ExxonMobil

High-performance thermoformed barrier packaging films

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ExxonMobil's polyethylene portfolio, including Exceed™ XP and Exceed™ performance polymers, delivers extreme performance in barrier films for thermoformed packaging. These high-integrity films protect and preserve food quality and enhance food safety, while delivering cost savings across the value chain.

Delivered attributes	Derived benefits & potential value
Enhanced toughness	▪ Improved puncture resistance ▪ Reduced number of re-packs/ food waste ▪ PE or PA material reduction opportunity for unit cost reduction
Excellent sealing	▪ Low SIT and optimum seal strength ▪ Potential plastomer reduction or replacement with mLLDPE
Excellent optical properties	▪ Outstanding visual appeal for brand promotion ▪ Improved clarity on blown film equipment
High productivity	▪ Excellent thermoformabilty providing consistent corners ▪ Opportunity to run at higher output

Innovation opportunities

Converters can use Exceed XP and Exceed to create innovative thermoformed barrier packaging solutions. Because each polymer offers specific attributes, the toughness, sealing capabilities and optical properties of the film can be tailored to meet the needs of the application, while enhancing processability.

- **Exceed XP** – when eXtreme Performance matters – offers an unrivaled property combination of extreme toughness and stiffness, elevated sealing capabilities and enhanced processability.
- **Exceed** offers superior performance through high toughness and sealing with outstanding optical properties.

When extreme performance is required, thermoformed barrier packaging films based on Exceed XP and Exceed deliver the following benefits:

- Enhanced performance: puncture resistance and dart impact
- Up to 30% PE downgauging opportunities
- Excellent optical properties: high gloss, clarity and reduced haze (on blown film lines)
- Potential to reduce polyamide use

Sustainability benefits

Improved puncture resistance and enhanced toughness delivers high package integrity, reducing the need for re-packaging and lessening the amount of food waste. Toughness and puncture resistance also allows thinner gauge films for less material use, while package integrity is maintained.

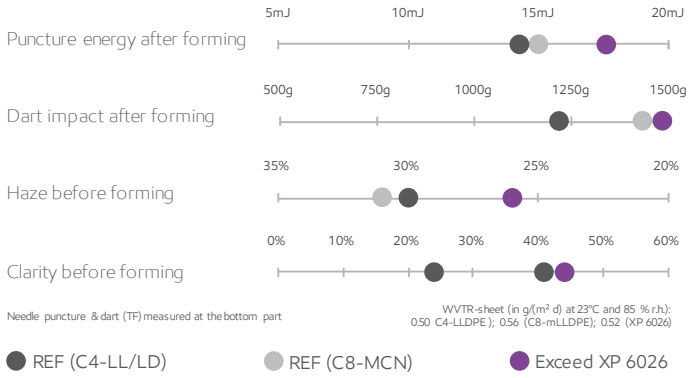
Excellent thermoforming and extrusion

These performance polymers deliver excellent thermoformability without the need for LDPE. They also provide optimized output and melt pressure.

when eXtreme Performance matters

Enhanced film performance

Figure 1: Exceed XP and Exceed formulated film and reference films.



Regular blown case. Thermoforming parameters (TF): no plug/vacuum forming, temp. 100°C, 9 cm depth, DR 3.6 (deep draw).

Table 1: Product data for an Exceed XP and Exceed formulated film and reference films.

	Melt index (g/10 min)	Density (g/cm³)	Exceed XP 200 µm film (XP 6026)	Reference 200 µm film (C4-LLDPE)	Reference 200 µm film (C8-mLLDPE)
Exceed XP 6026	0.2	0.916	■		
Exceed 3812	3.8	0.912	■		
Exceed 1012	1.0	0.912	■		
C4-LLDPE	1.0	0.918		■	
LDPE	0.33	0.916		■	■
C8-mLLDPE	1.0	0.916			■
C8 plastomer	1.0	0.902			■

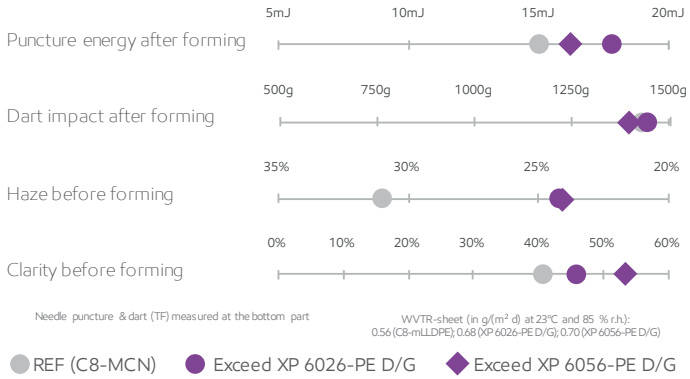
CoPA 6,66 thickness was held constant (60 µm)
Tie layer: blend of conc. Tie resins and C4-LLDPE (28:72), was held constant (40 µm)
Data traceability: MAC 201706.0294
Data from tests performed by or on behalf of ExxonMobil

Compared to a 200-micron market reference film, a 11-layer, 200-micron thermoforming film based on Exceed™ XP and Exceed™ performance polymers offers:

- Enhanced puncture and dart
- Improved blown film optical properties
- Excellent sealing
- Enhanced extrudability

Excellent optics and downgauging opportunity

Figure 2: Exceed XP and Exceed formulated film and reference film.



Regular blown case. Thermoforming parameters (TF): no plug/vacuum forming, temp. 100°C, 9 cm depth, DR 3.6 (deep draw).

Table 2: Product data for an Exceed XP and Exceed formulated film and reference film.

	Melt index (g/10 min)	Density (g/cm³)	Exceed XP 170 µm film (XP 6026-PE D/G)	Exceed XP 170 µm film (XP 6056-PE D/G)	Reference 200 µm film (C8-mLLDPE)
Exceed XP 6026	0.2	0.916	■		
Exceed XP 6056	0.5	0.916		■	
Exceed 1012	3.8	0.912	■	■	
Exceed 3812	1.0	0.912	■	■	
C8-mLLDPE	1.0	0.916			■
LDPE	0.33	0.916			■
C8 plastomer	1.0	0.902			■

CoPA 6,66 thickness was held constant (60 µm)
Tie layer: blend of conc. Tie resins and C4-LLDPE (28:72), was held constant (40 µm)
Data traceability: MAC 201706.0294
Data from tests performed by or on behalf of ExxonMobil

Compared to a 11-layer, 200-micron market reference film, a 11-layer, 170-micron thermoforming film based on Exceed XP and Exceed performance polymers offers:

- 15% downgauging (30% PE reduction)
- Enhanced optics
- Excellent extrudability
- Excellent sealing

Test items	Test methods based on
Needle puncture test	CEN 14477
Impact resistance by free-falling Dart : method A	ASTM D1709
Clarity	ASTM D1746
Total haze	ASTM D1003
Melt index	ASTM D1238
Density	ASTM D1505
Film thickness & PA layer thickness measurement	ExxonMobil test method
Water vapour transmission rates (WVTR)	DIN EN ISO 15106-3: 05/2005 at 23 °C / 85 % à 0 % r.h. (MOCON instrument)

Exceed™ XP performance polymers — when eXtreme Performance matters.

Discover how our formulation expertise can help you select the right performance polymers for your barrier film formulations, visit: **exxonmobilchemical.com**

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