ExxonMobil
Signature Polymers

Case Study

Exceed™ Stiff+ Exceed™ Exxtra™ Seal ExxonMobil™ LD

Recyclable* full PE** packaging solution with outstanding stiffness

Potential benefits:

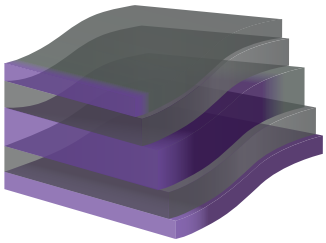
- Designed for recyclability*
- Outstanding stiffness
- Optical Properties
- Package integrity maintained

Challenge

To create a full PE** laminated packaging solution, consisting of an MDO-PE substrate with excellent stiffness and optics, keeping the same overall laminate thickness — as a potential alternative to more difficult to recycle multimaterial packaging solutions.

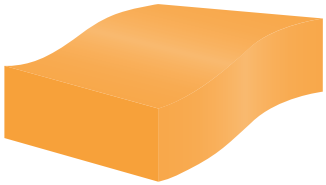
MDO-PE substrate
Thickness: 25µm

- Exceed™ Stiff+ m 0820.ML
- Exceed Stiff+ m 0238.MC
- Exceed™ HD 6107



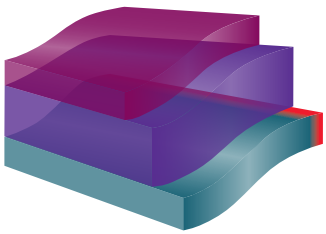
Adhesive
Henkel PU adhesive

- LOCTITE LIOFOL LA 7818 RE / LA 6231 RE



PE sealant film
Thickness: 107µm

- Exceed™ m 1018.MA
- Exceed Stiff+ m 0926.ML
- Exxtra™ Seal POP 2008.MA
- ExxonMobil™ LD



* Recyclable in the few communities with programs and facilities in place that collect and recycle plastic film.
** With full PE meaning at least 95% polyethylene, allowing for inks and adhesives.

Henkel

WINDMÖLLER & HÖLSCHER

Solution

Through an innovative value chain collaboration between Windmöller & Hölscher, Henkel and ExxonMobil, a recyclable* full PE** pouch was created that has similar properties and total thickness as multimaterial PET//PE laminates. The combination of the latest conversion techniques, polymers, and adhesive allows for the creation of an innovative full PE** pouch incorporating an MDO-PE substrate with outstanding stiffness, comparable to BOPP, allowing for a downgauged sealant web.

The blown MDO-PE film was produced by W&H with ExxonMobil resins on a W&H VAREX^{II} extrusion line with inline MDO (Machine Direction Orientation) unit. The film was then reverse printed by W&H on their HELIOSTAR^{II} S rotogravure printer.

The sealant web was produced on a 5L W&H VAREX line. It was chosen to produce a 3L sealant web instead of a 5L to take into consideration the needs of the current market.

The printed MDO-PE substrate was then laminated to the 3L PE sealant web, using Henkel's new, 2-component polyurethane laminating adhesive without the use of solvents, LOCTITE LIOFOL LA 7818 RE / LA 6231 RE. This system has been designed for recycling and has been recognized as fully compatible with PE recycling stream by Recyclass.*

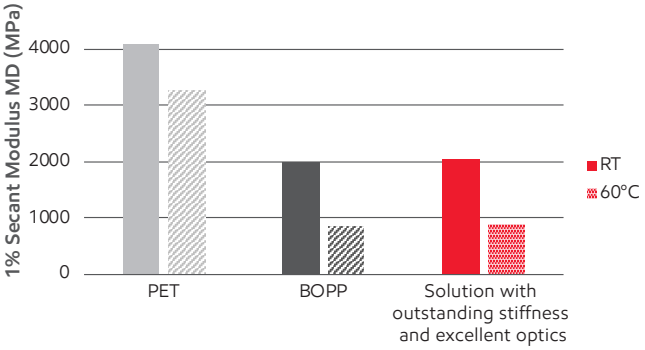
To help achieve excellent packaging integrity of the monomaterial PE pouch, ExxonMobil's latest generation of performance materials were used.

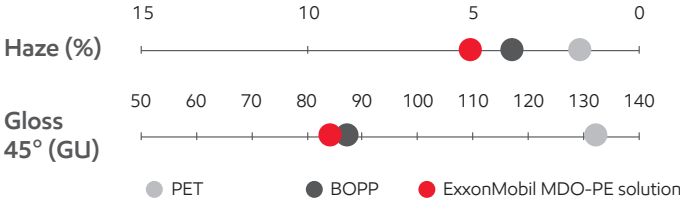
Results

MDO-PE substrate film

The ExxonMobil MDO-PE substrate consists of our new Exceed™ HD 6107 high density PE grade offering enhanced stiffness, processability and excellent gel performance. Exceed™ Stiff+ m 0238 metallocene PE resin was used to boost the stiffness and for excellent bubble stability; while Exceed Stiff+ performance PE offers process stability.

The MDO-PE solution exhibited outstanding stiffness even at higher temperatures, matching a 27µm BOPP reference, without compromising on optical properties.





Full PE**-laminate – MDO-PE//PE

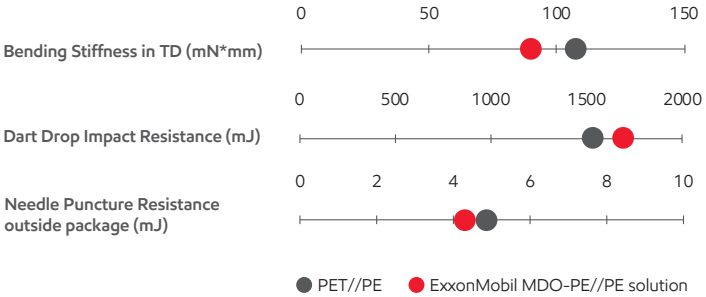
Because of the outstanding stiffness of the MDO-PE substrate, and our sealant web design, we were able to achieve the same laminate thickness for our MDO-PE//PE solution as for the reference PET//PE laminate.

The 3L sealant web consists of Exceed™ and Exceed™ Stiff+ performance PE and Exxtra™ Seal plastomer. The Exceed Stiff+ m 0926.ML offers an excellent combination of stiffness and toughness, while the Exxtra Seal POP 2008. MA plastomer leverages the broadened sealing window, needed for MDO-PE//PE solutions.

Because of the performance polymers used in the sealant film, combined with the outstanding stiffness of our MDO-PE substrate we are able to leverage a downgauged sealant web. Hereby creating a full-PE** pouch with equal thickness (25µm MDO-PE + 107µm sealant web) as the PET//PE pouch (12µm PET + 120µm PE sealant web), without compromising the package integrity.

Our MDO-PE//PE solution exhibits excellent toughness performance, having a higher dart drop impact resistance than, and comparable needle puncture resistance to the PET//PE reference.

Moreover our MDO-PE//PE pouch has a good standability, although it has a slightly lower bending stiffness than the PET//PE laminate.



* The terms "recyclable" and "recyclability" as used throughout this case study are intended to refer to the potential for recyclability of full PE solutions designed and manufactured in accordance with recycling guidelines such as PRE RecyClass. Ultimate recyclability of full PE packaging will depend on a number of factors outside the control of W&H / ExxonMobil / Henkel, including, but not limited to, availability of programs and facilities that collect and recycle plastic packaging within a given community. Any and all claims about the recyclability of full PE-packaging are the sole responsibility of the packaging manufacturer.

** With full PE meaning at least 95% polyethylene, allowing for inks and adhesives.

Test	Test Method
Tensile properties on film at RT	EM method
Tensile properties on film at 60°C	EM method
Bending stiffness	EM method
Dart Drop Impact Resistance	Based on ISO 7765-2
Needle Puncture Resistance	EM method
Gloss 45°	EM method
Haze	Based on ASTM D1003-A

Contact us for more information: **exxonmobilchemical.com/pe**

ExxonMobil
Signature Polymers

Bring your impossible

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™ S 9243ML	Exceed™ Stiff+ m 0926.ML
Exact™ 3236	Exxtra™ Seal POP 2008.MA
Exceed S 9272ML	Exceed Stiff+ m 0820.ML
Enable™ 4002MC	Exceed Stiff+ m 0238.MC
ExxonMobil™ HD7165L	Exceed HD 6107
Exceed™ 1018MA	Exceed m 1018.MA
ExxonMobil™ LDPE	ExxonMobil™ LD

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** or contact your ExxonMobil representative to know more.

Want to see what's changed in our portfolio? Go to **exxonmobilchemical.com/sptransform**