



Exceed™ Flow+

Exceed™ Stiff+

Exceed™ Tough+

Exxtra™ Seal

# Recyclable\* 97% PE barrier pouch packaging with high oxygen barrier, unique optics and outstanding package integrity



Recyclable\*



Outstanding oxygen barrier



Tremendous optics



Outstanding package integrity

## Challenge

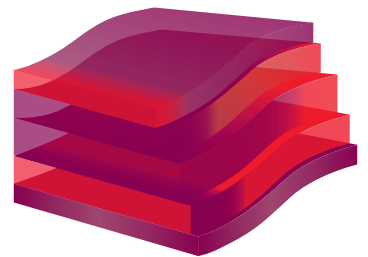
To create a >95% PE high oxygen barrier pouch - as an alternative to more difficult to recycle multimaterial high oxygen barrier laminates - with unique aesthetics through digital printing.



### MDO-PE film

Thickness: 25 µm

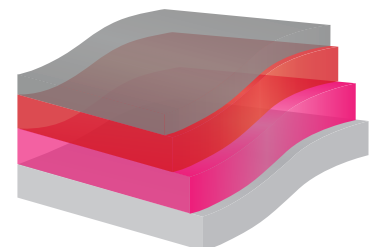
- Exceed Tough+ m 0516.ML
- Exceed Stiff+ m 0238.MC
- Exceed Flow m 0527.MC
- ExxonMobil™ HD



### Lamination & barrier coatings layer

Basis weight: 4.8 gsm

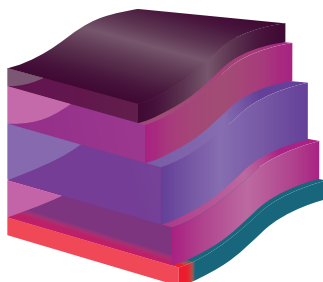
- Vacuum-coated AlOx
- Henkel top coating
- Printing ink
- Henkel PU adhesive



### PE sealant film

Thickness: 120 µm

- Exceed™ Tough+ m 0814.ML
- Exceed™ Flow+ m 0938.MC
- Exceed™ Stiff+ m 0926.ML
- Exxtra™ Seal POP 2008.MK
- ExxonMobil™ LD



\*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 product after use. However, access to facilities that accept plastic films and medical devices is limited and not widely available.



**HOSOKAWA**  
ALPINE



**erema**  
group



# Solution

Using the latest technology in polymers and conversion and through a unique value chain collaboration, the team was able to create a 97% PE pouch with high oxygen barrier, unique optics thanks to HP Indigo digital printing and very good package integrity.

This blown film was produced with ExxonMobil best-in-class performance polyethylene resins and made 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.

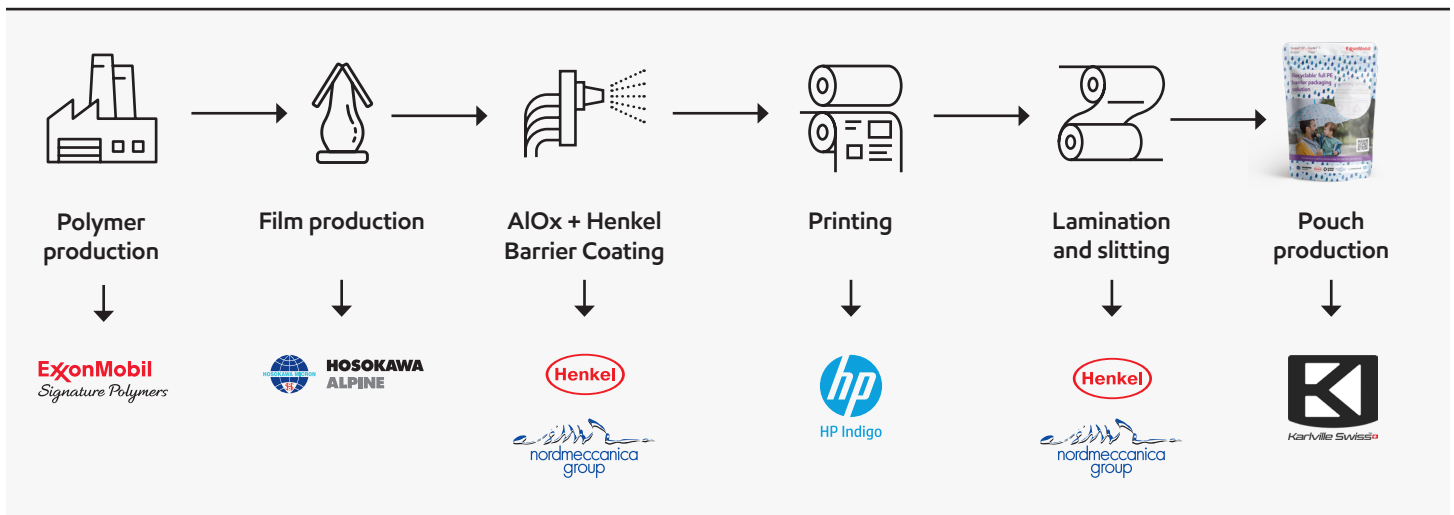
Two extremely thin functional layers were then applied on the MDO-PE to deliver outstanding barrier properties: the first layer consisted of 10 nanometers of uniform and homogeneous AlOx, while the second layer consisted of 1 micron of Henkel's newly developed Barrier Coating. Both functional layers

were applied using Nordmeccanica's Vacuum & Coating technologies [Nordmet 12F Plus / Super Combi 5000]. These technologies offer industry leading performance in terms of reliability, uniform laydown, thickness control and energy consumption.

Subsequently, the film was printed by HP using digital printing technology on an HP Indigo 25K press.

In the following step, the MDO-PE was laminated with the sealant web on a Nordmeccanica SC 5000 Coating-Laminating machine by using Henkel's customized SL adhesives, designed for mechanical recycling.

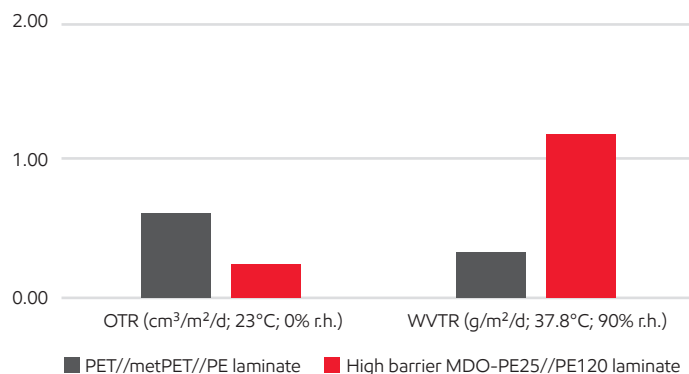
And finally, the pouches were converted by Karlville Swiss with the latest pouch machine KS-DSUP-400 model.



## Barrier properties

This pouch incorporates the innovative concept of AlOx and barrier coatings – to produce a very high PE content (97%) pouch while still providing high OTR (~0.25 cm<sup>3</sup>/m<sup>2</sup>/d) and WVTR (~1.2 g/m<sup>2</sup>/d;) values comparable to less recycle-ready low barrier structures, as can be seen from Graph 1.

Graph 1 - Oxygen and moisture barrier\*

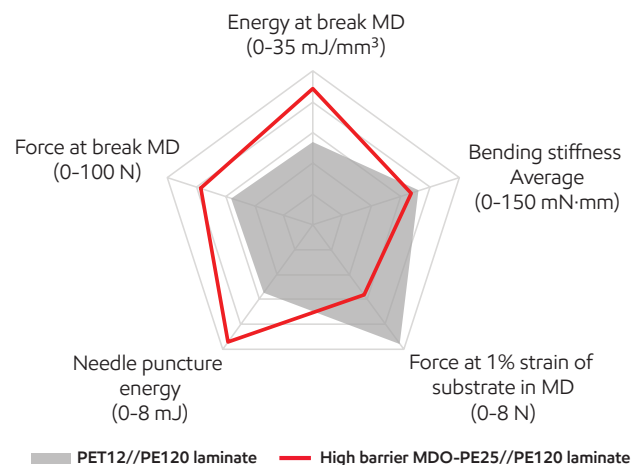


\*All barrier values are to be considered as indicative as they may strongly depend on various parameters and test conditions

## Mechanical properties

This pouch features the latest PE resin to deliver outstanding package integrity – resulting in an improvement in puncture and force at break of respectively 60% and 70% versus comparable alternatives, while keeping comparable bending stiffness to maintain stand-up ability.

Graph 2-Mechanical properties

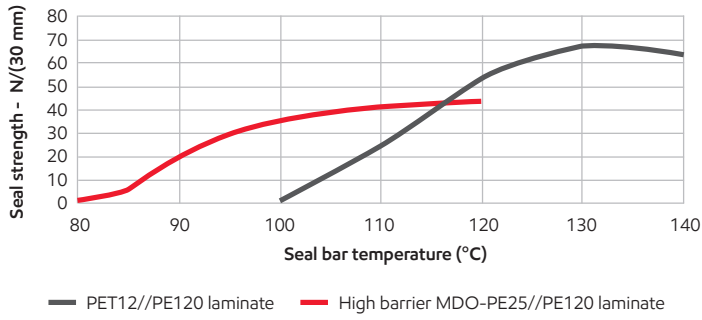


Legend: PET12//PE120 laminate (grey), High barrier MDO-PE25//PE120 laminate (red)

In addition, the pouch features the Exxtra™ Seal POP-series sealant materials to lower the Seal Initiation Temperature.

This pouch also includes HP Indigo digital printing technology, which allows printing to make each pouch look unique.

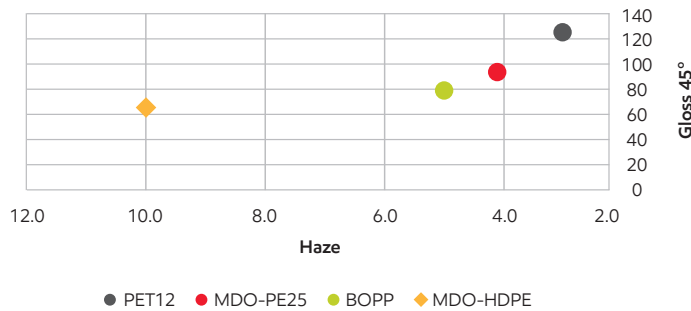
**Graph 3 - Seal Strength**



**Optics**

The MDO substrate also does not compromise on shelf-appeal with outstanding gloss (~93 GU) & low haze (~4%), rivaling the best-in-class PET substrate, as can be seen in Graph 4.

**Graph 4 - Optical Properties**



Test item	Test method
Oxygen transmission rate (OTR)	ExxonMobil test method
Water-vapor transmission rate (WVTR)	ExxonMobil test method
Tensile properties on film at room temperature	ExxonMobil test method
Puncture - needle test	ExxonMobil test method
Heat seal strength at RT	ExxonMobil test method
Bending stiffness	ExxonMobil test method
Haze	Based on ASTM D-1003-13
Gloss 45°	ExxonMobil test method

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Bring your impossible



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