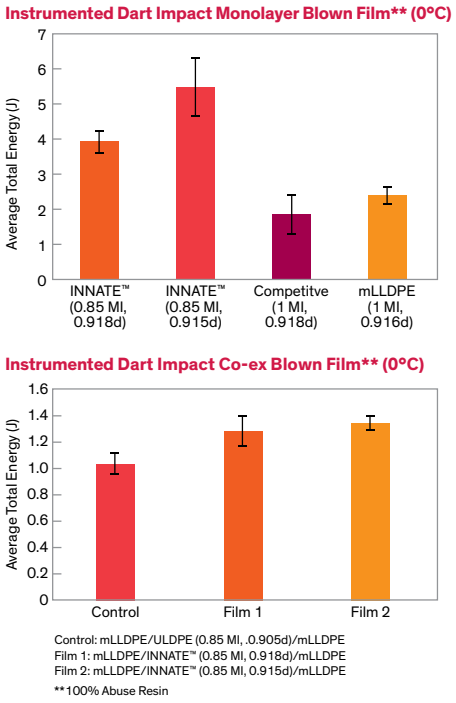
- Exceptional toughness & flex crack resistance
- Excellent processability
- Down-gauging potential while achieving similar or improved toughness with improved flex crack performance

Customers seeking dual functionality of abuse and seal performance in one-layer will find that INNATE™ resins provide excellent toughness and improved processability vs. mPE, while delivering medium performance sealing in non-laminated structures (Figure 7). The developmental resins XUS 59910.03[1] and XUS 59910.04[1] specifically offer:

- Excellent processability
- Dual functionality in one layer (abuse plus sealing)
- Potential for down-gauging with similar or improved toughness
- Design flexibility with two-in-one (sealability and abuse) approach

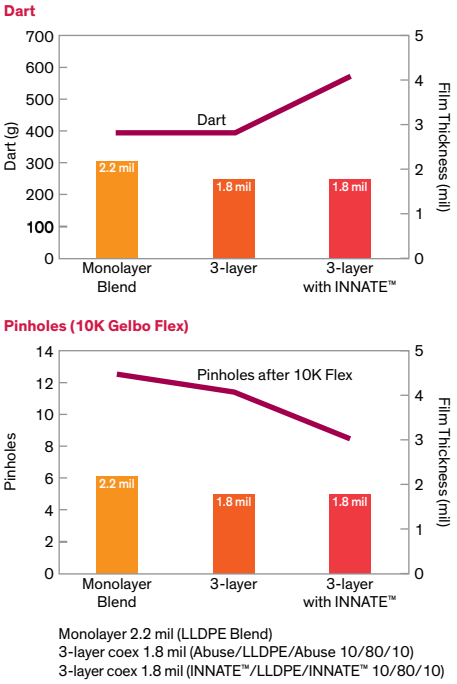
INNATE™ resins also provide a superior stiffness/toughness balance vs. mPE with better processability which affords improved film mechanics in PE or PE-rich pouches.

Figure 5: Improved Toughness at Lower Temperature[2]



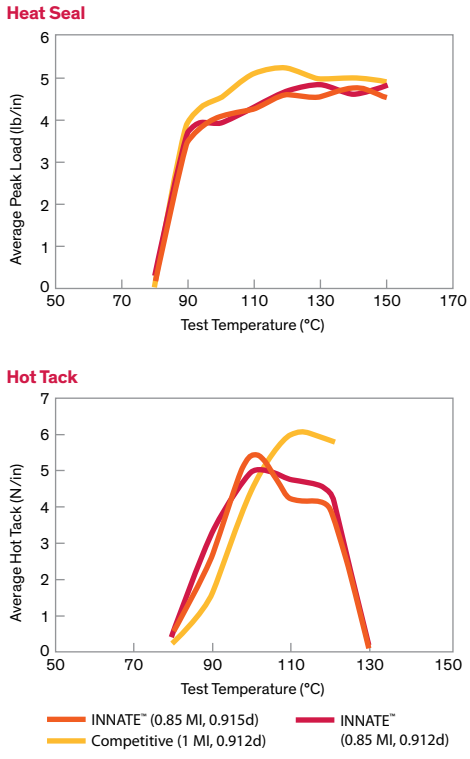
Control: mLLDPE/ULDPE (0.85 MI, .0.905d)/mLLDPE
Film 1: mLLDPE/INNATE™ (0.85 MI, 0.918d)/mLLDPE
Film 2: mLLDPE/INNATE™ (0.85 MI, 0.915d)/mLLDPE
**100% Abuse Resin

Figure 6: Toughness & Flex-crack Performance[2]



Monolayer 2.2 mil (LLDPE Blend)
3-layer coex 1.8 mil (Abuse/LLDPE/Abuse 10/80/10)
3-layer coex 1.8 mil (INNATE™/LLDPE/INNATE™ 10/80/10)

Figure 7: Non-laminated Heat Seal & Hot Tack[2]



*Dow tesing. Additional information available upon request.
[1] Developmental product of The Dow Chemical Company
[2] Dow testing. Typical properties only, not to be construed as specifications. Users should confirm results by their own tests.

OTHER APPLICATIONS

Figure 8: Improved Modulus and Dart Impact Balance[2]

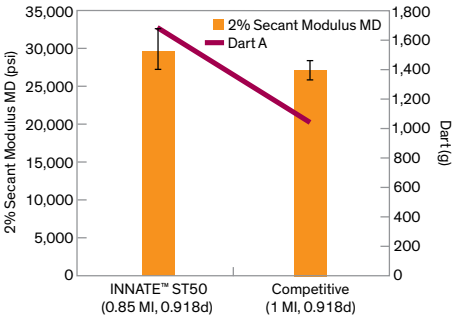


Figure 9: Better Stiffness/Toughness for Construction Films

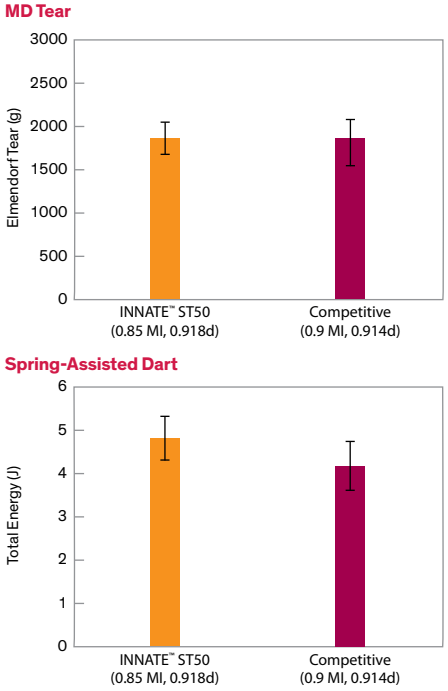
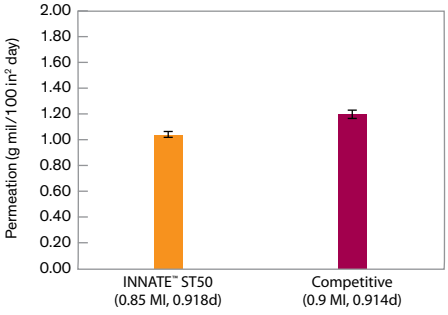


Figure 10: Improved Balance of Abuse & Moisture Barrier



Industrial Packaging

Films made using INNATE™ Precision Packaging Resins gain strength and toughness to stand up to virtually any challenging industrial film application, while offering excellent bubble stability for overall excellent processability.

Heavy-duty Shipping Sacks

Heavy-duty shipping sack manufacturers who need improved film mechanics and/or downgauging will find an advantaged stiffness/toughness balance vs. mPE with excellent processability.

With an outstanding combination of dart and modulus (Figure 8), robust bag drop performance has been documented, with 50-pound bags surviving eight-foot drops in testing.* Comparisons between coex films show up to 2x greater abuse resistance in films made with INNATE™ resins.*

INNATE™ ST50 Precision Packaging Resin offers another advantage: the potential to realize this performance with up to 10%* reduction in thickness! INNATE™ ST50 also presents comparable heat seal performance to popular incumbent resins for use across a wide range of industrial packaging applications (Figure 2, page 3).

Construction Films

For converters of thick construction films (>5 mils) needing to meet stringent industry codes & standards, INNATE™ resinsprovide excellent stiffness/toughness balance plus robust processability with or without LDPE for bubble stability. For such applications, INNATE™ ST50 resin offers:

- Distinctive combination of dart with moisture barrier
- Excellent processability for large diameter bubbles without the need for blending
- Robust performance for consistency in >5 mil films

And More

INNATE™ Precision Packaging Resins are so versatile that their capabilities benefit applications beyond traditional packaging – and even into other marketplaces.

The toughness and resiliency of the resins make them an excellent option for logistical applications such as **stretch wrap**. INNATE™ resins can also be used for **silage wrap** films and other **agricultural applications**.

The talents of INNATE™ Precision Packaging Resins even extend to the playing field, delivering resilient monofilament yarns for **artificial turf**.

*Dow testing. Additional information available upon request.
[1] Developmental product of The Dow Chemical Company
[2] Dow testing. Typical properties only, not to be construed as specifications. Users should confirm results by their own tests.

SHARING THE STAGE

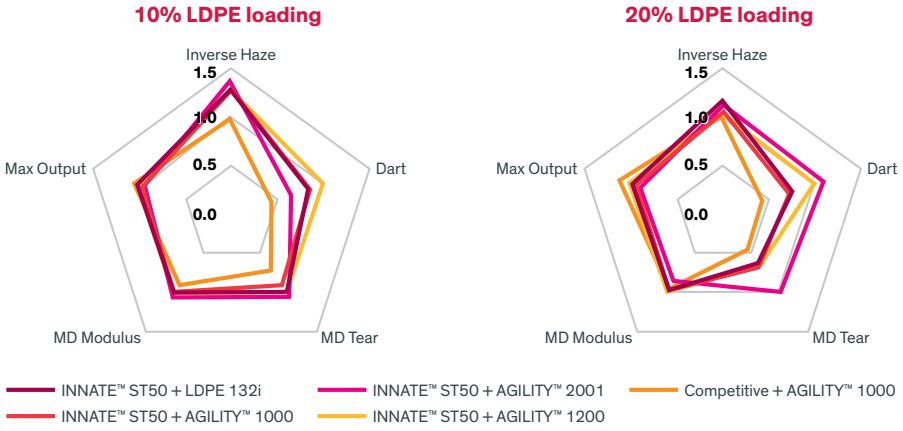
As shown in Figure 11 and in Table 2, INNATE™ resins demonstrate an excellent balance of processing and end-use properties when used in LDPE blends (especially AGILITY™ Performance LDPE Resins from Dow). This characteristic further enhances their ability to create valuable film structures.

Table 2: Blending with LDPE[2]

Value Proposition	10% LDPE Loading	20% LDPE Loading
Processability/Abuse	Current product: AGILITY™ 1000 or 2nd generation: AGILITY™ 1200	–
Dart/Tear/Optics	–	AGILITY™ 2001 or AGILITY™ 1021
Value Proposition	**Core Layer**	**Skin Layer**
Optics/Abuse	10% AGILITY™ 1200	20% AGILITY™ 1021 or AGILITY™ 2001

[2] Dow testing. Typical properties only, not to be construed as specifications. Users should confirm results by their own tests.

Figure 11: Property Balance[2]



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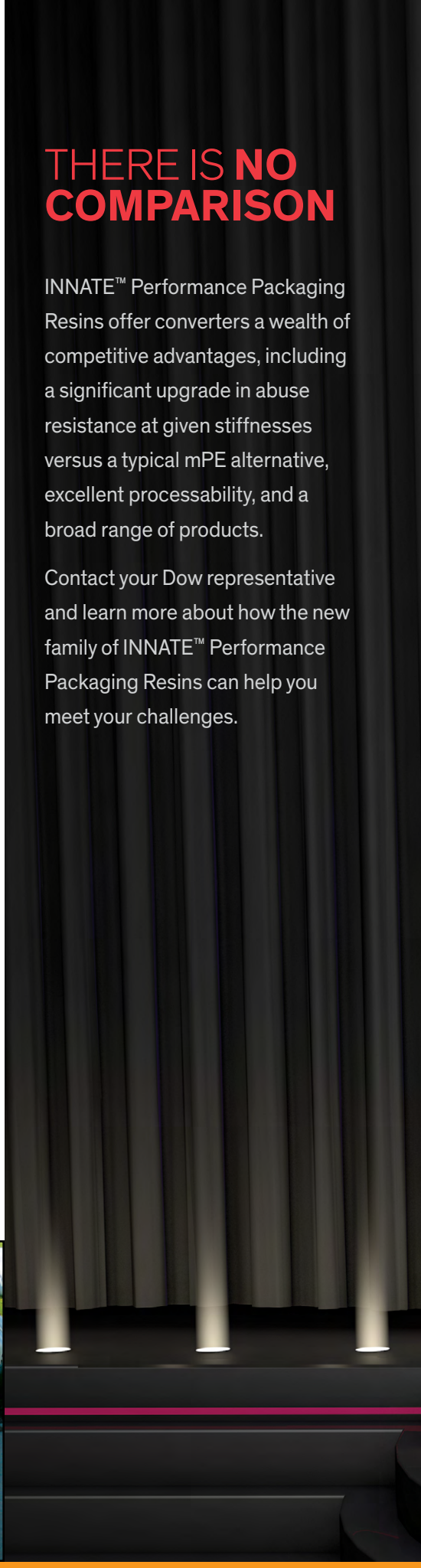

THERE IS **NO COMPARISON**

INNATE™ Performance Packaging Resins offer converters a wealth of competitive advantages, including a significant upgrade in abuse resistance at given stiffnesses versus a typical mPE alternative, excellent processability, and a broad range of products.

Contact your Dow representative and learn more about how the new family of INNATE™ Performance Packaging Resins can help you meet your challenges.

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	1 989 832 1426	Italy	800 783 825
Mexico	+ 1 800 441 4369	**South Africa**	00 800 99 5078
Latin America		**Asia Pacific**	+ 800 7776 7776
Argentina	+ 54 11 4319 0100		+ 603 7965 5392
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