ExxonMobil
Signature Polymers

Case study

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

Chengdu Boshikerui New Materials creates innovative metallized polyethylene film with simplified lamination structure and superior barrier performance

- Downgauging opportunities
- Superior barrier performance
- Excellent packaging integrity
- High needle puncture resistance
- Excellent sealing performance

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

Challenge

Vacuum metallization is commonly used in the industry to achieve barrier performance in flexible packaging. Most vacuum metallized packaging on the market generally has three-ply composite structures, in which vacuum metallized polyethylene terephthalate (PET) is used for its barrier properties. However, PET is incompatible with polyethylene (PE) or polypropylene (PP). When implementing PE metallization plating, the industry often faces challenges such as poor metallization adhesion and bonding strength, poor appearance, high friction coefficient and weak barrier performance.

Solution

Chengdu Boshikerui New Materials Co., Ltd (BSKR) is a leading film converter based in Chengdu City, Sichuan Province, with strong expertise and long history in lamination film production. They have traditionally produced flexible food packaging with 3-ply laminate structure consisting of oriented PET or PP substrate layer, metallized PET barrier layer and coextruded PE sealant layer (BOPET or BOPP//m-PET//PE).

Together with ExxonMobil Signature Polymers and its downstream partner Chengdu Fulinda New Materials Co., Ltd (FLD), a functionalized film producer who is experienced in metallized technology, BSKR developed a two-ply lamination film that delivers excellent sealing performance, enhanced needle puncture with comparable stiffness to the incumbent three-ply laminate, while still retaining the barrier performance despite the simplified structure.

In the coextruded PE sealant film, Exceed™ Tough+ m 0814 and Exceed™ Flow+ m 0516 performance polyethylene were used for their mechanical properties to deliver step-out toughness that ensured excellent package integrity and high needle puncture resistance. Combined with Exxtra™ Seal m 2012 performance polyethylene, the formulation offers low temperature sealability, which is required for excellent sealing performance. With a balanced combination of stiffness and toughness performance, Exceed™ Stiff+ m 0926 performance polyethylene was the polymer of choice to create a downgauged formulation while maintaining a smooth and efficient downstream conversion process.

博实科睿 富林达 FULINDA 青蓝 CYANINE

BSKR utilized their innovative pre-treatment methods to treat the PE sealant film. FLD and Qinglan New Materials Co., Ltd (Qinglan), a laminator specializing in film coating solutions, co-developed a novel barrier coating technology. The pre-treated PE film was first coated with a barrier layer, and then went through a metallization process with excellent uniformity and high adhesion strength, despite the PE film's higher elongation nature.

Subsequently, the vacuum metallized polyethylene film (VMPE) was laminated with BOPP, resulting in a 90μm two-ply BOPP//VMPE lamination structure.

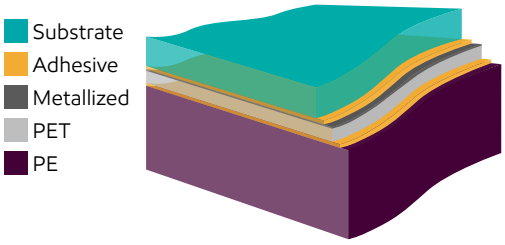
Results

The resultant film has a simplified structure with thinner gauge while maintaining superior barrier performance and packaging integrity. Compared to the incumbent, this innovative solution provides following key attributes:

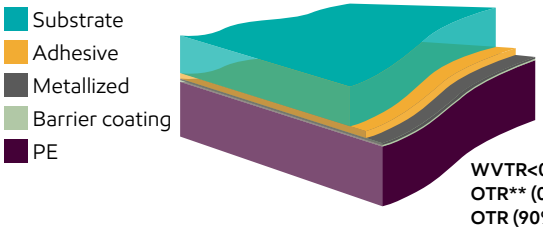
- Simplified film structure from three-ply BOPP//VMPET//PE to two-ply BOPP//VMPE laminate;
- Total thickness of film was downgauged from 125μm to 90μm without compromising the convertibility and standability of stand-up pouch;
- Superior barrier performance versus the incumbent three-ply film with oxygen transmission rate (OTR) at less than 0.5 cc/(m^2·day) and water vapor transmission rate (WVTR) at less than 0.5g/(m^2·day);
- Enhanced package integrity with excellent needle puncture resistance.

Superior water and oxygen barrier properties

REFERENCE FILM - 125μm

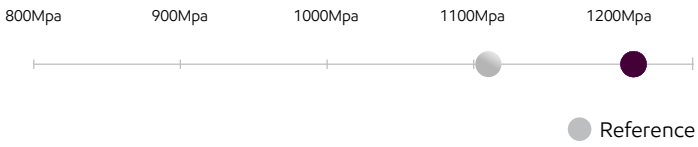


BSKR SOLUTION - 90μm

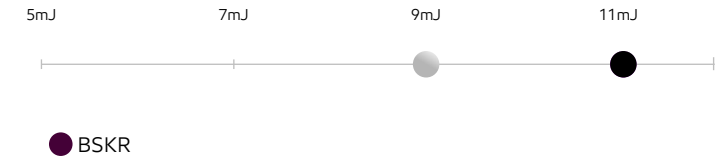


WVTR<0.5
OTR (0%/0% humidity) <0.5**
OTR (90%/90% humidity) <0.5

MD 1% Secant Modulus (Standability)



Needle puncture energy



Summary

This cutting-edge VMPE film with simplified structure developed through the value chain collaboration between BSKR, FLD, Qinglan and ExxonMobil Signature Polymers is a breakthrough in metallization technology. The BOPP//VMPE solution can be applied to a wide range of food packaging requiring superior barrier properties. With the removal of PET content in the lamination, this new film solution has a 100% polyolefins (PO) structure.

Mr. Zheng Yong, General Manager of BSKR shared, "The VMPE substrate film, co-developed with ExxonMobil Signature Polymers, is an innovative and simplified flexible packaging structure with its revolutionary barrier upgrade in OTR and WVTR while maintaining mechanical strength. Committed to pioneering film technology innovation, we believe this advancement will accelerate market demand for high-performance barrier structures, positioning it as a core driver of future industry growth."

"VMPE structure's advanced lamination process pioneers next-generation high-barrier solutions, directly tackling critical packaging challenges. Through collaboration with ExxonMobil Signature Polymers and BSKR, we are scaling this innovative technology into commercially viable innovations, unlocking market potential far beyond conventional packaging limits", said Mr. Zhang Zhimiao, General Manager of Qinglan.

*Barrier data is indicative, affected by multiple factors/parameters.
** OTR is measured in cc/(m^2·day), and WVTR is measured in g/(m^2·day)

Test item	Test method
PE film tensile	ExxonMobil test method
Needle puncture	ExxonMobil test method
Water vapor transmission rate	ExxonMobil test method
Oxygen transmission rate	ExxonMobil test method

Data from tests performed by or on behalf of ExxonMobil

Customer profile

Chengdu Boshikerui New Materials Co., Ltd (BSKR) is an experienced film converter based in Chengdu City, Sichuan Province. They have produced blow molded PE, PP, and nylon co-extruded films with certain functionalities on their thirteen processing machinery including 3, 5, 7-layer blown and tubular water quench production lines since 2019.

Chengdu Fulinda New Materials Co., Ltd (FLD) is a functionalized film flexible packaging material manufacturing enterprise formed by Chengdu Fuquan Packaging Material Co., Ltd. and Chengdu Zhilin Packaging Material Co., Ltd. With many years of experience in the industry, FLD is known as a high-quality and functional film supplier in the field of flexible plastic packaging.

Qinglan New Materials Co., Ltd provides exceptional laminating, printing, and bag-making services, dedicated to delivering high-quality flexible packaging products for the food industry. In the VMPE project, Qinglan offered an excellent coating solution that effectively met the high barrier performance requirements of the VMPE structure.

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.

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 6056	Exceed™ Flow+ m 0516
Exceed™ XP 8784	Exceed™ Tough+ m 0814
Exceed™ 2012	Exxtra™ Seal m 2012
Exceed™ S 9243	Exceed™ Stiff+ m 0926

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**