



A NEW GENERATION OF PERFORMANCE LDPE RESINS

Agility[™]
performance LDPE



AGILITY™ PERFORMANCE LDPE – MEET THE GROWING FAMILY

AGILITY™ Performance LDPE Resins constitute a new family of resins which is elevating the performance standards of the LDPE category through:

SPEED: Enables higher throughput on existing extrusion equipment

FLEXIBILITY: Offers solutions for multiple markets – extrusion coating, blown and cast film, and polyolefin foams – and improved long term supply security and flexibility

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

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

AGILITY™ Performance LDPE resins are designed to challenge the limits and bring the best performance attributes of conventional autoclave and tubular into one resin, offering customers a sustainable, long-term solution meeting and exceeding the performance targets of conventional autoclave LDPE resins. Dow has integrated this technology with its expanding global manufacturing footprint in the U.S. Gulf Coast to provide global solutions for customers and industry.

Based on Dow's novel patented advanced tubular technology, AGILITY™ resins are a new generation of packaging resins developed to meet industry needs for higher line speed and optimal material use as well as to offer an improved long-term supply versus autoclave technology.

The LDPE global market is projected to grow 2.8% annually until 2025, while at the same time autoclave technology will be growing slower than the market due to old asset closures.¹

AGILITY™ resins have proven to deliver improved performance standards not only for extrusion coating and lamination, but also for cast and blown films and foams covering a wide range of applications:

- Extrusion coatings for beverages, consumer and industrial packaging
- Extrusion laminates for food, pharma and medical packaging
- Performance polyolefin foams for protective logistics packaging
- Lamination films for food, beverages, home and personal care goods
- Collation shrink films for consumer packaging
- Agricultural films
- Frozen food packaging
- Stand-up pouches



¹Source: IHS Global PE report, 2015

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Table 1: Overview of AGILITY™ Performance LDPE Resins

Commercial Product	Applications	Benefits	Melt Index dg/min	Density g/cm ³	Product Additives	Extrusion Technology
AGILITY™ 1000 Performance LDPE	Agricultural films Food packaging and lamination films Shrink films		0.18	0.920	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	Improved output/mechanics	0.65	0.921	AB	Blown Films
AGILITY™ 1021 Performance LDPE	Protective foams for protective packaging Food packaging and lamination films		1.85	0.920	None	Blown and Cast Films
AGILITY™ 1022 Performance LDPE	Bread bags		1.85	0.921	S/AB	Blown and Cast Films
AGILITY™ 2001 Performance LDPE	High clarity collation shrink film	Improved output/mechanics/optics balance	0.25	0.924	None	Blown Films
NEW! AGILITY™ 1200 Performance LDPE	Agricultural films Food packaging and lamination films Shrink films	High performance blending partner for LLDPE resins such as INNATE™ Precision Packaging Resins, ELITE™ Enhanced Polyethylene (EPE) and DOWLEX™ Polyethylene for improved output and mechanics	0.25	0.919	None	Blown Films
NEW! AGILITY™ EC 7000 Performance LDPE	Board laminates for liquid beverages and semi-solid food Tableware Food sachets Pouches for food and pharma Release liners for labels Imaging paper Medium to high density foams for protective packaging	High speed/light weights for extrusion coating & lamination Very smooth surface finishing foams for protective packaging	3.9	0.919	None	Extrusion Coating & Lamination/ Polyolefin Foams
NEW! AGILITY™ EC 7220 Performance LDPE	Paper and board coating and lamination for liquid board laminates and pouches where packaging integrity for shelf-life is key Very low density foams for protective packaging	High performance blending partner for ELITE™ EPE for high speed/light weights extrusion coating & lamination Light foams for protective packaging	1.5	0.918	None	Extrusion Coating & Lamination/ Polyolefin Foams
NEW! AGILITY™ EC 7080 Performance LDPE	Paper and board coating and lamination, especially sachets for food packaging where fast packaging speed is key	Very high speed/light weights for extrusion coating & lamination	8.0	0.918	None	Extrusion Coating & Lamination

AGILITY™ 1000, 1001, 1002, 1021, 1022, 1200, 2001 – NAA and LAA, for other regions availability check sales representative
AGILITY™ EC 7000, EC 7220 and EC 7080 – global



RAISING THE BAR IN FILMS

AGILITY™ Performance LDPE Resins enable an uncoupling from conventional rules in LDPE between melt strength and melt index. This offers those customers in the blown film industry serving a wide range of applications within food and industrial packaging and agricultural films the ability to produce thinner films faster for improved conversion efficiency and sustainability.

AGILITY™ 1200 Performance LDPE Resin is specifically designed to be used as a blending partner with LLDPE resins such as DOWLEX™ Polyethylene, ELITE™ Enhanced Polyethylene (EPE), and INNATE™ Precision Packaging Resins for best output/mechanics balance:

- Improved output:
 - up to +18% vs. industry standard film resin such as DOW™ LDPE 1321/310E
 - lower apparent viscosity at the same MI
 - lower screen pressure (by about 10%)
- Higher melt strength vs. standard fractional tubular resins for improved bubble stability and processability
- Good film properties
 - Dart and MD secant modulus similar to AGILITY™ 1000
 - MD tear 10-25% improved

Figure 1: Comparative melt strength – AGILITY™ 1200 vs. standard LDPE (190°C)

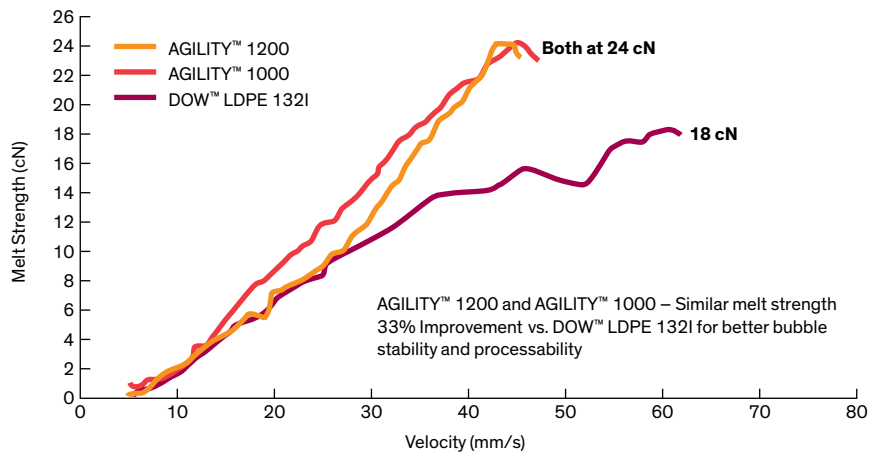
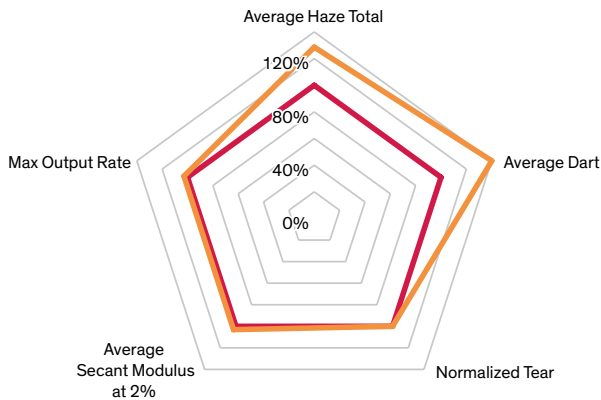


Figure 2: Packaging and conversion performance comparison in blends, 20% AGILITY™ 1200 loading with INNATE™ Precision Packaging Resins



RAISING THE BAR IN EXTRUSION COATING & LAMINATION

AGILITY™ EC Performance LDPE Resins have been specially designed to meet coatings industry needs on high conversion speed and light coating weights for improved conversion efficiency and sustainability. Additionally, AGILITY™ resins offer customers and the industry a sustainable, long-term supply solution to autoclave technology.

In addition to the latest commercial grade, AGILITY™ EC 7000, the first product introduced, the technology platform is expanding the family with two more resins designed to meet current and future needs of the packaging industry.

AGILITY™ EC 7000 is specifically designed to allow for:

- High coating speeds
- Light coating weights

AGILITY™ EC 7220 is specifically designed to be used as a blend partner in ELITE™ EPE rich blends, for example up to 70%, for:

- High coating speeds
- Light coating weights
- Improved sealability

AGILITY™ EC 7080 is specifically designed to allow for:

- Very high coating speeds
- Very light coating weights

AGILITY™ resins versus incumbent autoclaves offer LDPE's following advantages:

- Global availability
- Improved long-term supply flexibility
- Excellent adhesion
- Good organoleptics
- Ease of process even at high speed

Figure 3: Comparative neck-In – AGILITY™ EC 7000 and AGILITY™ EC 7080

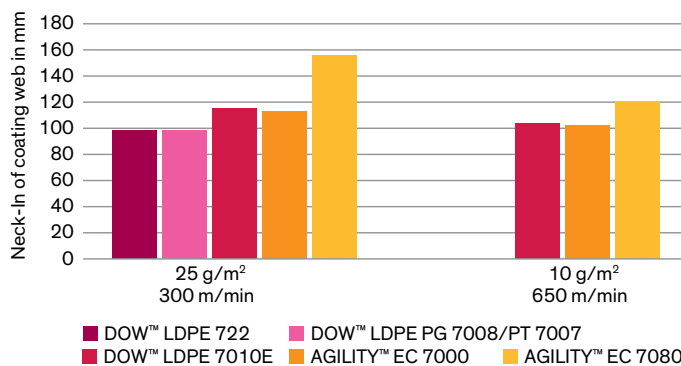


Figure 5: Comparative neck-In – AGILITY™ EC 7220 Blended with 70% ELITE™ 5860 in all cases, extruded at 320°C

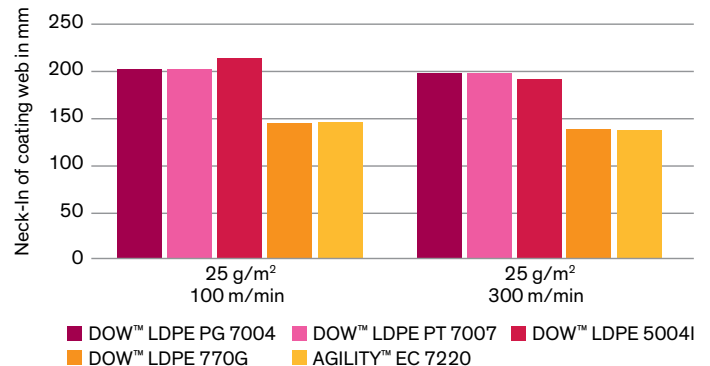


Figure 4: Comparative draw down¹ – AGILITY™ EC 7000 and AGILITY™ EC 7080

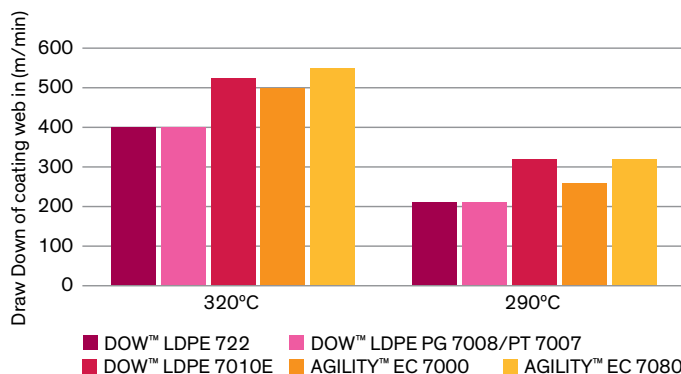
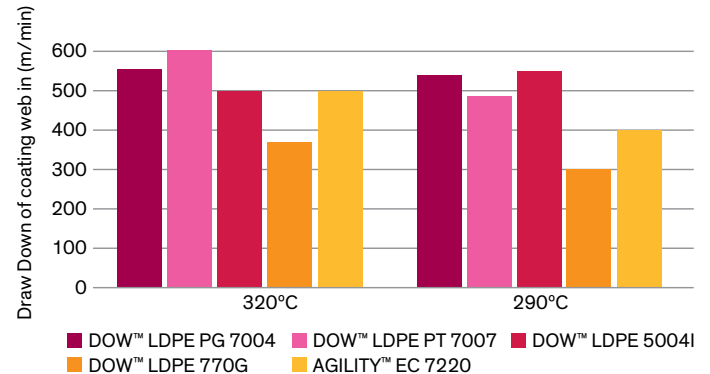


Figure 6: Comparative draw down¹ – AGILITY™ EC 7220 Blended with 70% ELITE™ 5860 in all cases



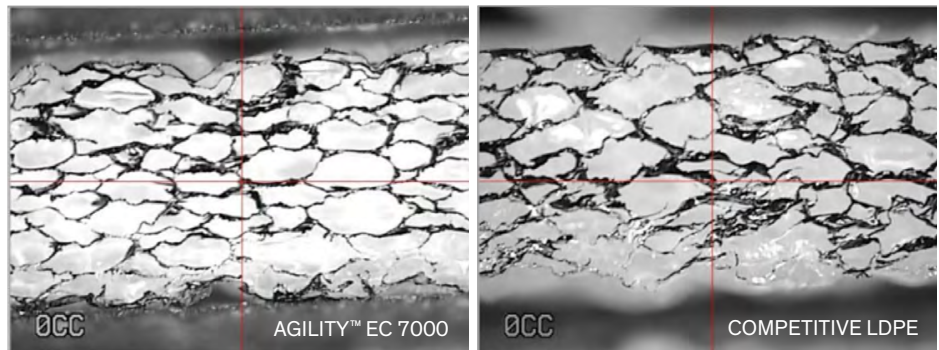
¹Draw down: Data generated in Pack Studios lab by fixing the throughput as 15 [g/sqm] at 100 [m/min] line speed and ramping the substrate speed until the first considerable instability of either instable web edges, edge tear or web tear occurred.

RAISING THE BAR IN FOAMS FOR PROTECTIVE PACKAGING

The e-commerce retail market, accounting for roughly 7% of global retail sales, has been growing spectacularly over the past years, and it is projected to keep growing at double-digit rates annually. This will drive growth of the logistics packaging market and polyolefin foams¹.

AGILITY™ Performance LDPE Resins, designed with very high melt strength, have proven to deliver a very stable foaming process and improved mechanics, optimizing material use in polyolefin foams used mainly for protective logistics packaging.

Figure 7: Comparative foam structures



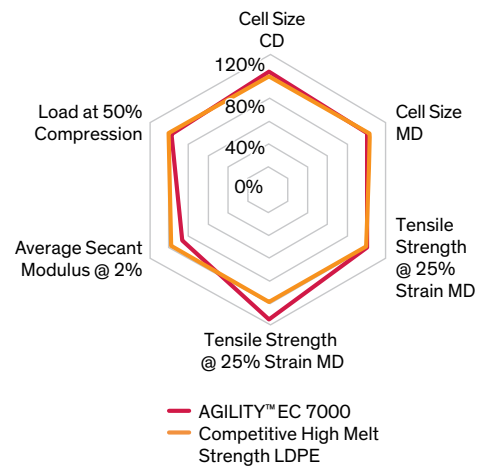
For medium to high density foams, AGILITY™ EC 7000 offers the following advantages:

- Potential for smaller cell sizes
- Potential for reduced foam density
- Improved mechanical properties
- Reduced corrugation
- Broad processing window
- Very smooth surface

For very low density foams (<20 kg/m³), AGILITY™ EC 7220 offers the following advantages:

- Improved cell stabilization
- Very good processability (equivalent to a 2.0 MI resin)

Figure 8: Comparative foam conversion and performance – AGILITY™ EC 7000



¹ Source: Euromonitor, 2015

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PACK STUDIOS: A NEW MODEL FOR COLLABORATION

To further enable the development of packaging innovation, Dow introduced Pack Studios, a collaborative capability of Dow Packaging and Specialty Plastics, which helps accelerate packaging application projects through a global network of labs, experts and testing equipment. Currently, there are six Pack Studios centers around the globe – Freeport, Texas; Horgen, Switzerland; Mozzate, Italy; São Paulo, Brazil; Shanghai, China; and the newest location in Ringwood, Illinois near Chicago.

Each center features a collaboration room to inspire solution-based thinking, laboratory facilities for material development, and fabrication and testing equipment to validate packaging applications. Customers and other members of the packaging value chain who visit Pack Studios have the opportunity to collaborate with a dedicated Dow technical team and a global network of industry professionals that have a wealth of experience in packaging application, materials and design.

At Pack Studios customers are able to test applications for primary, secondary and tertiary packaging. Pack Studios allows us to:

Minimize the downtime associated with prototyping and testing, along with the wear and tear on your own equipment.

Accelerate the development of new packaging applications by providing the materials expertise and prototype capabilities you need to deliver innovative packaging solutions.

Validate packaging concepts through modeling, sensory testing, and supply chain analytics.

Do quick **evaluations** of existing and nascent technologies for **better packaging.**

Talk to us.

Working together will enable us to find better ways to capture the value of future opportunities in packaging applications!

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- use as a critical component in medical devices that support or sustain human life; or
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