



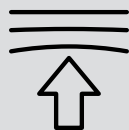
Exceed™ Stiff+ Exceed™ HD Exceed™ Tough+ Exceed™ Flow+ Exxtra™ Seal



Windmüller & Hölscher, B&B, Henkel and ExxonMobil Signature Polymers combine their expertise to create mono-material packaging designed for recyclability*, containing an MDO PE substrate with outstanding stiffness and excellent optics comparable to BOPP



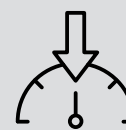
Designed for
recyclability*



Outstanding
stiffness of
MDO PE
substrate



Uncompromised
printing quality



Downgauging
opportunity

Data and results presented herein apply specifically to the noted application under this case study. Your results may differ depending on factors such as operating conditions, equipment and materials used.

Challenge

To create mono-material packaging designed for recyclability* meeting converting and end-use requirements.

As the global packaging industry embraces concepts of a more circular economy, the need for packaging that is designed for both recyclability and resource efficiency is apparent. For example, the EU Regulation on Packaging and Packaging Waste (PPWR)¹ reinforces the need for recyclable packaging. But beyond compliance, brand owners and converters are seeking packaging solutions that can enhance packaging's end-of-life value, address extended producer responsibility (EPR) schemes, and support a more circular economy.

¹ <https://eur-lex.europa.eu/eli/reg/2025/40/oj>

* Designed with features intended to support recyclability. Actual recyclability depends on factors such as local collection, sortation, and recycling infrastructure, as well as the condition and configuration of the package after use. However, access to facilities that accept and process plastic film is limited and not widely available.

**Solvent-free adhesive solution – designed for recycling and certified by a recognized certification body as compatible with existing recycling streams.

Solution

Through innovative value chain collaboration between W&H, B&B, Henkel & ExxonMobil Signature Polymers a thoughtfully designed mono-material PE pouch was created.

Combining W&H's leading MDO technology with ExxonMobil Signature Polymers resins enables customers to achieve an MDO PE substrate with outstanding stiffness and excellent optics, comparable to BOPP. Outstanding print quality and excellent process stability was achieved with W&H's ALPHAFLEX press.

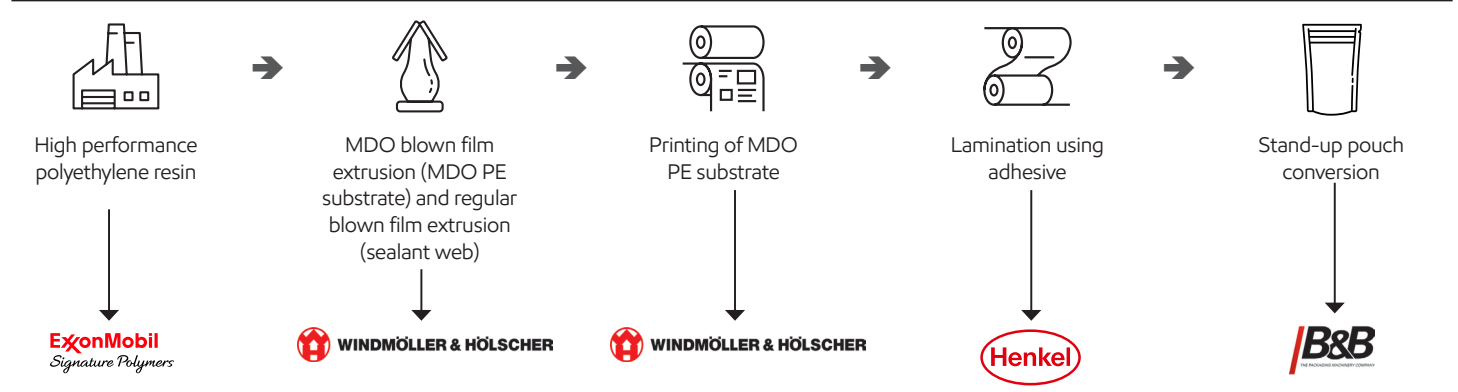
A 5-layer sealant web was designed combining both easy extrudability and good performance and was produced on W&H's VAREX II using ExxonMobil Signature Polymers resins. The mono-material packaging solution is achieved by combining the outstanding stiff MDO PE substrate with the 5-layer sealant web during lamination with Henkel's recycling compatible PU adhesive** LOCTITE LIOFOL LA 7818 RE / LA 6231 RE, and converted into stand-up pouches on B&B's high-efficiency STBB 8K stand-up pouch equipment.



WINDMÜLLER & HÖLSCHER



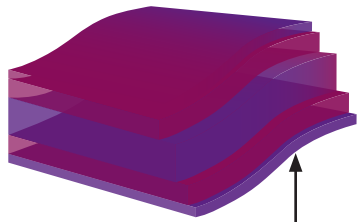
The design process



MDO PE substrate

Thickness: 25 μm

- Exceed™ Stiff+ m 0820
- Exceed™ Stiff+ m 0238
- Exceed™ HD 6107

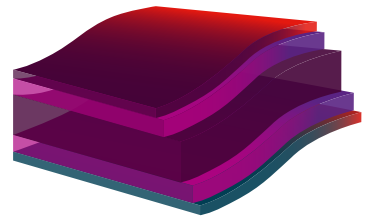


Outside bubble/
treatment side

Sealant web

Thickness: 90 μm

- Exceed™ Tough+ m 1019
- Exceed™ Flow+ m 0938
- Exceed™ Stiff+ m 0926
- Exceed™ Tough+ m 0814
- Exxtra™ Seal POP 2008
- ExxonMobil™ LD 07523



Results

Building on the ExxonMobil Signature Polymers' expertise, the MDO PE substrate was developed consisting of Exceed™ HD 6107 high-performance polyethylene offering high stiffness and excellent processability in particular in MDO PE applications. Additional components are Exceed™ Stiff+ m 0238 providing excellent bubble stability combined with stiffness, and Exceed™ Stiff+ m 0820 offering process stability. The MDO PE solution exhibited outstanding stiffness, even at elevated temperatures, comparable to a BOPP reference film, without compromising on optical properties.

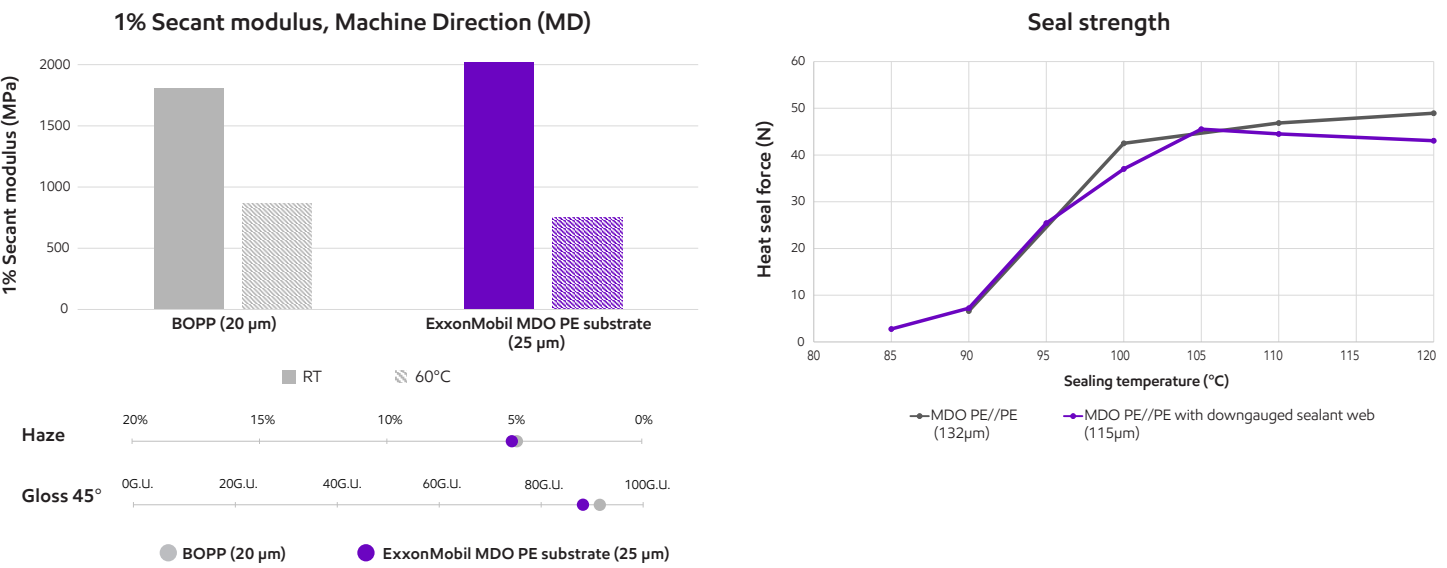
For the MDO PE//PE laminate, a 5-layer sealant web was designed. The outstanding stiffness of the MDO PE substrate allows finetuning of the sealant film formulation to balance processability and performance, while offering downgauging potential.

ExxonMobil Signature Polymers resins in the 5-layer downgauged sealant web can provide:

- Exceed™ Tough+ m 1019 and Exceed™ Tough+ m 0814: excellent toughness
- Exceed™ Flow+ m 0938: a good combination of processability and stiffness
- Exceed™ Stiff+ m 0926: a good balance between stiffness and toughness
- Exxtra™ Seal POP 2008: a low sealing initiation temperature, enabling a broad sealing window for mono-material packaging

Compared to a previously developed MDO PE//PE laminate, our newly developed MDO PE//PE laminate contained a downgauged sealant web. Despite the thinner sealant web, the seal strength of the MDO PE//PE laminate was maintained.

Moreover, an excellent package integrity was obtained as demonstrated when testing bag drop at a typical shelf height of 2 meters, with a survival rate of 100%.



The strong collaboration between Windmöller & Hölscher, B&B, Henkel and ExxonMobil Signature Polymers and their combined expertise, enabled the successful development of a mono-material package, designed for recyclability*.

Property tested	Test method based on
Tensile properties of film at RT	ExxonMobil method
Tensile properties of film at 60°C	ExxonMobil method
Total haze	ASTM D1003-A
Gloss 45°	ExxonMobil method
Bag drop testing	ExxonMobil method
Heat seal strength at RT	ExxonMobil method

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Data from tests performed by or on behalf of ExxonMobil. 2025-RTI-4983

ExxonMobil

Signature Polymers

Bring your impossible

ExxonMobil Signature Polymers was born from the belief that people fuel progress. From automotive and construction to packaging, agriculture, industrial, and beyond, we leverage the scale and reach of ExxonMobil to deliver the insights and innovations that empower our diverse, global partners to take their businesses to new heights. We continuously work to provide the listen-first, service-driven, game-changing collaboration that unlocks opportunities for our partners and advances their business goals.