



Exceed™ Tough+

Exceed™ Stiff+

Exceed™ Flow+

Exxtra™ Seal

# Full PE thermoformed packaging with improved recyclability\* and uncompromising package functionality



Recyclable



High O<sub>2</sub> barrier



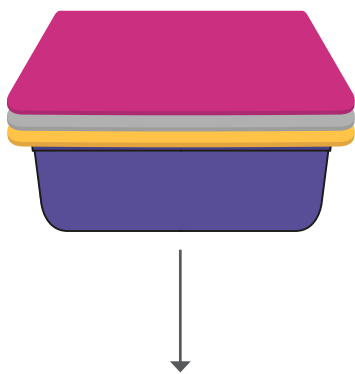
Optimized formability



Great optics through MDO PE lid film

## Challenge

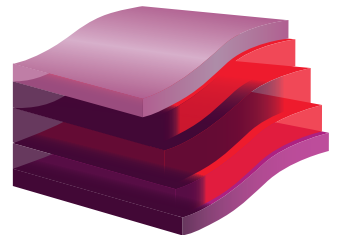
The goal was to produce a recyclable\*, thermoformed package with very high PE content without compromising on functionality or optics.



### MDO Substrate

Thickness: 25µm

- Exceed Tough+ m 0516.ML
- Exceed Flow m 0527.MC
- Exceed Flow+ m 0938.MC
- ExxonMobil™ HDPE

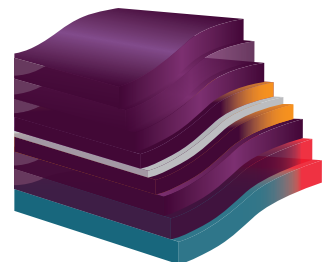


### Lamination layer

### Sealant web

Thickness: 55µm

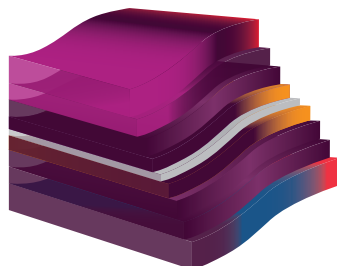
- Exceed Tough+ m 0512
- EVAL™ L171B
- Exxtra Seal POP 2008.MK
- ExxonMobil LDPE
- Tie resin masterbatch



### Thermoformed Bottom web

Thickness: 180µm

- Exceed Tough+ m 0512
- Exceed Flow+ m 0938
- EVAL™ LT172B
- Exxtra Seal POP 2008.MA
- ExxonMobil LDPE
- Tie resin masterbatch



Exceed™ Stiff+ performance polyethylene can also be used in both the thermoformed web as well as the MDO film/sealant film and provide excellent stiffness/toughness/formability. Please contact your ExxonMobil representative to design a tailored formulation that works best for you.  
\* Recyclable in the few communities with programs and facilities in place that collect and recycle plastic film

## Solution

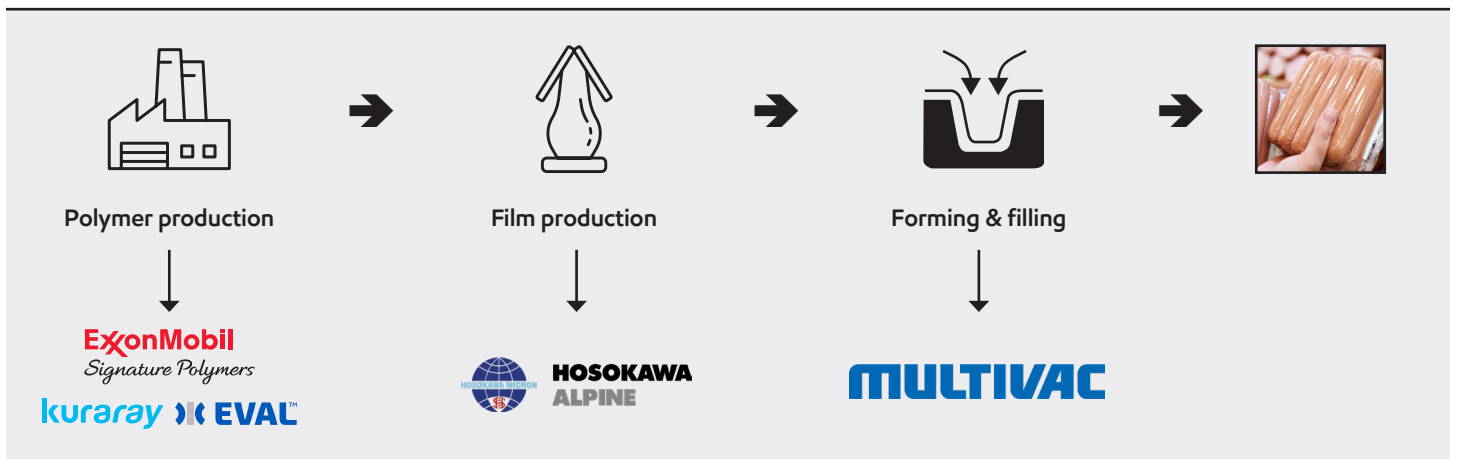
**Creation of a 95% PE<sup>1</sup> / 94% PE<sup>2</sup> thermoformed package, consisting of a formed bottom web and MDO (machine direction oriented) PE // PE lid film - with high oxygen barrier & outstanding package integrity through optimized corner thickness & puncture.**

The bottom web was produced with ExxonMobil best-in-class resins like Exceed™ Tough+ performance PE and Exxtra Seal POP plastomer & a special EVAL™ EVOH resin for thermoforming. The films were made on an Alpine 9-layer barrier line.

ExxonMobil resins provide exceptional toughness and formability, while the EVAL™ EVOH resin LT172B designed for thermoforming combines low thickness with high barrier properties.

The lidding film consists of a sealant web produced on an Alpine 9-layer line barrier line with a special EVAL™ EVOH high barrier resin L171B and MDO film produced on an Alpine 5-layer line with inline MDO. This state-of-the-art MDO technology offers film quality with outstanding processability and optimized flatness.

The package was then formed and filled on a Multivac R245 machine comparable to industry standard process conditions at which good hermetic packs & maximum line speeds were achieved.



## Result

### Thermoformed Web:

- The combination of ExxonMobil performance PE and EVAL™ EVOH resins deliver outstanding package integrity, with puncture values after forming comparable to that of PA containing thermoformed film. In addition, thanks to the latest generation of resins such as Exceed™ Tough+, corner thickness after forming is maintained.
- Package functionality such as oxygen barrier and optics are comparable to PA containing thermoformed films.

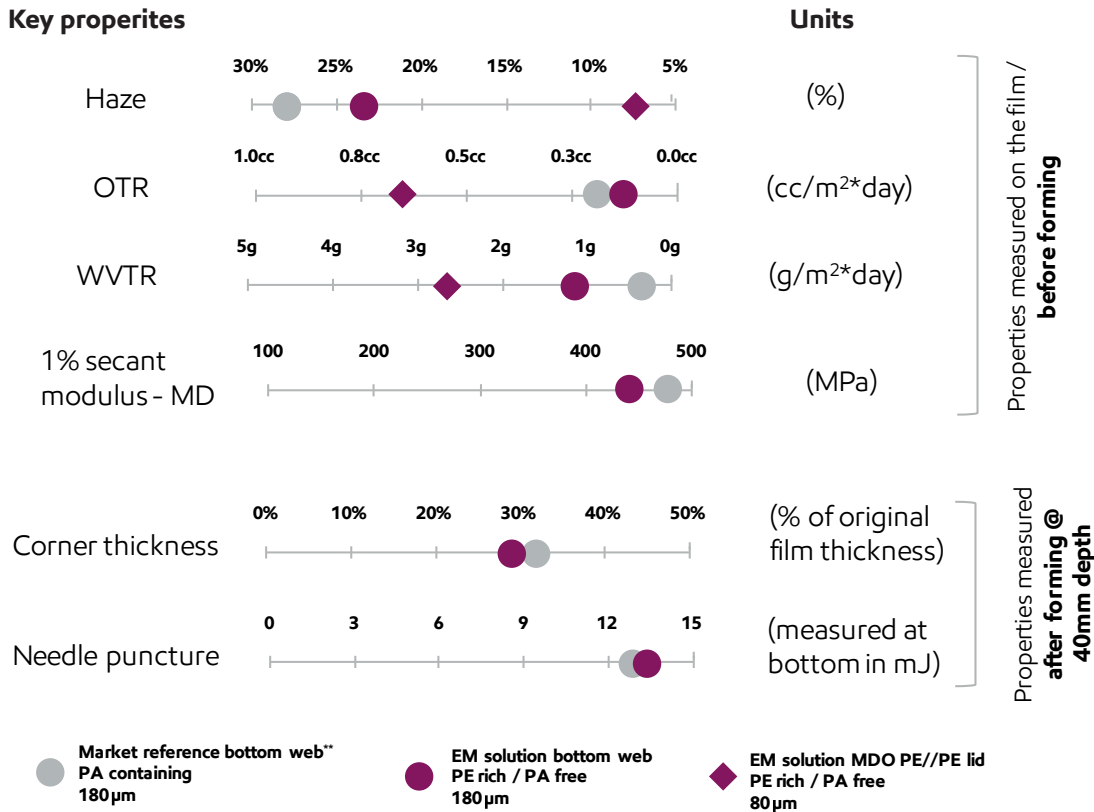
### Lid film (MDO PE // PE laminate):

Both the thermoformed bottom as well as the laminated lid were specially designed to provide a broad forming and hermetic sealing window. The result is a film with excellent machinability on the Multivac R245 forming and filling machine. Under optimized thermoforming trial conditions\* on the R245 Multivac line, maximum line speed (>11 cycles/minute) was achieved with this new design.

(\*): Sealing: 1 second at 125°C, forming: 2 seconds at 100°C, vacuum: 100mbar & mold size: 182mm x 112mm, with depths of 30mm and 40mm

(1) Calculated based on layer distribution thicknesses  
(2) Calculated based on weight

## Key properties



\*\* PE/Tie/coPA/EVOH/coPA/Tie/PE with thickness distribution: 45/20/20/10/20/20/45, with 22% coPA and outer PE layer based on LLDPE and sealant PE layer based on Exceed m 1018. Data traceability: R2205-006953; R2209-009202

In summary, using the latest generations of performance resins from ExxonMobil and EVAL™, it is possible to create a 94 - 95% PE-based thermoformed package, without compromising on package integrity, optics or machinability.

Test Item	Test method
Tensile properties on film at room temperature	ExxonMobil test method
Total haze	ExxonMobil test method (based on ASTM D1003-21)
Oxygen transmission rate (OTR)	ExxonMobil test method (measured at 23°C, 50% RH of the test gas)
Water vapor transmission rate (WVTR)	ExxonMobil test method (measured at 37.8°C, 90% RH of the test gas)
Heat seal strength at room temperature	ExxonMobil test method
Needle puncture resistance	ExxonMobil test method

We based the information on data believed to be reliable on the date compiled, but we do not represent, warrant, or otherwise guarantee, expressly or impliedly, the merchantability, fitness for a particular purpose, freedom from patent infringement, suitability, accuracy, reliability, or completeness of this information or the products, materials or processes described. The user is solely responsible for all determinations regarding any use of material or product and any process in its territories of interest.

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Signature Polymers

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## What's new: ExxonMobil Signature Polymers

All our polymers are now positioned under a single portfolio brand: Signature Polymers. The aim is to simplify our product architecture and naming to improve portfolio navigation for you. We would like to stress that our commitment to high quality products remains the same, it is the names that change. Everything else remains the same. We will be making these modifications over the next six months so you will see both old and new grade names highlighted during that time.

Here's a quick overview of brands and grade names that have changed in this document:

Legacy Commercial Name	New Commercial Name
Exceed™ XP 8656ML	Exceed™ Tough+ m 0516.ML
Enable™ 2705MC	Exceed™ Flow m 0527.MC
Enable 4009	Exceed Flow+ m 0938
Exceed XP 7052	Exceed Tough+ m 0512
Exact™ 3236	Exxtra™ Seal POP 2008.MA

Some of our existing Exceed, Achieve, Paxon and premium PP/HD grades have moved to Exceed brand; most existing Enable grades have moved to Exceed Flow[+]; most of our existing Exceed XP grades have moved to Exceed Tough[+]; most of our existing Exceed S grades have moved to Exceed Stiff[+]. More details here [https://www.exxonmobilchemical.com/en/brands/signature-polymers/exceed\\_high\\_performance\\_polymers](https://www.exxonmobilchemical.com/en/brands/signature-polymers/exceed_high_performance_polymers) or contact your ExxonMobil representative to know more.

Want to see what's changed in our portfolio? Go to [exxonmobilchemical.com/sptransform](https://www.exxonmobilchemical.com/sptransform)