New Material Developments for Extreme Film Performance

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Polyethylene growth continues to outpace GDP

Source: IHS World Analysis 2016, UN World Population Prospectus 2015
Polyethylene solutions boost sustainability

- Damage Rate up to 5%
- Damage Rate <1%
- 100% (three icons)
- 30%
- 55%

Source: ExxonMobil Chemical Study, peer reviewed by external panel per ISO 14040 & 14044 – Images are representative of potential product applications.
Exceed™ XP performance polymers expand portfolio

**Exceed™ - for superior performance**
High toughness and sealing with outstanding optics

**Enable™ - for optimum solutions**
Excellent bubble stability with higher alpha-olefins (HAO) properties

**Exceed™ XP – when eXtreme Performance matters**
Step-out mechanical properties with excellent processability

**Mechanical Properties**
- Flex Crack Resistance
- Dart Impact
- MD Tear

**Processability**
- LLDPE Blends
- LDPE Blends

**Industry C8 mLLDPE Reference**
Processing advantages

- Unique molecular architecture allows
  - Shear thinning characteristics translating into **higher extrusion rates**
  - High melt strength of fractional-MI grades translating into great bubble stability

Results in increased toughness at higher output
Enhanced stiffness

- Repositions polyethylene stiffness / density correlation
  - Up to 30% average modulus increase
    (at 0.916 g/cm³ density)

- Stiffness gain depending on film structure and processing conditions

Possibilities for downgauging with improved properties
Thin film applications

Film performance
- Exceptional thin-film MD tear strength at high MD orientation
- Synergistic effect of linear blends on MD tear strength
- Exceptional toughness
- High melt strength, without the need for LDPE addition

Derived benefits and potential value
- Enhanced performance of thin films in agricultural and other applications
- Reduced waste and spoilage
- Cost-effective solutions with linear blends
- Shifts performance / output balance

Helps deliver strong film integrity especially in thin film solutions

Exceptional MD tear on thin Exceed XP monofilm films

Impact of linear blends on 1-mil monofilm properties

Monofilm structures based on Exceed XP 8656 – die gap 1.5 mm, die diam.:160 mm, BUR 2.5, output 135 kg/h, frost line height 760 mm (top chart) and 710 mm (bottom chart) – Melt temperature: 223-229 °C
Applications to enhance value

Liquid Packaging
Beneficial attributes
- Stiffness / toughness
- Flex crack resistance
- Sealability / machinability

Value
- Downgauge film up to 30%
- Up to 20% cost reduction
- Reduced package failures

Food Packaging
Beneficial attributes
- Stiffness / toughness / tear
- Sealability / machinability
- Bubble stability

Value
- High output
- Downgauging potential
- High packaging integrity

Construction Liners
Beneficial attributes
- Bubble stability
- Extreme Toughness (Dart)
- High tensile with modulus

Value
- Up to 33% higher output
- Surpasses class-A standards
- Less reprocessing

Agricultural Films
Beneficial attributes
- Exceptional MD tear* in thin films
- Extreme toughness
- High bubble stability /output

Value
- Higher film performance
- Cost saving opportunities
- Reduced risk of spoilage

*in thin films
Exceed™ XP performance polymers in liquid packaging

- Improved containment integrity
- Down-gauging up to 30%
- Up to 20% lower packaging cost
- Reduced supply chain cost & emissions
We welcome you to discover:

• Further extending new Exceed™ XP performance polymers
  – step-out mechanical properties
  – high melt strength and output
  – controlled holding force

• Tech talks from industry experts

• Solution demonstrations on the machines of the leading manufacturers

Come and see us at K2016
October 19 – 26
Dusseldorf, Germany
Pavilion FG04
Summary

• Worldwide megatrends drive global PE demand
• PE growth continues to outpace GDP
• Significant NA capacity additions increasing supply to global needs
• EM expanding portfolio to support broad range of packaging needs
• EM committed to growth via investment, innovation and collaboration
## Test methods

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