



The extreme performance polymer: Exceed™ XP performance polymers

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February 25, 2019
Houston, TX

Energy lives here™

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Overview

Introduction

Exceed™ XP family products values

Factors to design an extreme performance blown film

- Processability
- Mechanical strength



Market needs from around the world drive innovation



Flexible packaging market needs



Cost Savings

Downgauging
Processability
Simplified solution

Integrity/Durability

Toughness
Sealing
Shrinkability

Aesthetics

High gloss
Transparency
Printability

Convenience

Package features
Ease of use
Single serving

Sustainability

Recyclability
Resource efficiency
Reduce waste

Up to **15%** output increase



with Exceed™ XP 6026 performance polymer vs. mLL rich skin reference

Refer slide 11 for processing data

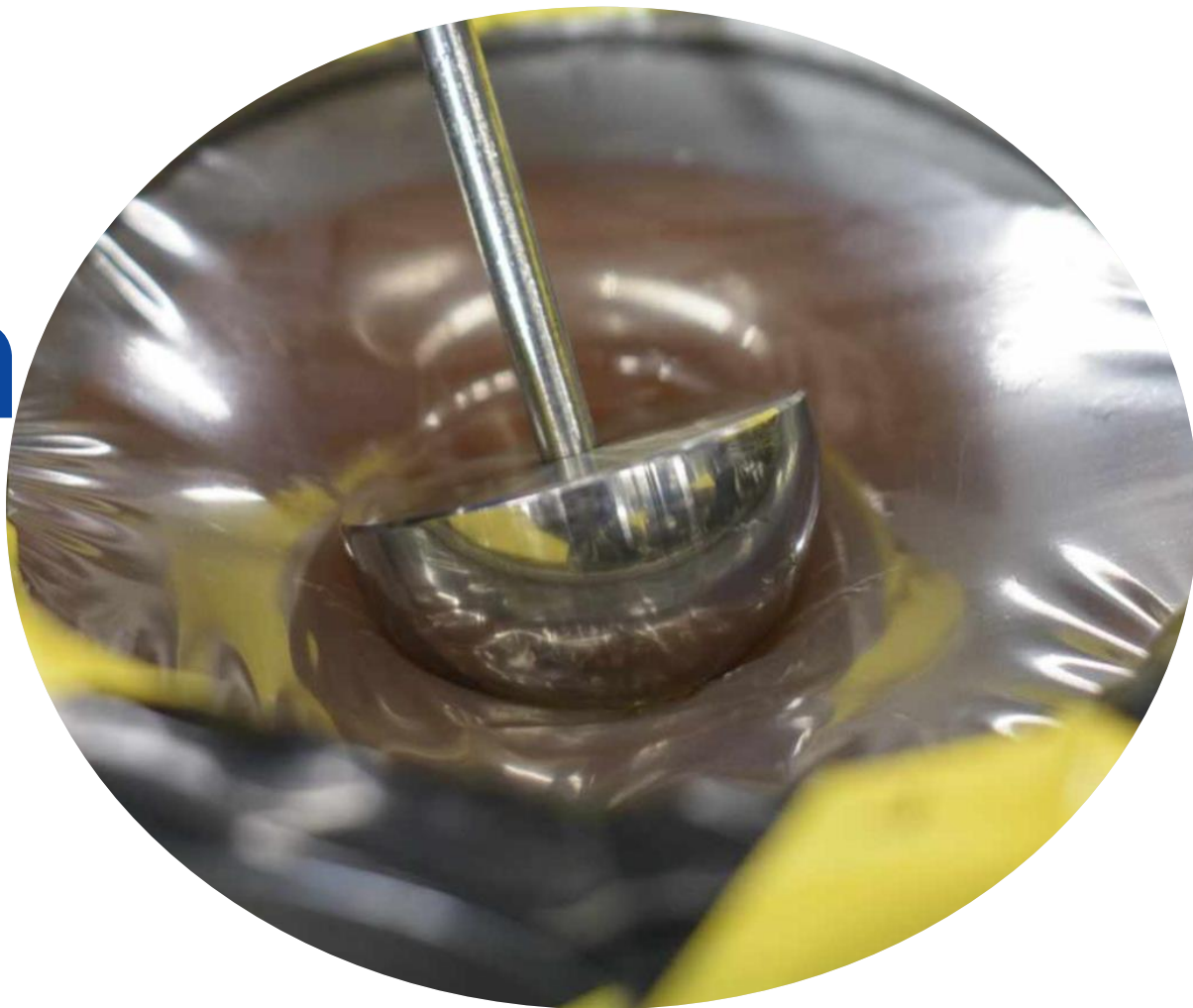
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Exceed™ XP, Exceed™ and Enable™ performance polymers

Data from tests performed by or on behalf of ExxonMobil

40g/μm

Dart impact with
Exceed™ XP 8656
performance polymer

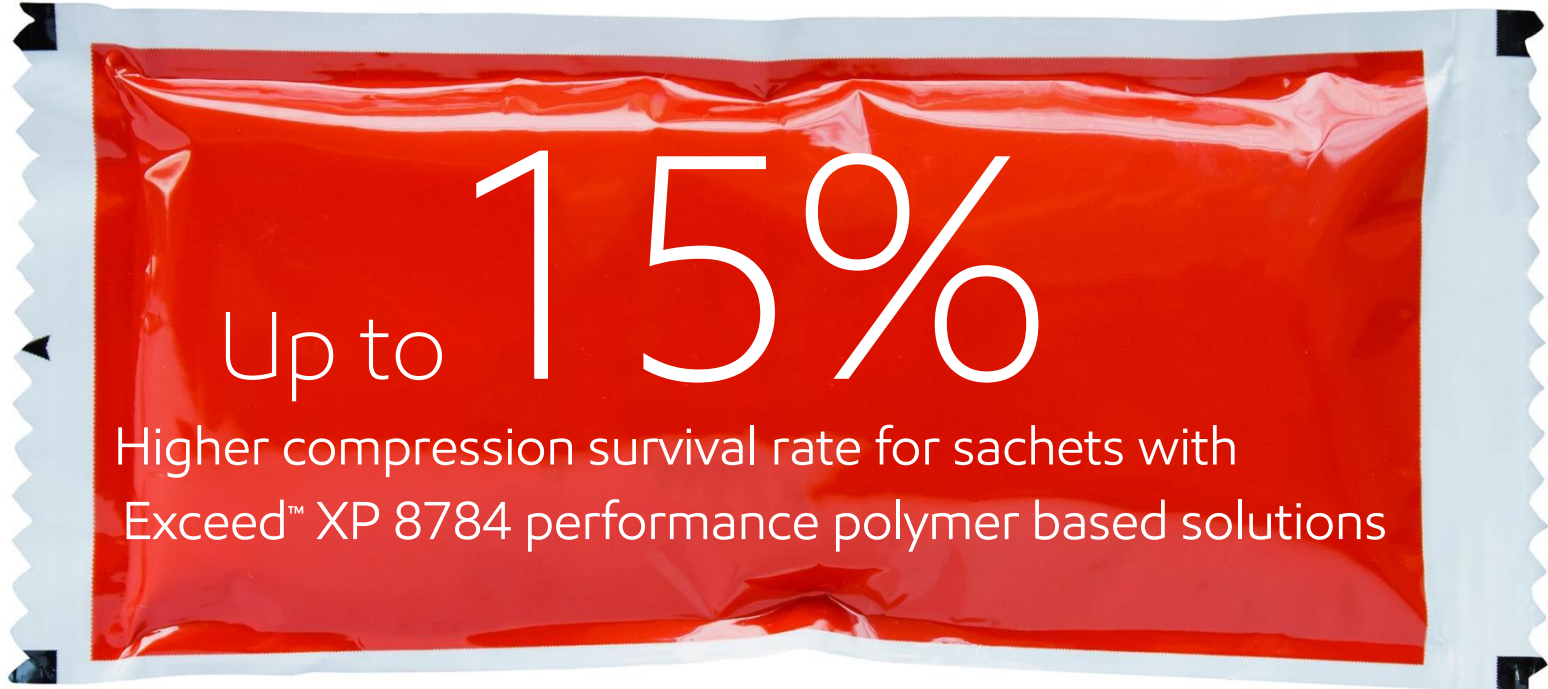


Refer slide 13 for data

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Refer slide 15 for data

Introducing Exceed™ XP performance polymers

■ Exceed™ XP

when eXtreme Performance matters

A new balance of toughness, sealing, and stiffness, combined with easier processing at lower energy



Enable™

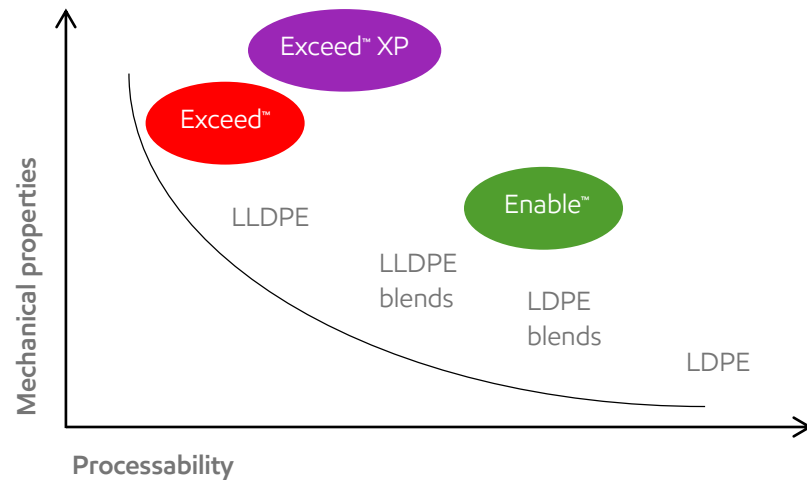
for optimum solutions

Combining excellent processing and bubble stability with toughness not realized in LDPE blends

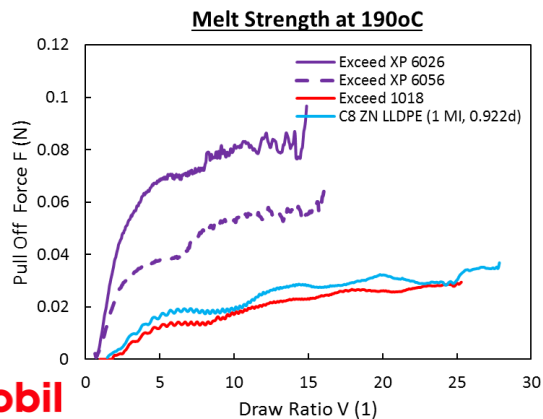
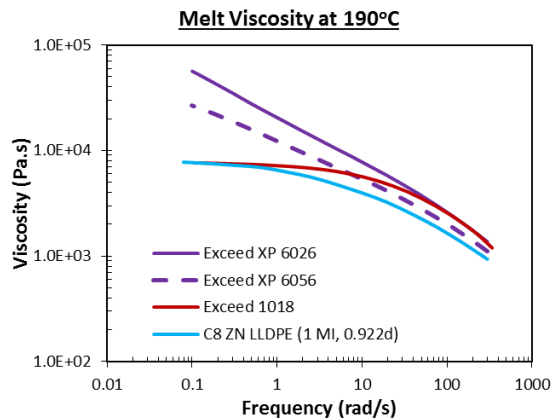
■ Exceed™

for superior toughness

Excellent mechanical performance for down-gauging/light-weighting, with outstanding sealing properties and best-in-class optics



High melt strength with easier extrusion



- Exceed™ XP grades are designed to deliver
 - Higher zero-shear viscosity translating to higher melt strength for **greater bubble stability**, especially for Exceed XP 6026 performance polymer
 - Increased shear thinning for **lower-energy extrusion**, especially for the higher MI Exceed XP 6056 performance polymer

Exceed™ XP rebalancing processability

■ Exceed XP 8784

■ Exceed 1018

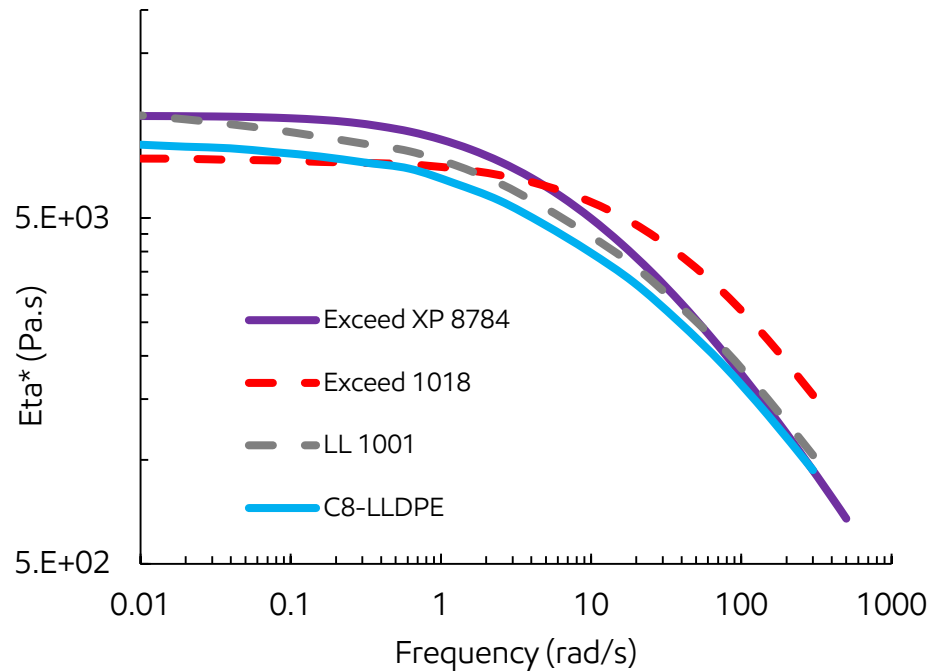
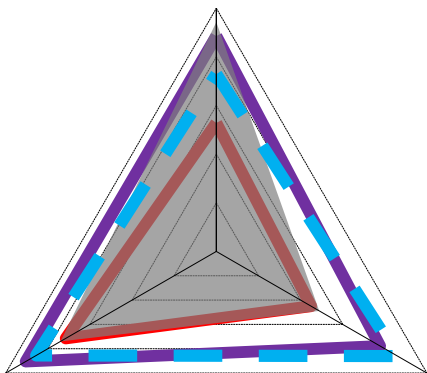
■ LL 1001

■ C8-LLDPE

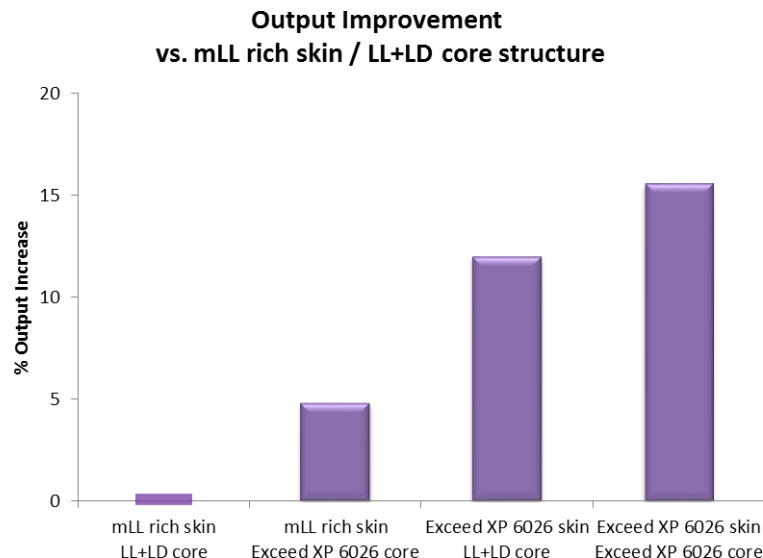
Maximum Output
[100-170] Kg/h

Motor Load
[80-60] %

Melt Pressure
[500-320] Bar



Increased blown film output

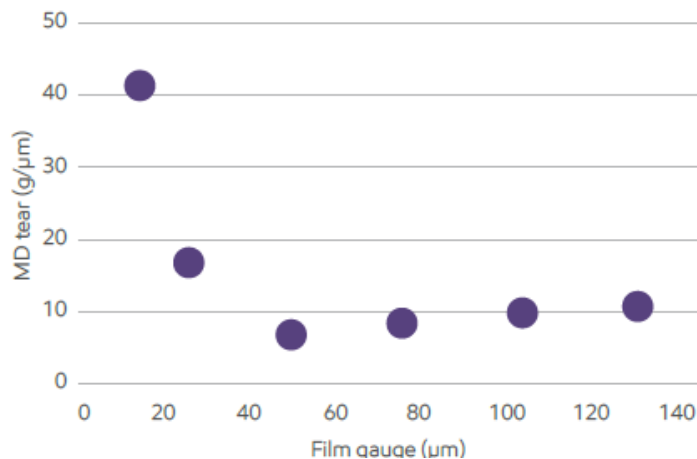


- Traditional 3-layer packaging film with
 - Metallocene sealants in the skins
 - And LLDPE/LDPE blends in core
- Saw more stable bubble/higher rates with
 - Exceed XP replacing the LDPE blend
- And even more stable bubble with Exceed™ XP sealant skins
- Leading to core and skins using the same resin
 - To allow higher rates
 - Eliminating blends
 - And simplifying operations

Exceed™ XP, Exceed™ and Enable™ performance polymers

All data from tests performed by or on behalf of ExxonMobil

Extreme MD tear

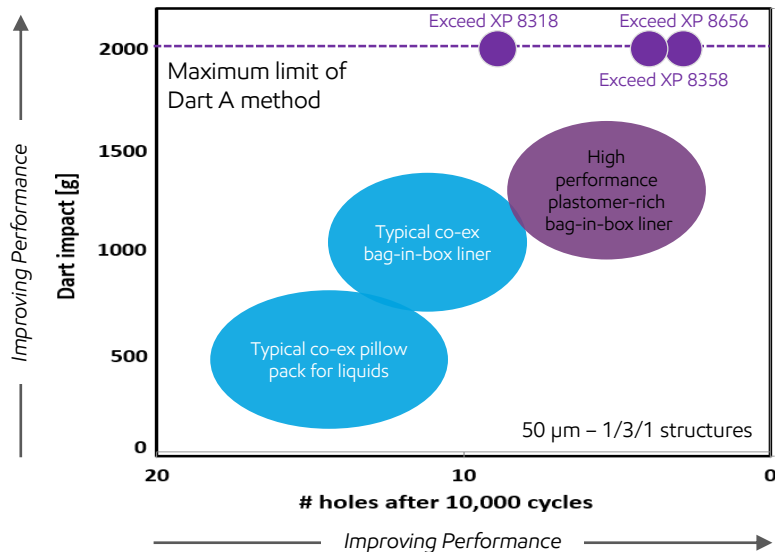


Exceed™ XP 8656 demonstrates extreme MD tear resistance in blown films when processed with

- high machine orientation – low blow-up ratio (BUR)
- high outputs
- low frost line height (FLH)
- wider die gap.

This attribute is specifically demonstrated in thin films, which is a unique feature versus conventional polyethylene grades.

Step-out mechanical properties

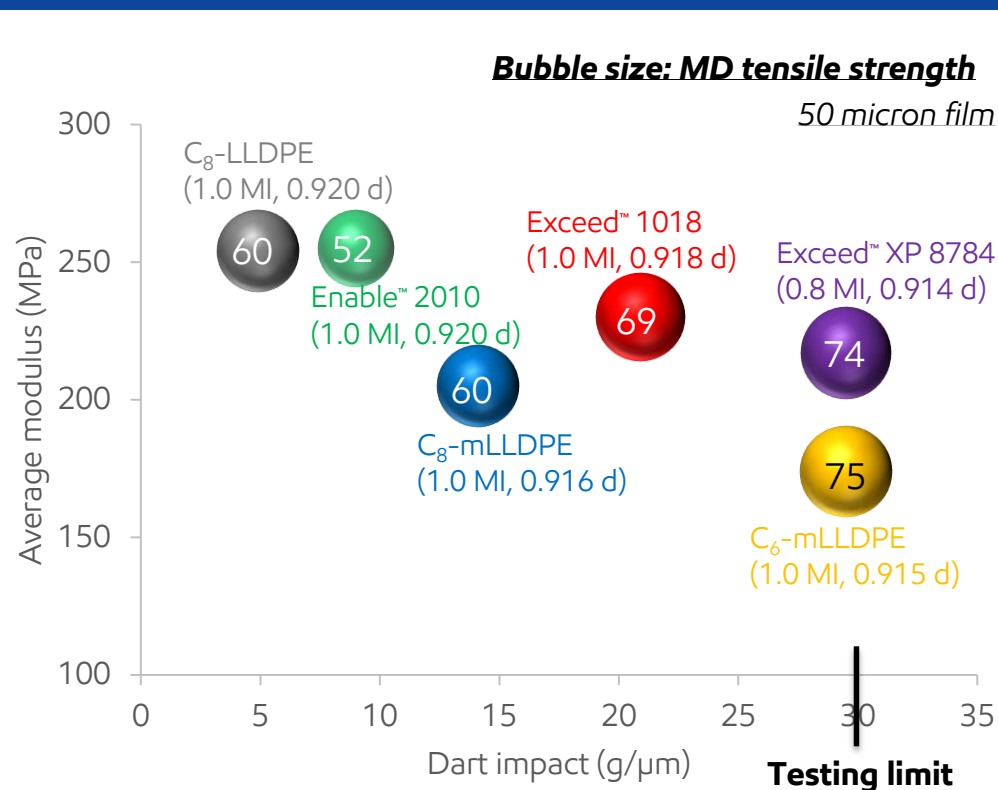


Product (for 25 μm mono film)	MD Tear (g)	TD Tear (g)
Exceed XP 8318	370	470
Exceed XP 8656	500	540
Exceed XP 8358	530	500
Exceed 1018	255	413
C8 ZN LLDPE (1.0, 0.920)	425	625
C8 mLLDPE (1.0, 0.916)	232	600

- Extreme **Dart impact**
 - Dart ≥ Leading C6 / C8 mPE; FMI Super C6
- Exceptional **flex-crack resistance**
- Outstanding **MD tear** with high machine orientation (gauges ≤ 25μm) and no long-chain branching in formulation
 - MD Tear ≥ Super C6 / Solution C8 on thin films

Exceed™ XP performance polymers enables up to 30% downgauging with eXtreme Performance attributes

Superior toughness and stiffness balance



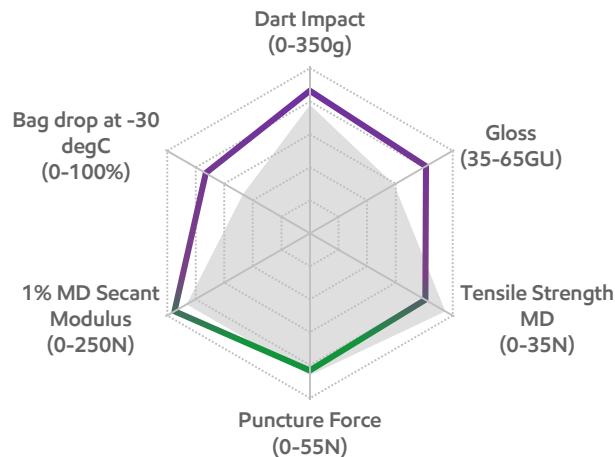
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Exceed™ XP performance polymers

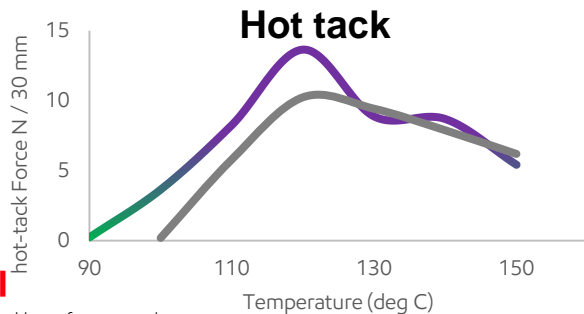


Freezer film: non-laminated



Exceed™ XP 8784 performance polymer solution provides:

- Opportunity of ~33% downgauging
- Excellent low temperature bag-drop performance
- Great hot-tack performance
- Superior stiffness despite downgauging
- Enhanced dart and gloss



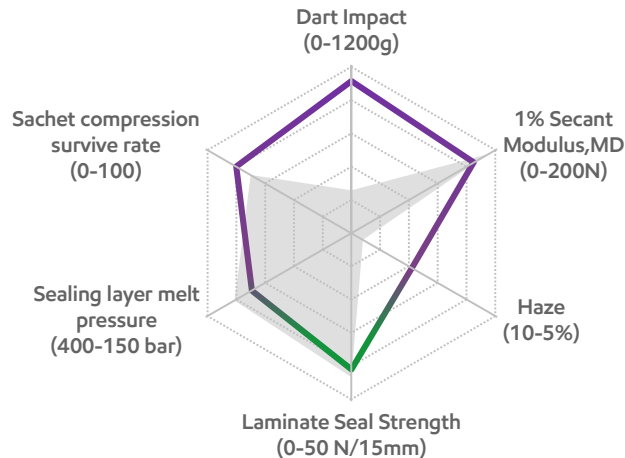
	Reference 60µm	EMC 40µm
Ratio	1 / 2 / 1	1 / 2 / 1
Outer/Inner	90% C8-LLDPE 10% LDPE	75% Exceed XP 8784 25% Enable 2005
Core	70% C8-LLDPE 30% LDPE	40% Exceed XP 8784 60% HDPE

C8-LLDPE (1 MI; 0.920 d); LDPE (0.3MI; 0.923 d); HDPE (0.7MI; 0.961 d)

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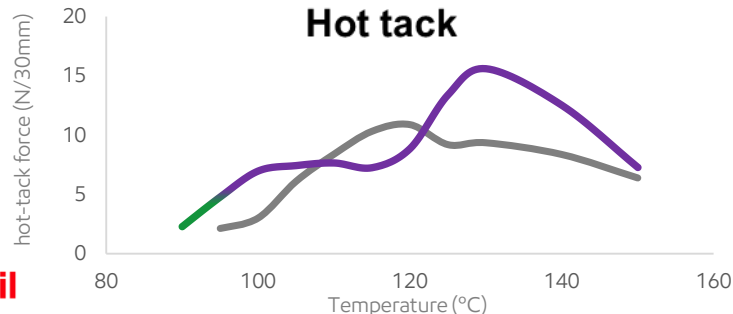
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Data from tests performed by or on behalf of ExxonMobil

Sachets



Exceed™ XP 8784 performance polymer solution provides:

- Opportunity of ~12% downgauging
- Excellent compression resistance
- Superior dart impact
- Maintained stiffness after downgauging
- Improved film optics
- Excellent hot-tack performance



	Reference 45µm	EMC: 40µm
Ratio	1 / 2 / 1	1 / 2 / 1
Outer	100% C8-mLLDPE	100% Exceed XP 8784
Core	90% MDPE 10% HDPE	70% Exceed XP 8784 30% HDPE
Sealing	30% C8- plastomer 30% LDPE 40% C8-mLLDPE	100% Exceed XP 8784

Hot tack and seal strength were tested on laminates, PE//OPET.
Dart impact, secant modulus and haze were tested on PE film.

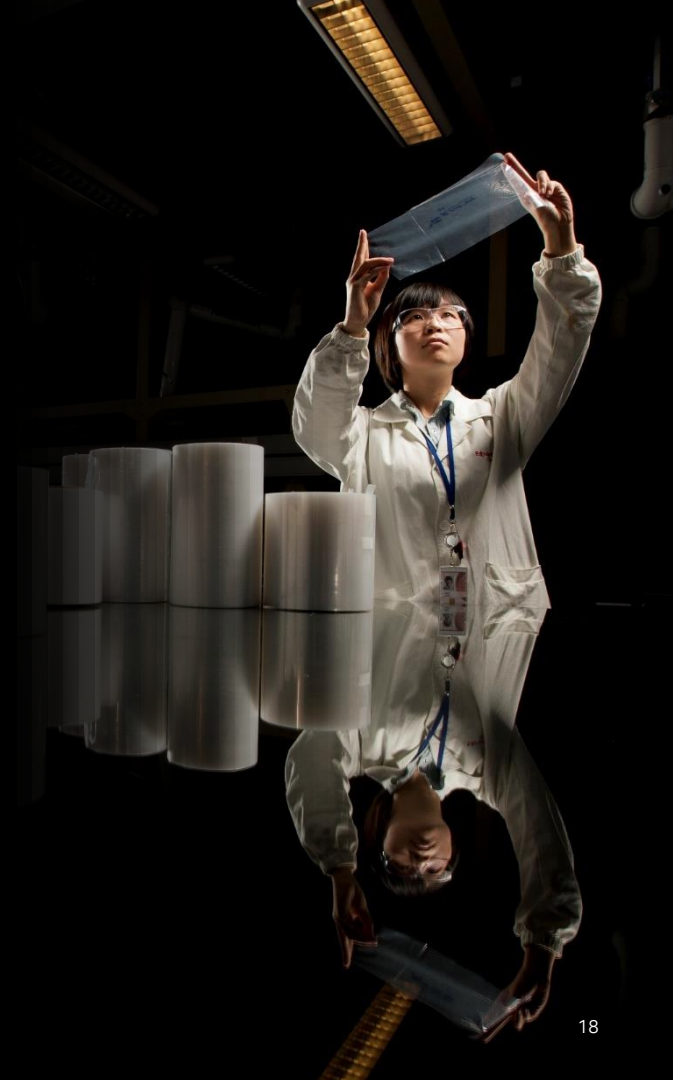
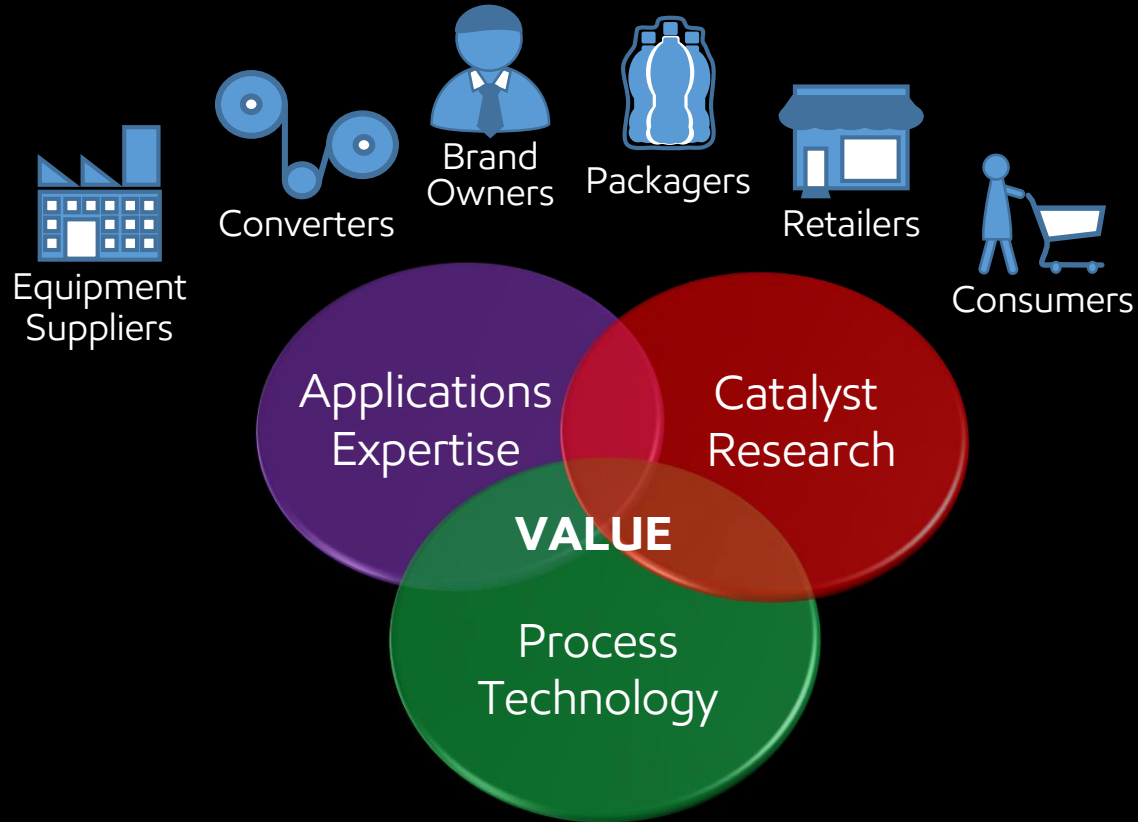
C8-mLLDPE (1 MI; 0.916 d); LDPE (2 MI; 0.923 d); C8-plastomer (1 MI; 0.904 d); HDPE (0.7MI; 0.961 d); MDPE (0.2MI; 0.923 d)

Summary

New Exceed™ XP performance polymers

- Expand the useful MI range for film materials
- While increasing throughput on existing lines
- Allowing increased toughness and good sealing capability

Collaborating with the value chain



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Test methods

Test

Method based on

MI (Melt Index)	ASTM D-1238
Density	ASTM D-4703 and ASTM D-1505 / ISO 1183
Melt Flow Ratio (MFR)	ASTM D-1238
Flow behavior- Capillary and Oscillatory Rheology	EMC methods
Tensiles tests	ASTM D-882
Dart Impact	ASTM D-1709 (procedure A)
Elmendorf tear	ASTM D 1922-09
Puncture resistance	EMC method
Puncture needle test	CEN 14471 (probe diameter = 0.8 mm)
Seal Strength sample preparation : Heat Seal mode	ASTM F-2029
Hot-tack	ASTM F-1921
Holes after flex	EMC method (Gelbo device)

Test methods

Test

Method based on

Haze	ASTM D-1003
Shrinkage tester: Betex	EMC method
Shrink force measurement by Retratch	ISO14616
Clarity measurement	ASTM D-1746
Thermicity	ASTM E-1421
Lab aging test	ISO 4892-2 at Norner
<ul style="list-style-type: none">• Tensile test• Carbonyl test	<ul style="list-style-type: none">• ISO527-3• Norner method M730849

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