Exceed™ XP Exceed™ S Enable™ performance polyethylene
Exact™ plastomers

Case Study

ExxonMobil

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

Recyclable

High O_2 barrier

Optimized formability

Great optics through MDO PE lid film

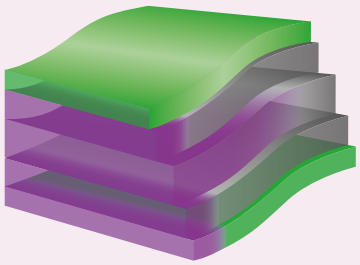
Challenge:

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 XP 8656ML
- Enable 2705MC
- Enable 4009MC
- ExxonMobil HDPE

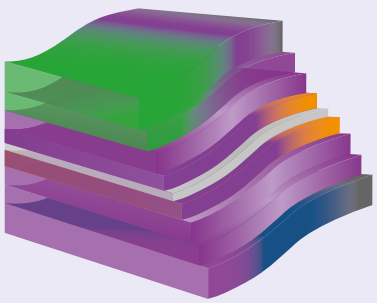


Lamination layer

Thermoformed Bottom web

Thickness: 180µm

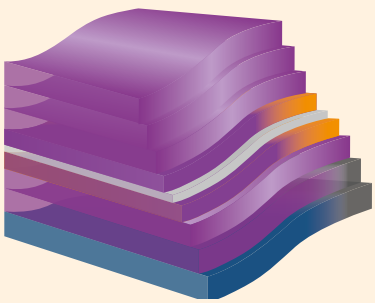
- Exceed XP 7052
- Enable 4009
- EVAL™ LT172B
- Exact 3236
- ExxonMobil LDPE
- Tie resin masterbatch



Sealant web

Thickness: 55µm

- Exceed XP 7052
- EVAL™ L171B
- Exact 3237
- ExxonMobil LDPE
- Tie resin masterbatch



Exceed™ S 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 communities with programs and facilities in place that collect and recycle plastic film.

Solution:

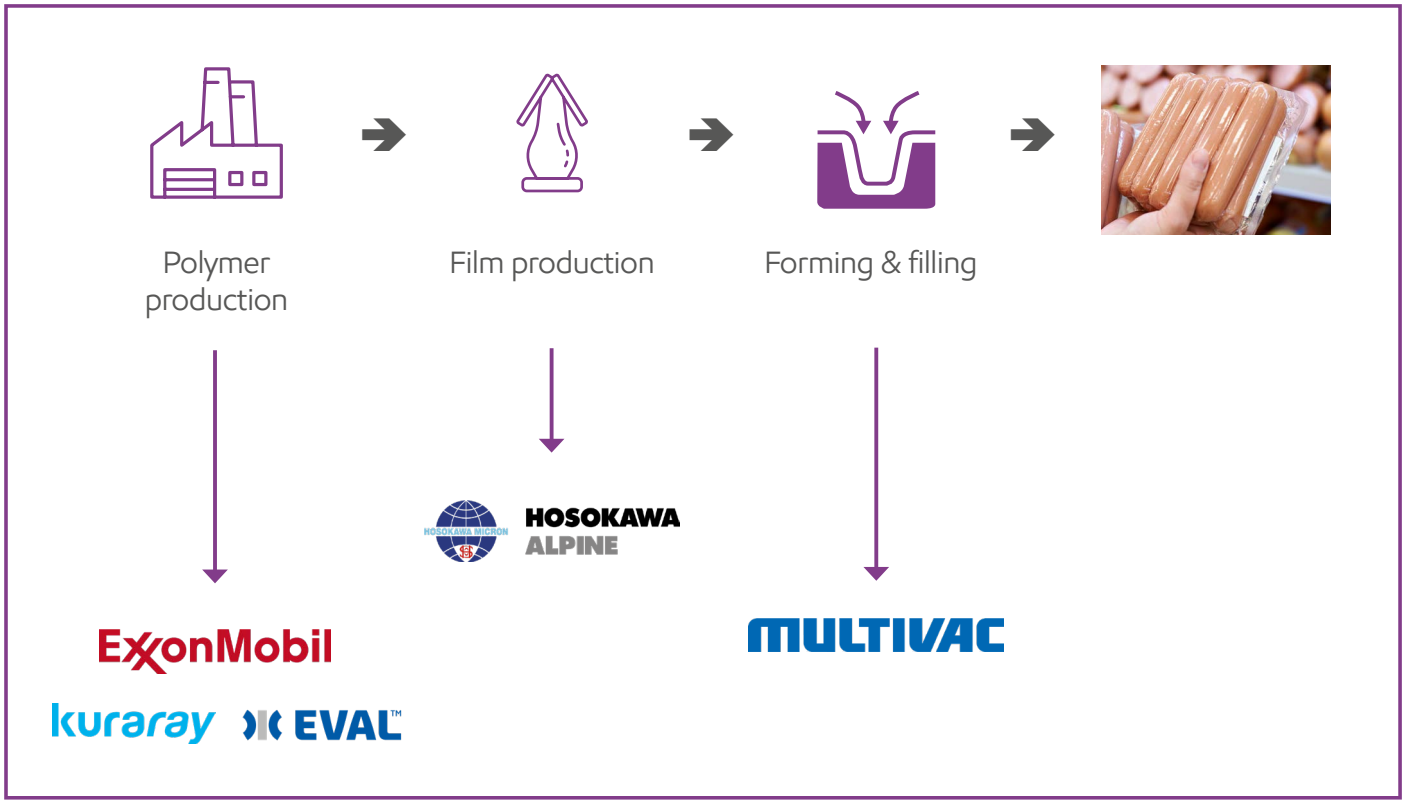
Creation of a 95% PE[1] / 94% PE[2] thermoformed package, consisting of a formed bottom web and MDO (machine direction oriented) PE //PE lid film - with high oxygen barrier & outstanding package integrity through optimized corner thickness & puncture.

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

ExxonMobil resins provide exceptional toughness & 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 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.



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

Result:

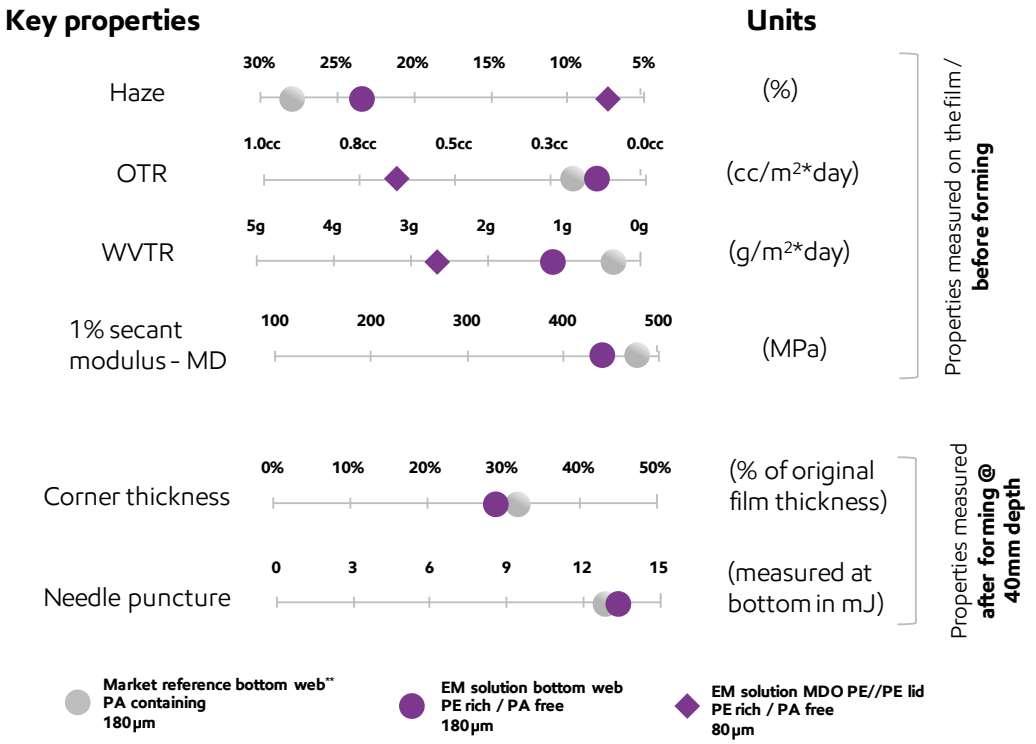
Thermoformed Web:

- 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™ XP, 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



** 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 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