



Exceed™ Stiff

Helping to address the need for recyclable* frozen food packaging solutions



Recyclable*



High oxygen barrier



Toughness



Stiffness

Challenge

Flexible primary packaging today is often created from composite laminates, typically comprising two layers — a PE film sealant together with a PA/PET substrate. These multi-material structures have the advantages of good sealing, high oxygen barrier capabilities as well as excellent stiffness. However, they can be challenging to recycle using existing processes as often the different layers first need to be detached for further treatment of the materials separately.

A potential alternative is a mono-material structure created with PE films, i.e. replacing the PA/PET substrate with a PE substrate. However, it is important to ensure that the mono-material structure maintains the desired properties comparable to those of multi-materials such as processability, printability, heat sealability, stiffness, to name a few. There is an increasing demand for mono-material, recyclable* flexible films in many food packaging applications, such as stand-up pouches and flow wrappers. The high oxygen barrier property is especially important in applications that can have an impact on shelf life.

Potential solution

To move to a mono-material structure or an all-PE alternative, collaboration across the value chain is key. In this case, the ExxonMobil team worked with the following companies: flexible packaging manufacturer Tobe Packaging Industries Pte Ltd, and Aegis Packaging — a Singapore-based company that manufactures high-oxygen barrier coating for flexible plastic packaging.

Tobe created a non-oriented film using ExxonMobil's performance polyethylene Exceed™ Stiff in the substrate layer. This substrate layer was subsequently laminated with a sealant film. This material was subjected a series of tests for processability, stiffness, barrier properties, bubble stability as well as melt properties.

Compared with the traditional multi material structure using a non-PE substrate, this mono-material structure demonstrated a significant boost in stiffness in addition to good melt strength, excellent bubble stability and comparable melt pressure.

*Recyclable in the few communities with programs and facilities in place that collect and recycle plastic film



For frozen food applications, a silicate polymer coating provided by Aegis was applied to help provide an oxygen barrier that can help preserve the quality and flavor of food products. This high oxygen barrier coating was applied using existing coating/laminating equipment, which meant that no special set-up/equipment was required.

Finally, the pouches (converted by Tobe Packaging) were ready to be used in frozen food applications.



Results

Tests performed on the material demonstrated:

- Boost in stiffness when Exceed™ Stiff performance polyethylene was used as the substrate film replacing the traditional LLDPE
- High oxygen barrier properties that are comparable to multi-material low barrier structures, which can be more difficult to recycle

A key enabler to materializing PE//PE solutions with sustainability benefits is innovative materials and excellent processing. In this instance, it is by combining state-of-art converting technology from Tobe and Aegis together with ExxonMobil Exceed Stiff PE.

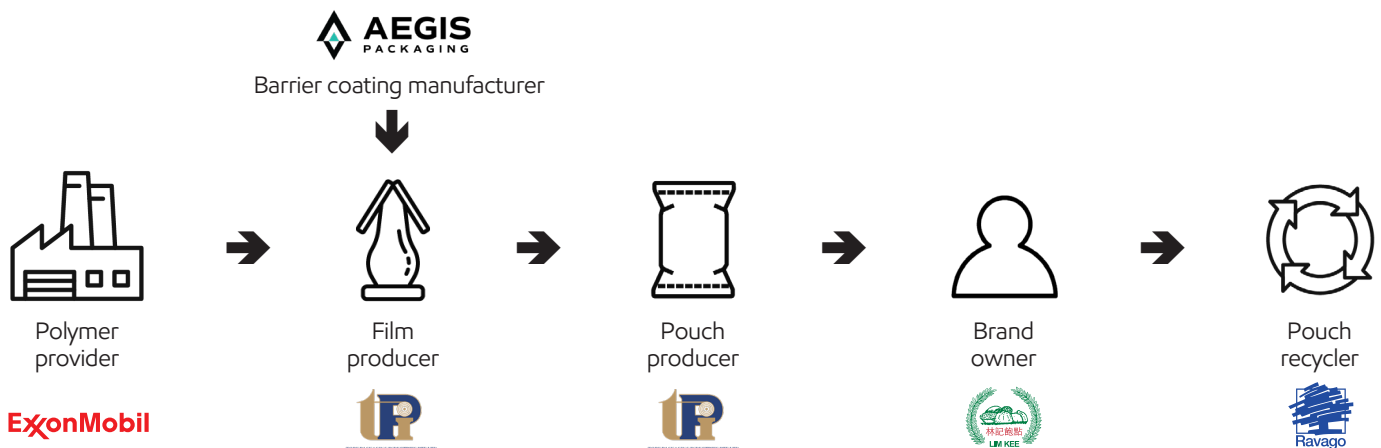
The team debuted the pouch at Food and Hotel Asia (FHA) Food and Beverage event held in Singapore in April 2023. Working together with brand owner Lim Kee Food Manufacturing, one of Singapore’s leading homegrown food manufacturers of Chinese steamed buns. The used pouches were collected by Ravago, one of the leading plastic recyclers. Through technological advancement, they are able to recycle more and more types of plastic waste, including post-consumer recycled (PCR) content materials.

Ms Lim Ziehui, Director of Tobe said, “Plastic continues to play a vital role in our daily lives, offering invaluable protection for food and helping to reduce food wastage. Recognizing our crucial position as a packaging manufacturer, we have embraced our responsibility to drive innovation, develop solutions with sustainability benefits, and lead the way.

With plastic waste being a pressing environmental challenge, we took it upon ourselves to take action. Our breakthrough came in 2022 with the introduction of EcoLeFin, a mono-PE material with superior barrier properties. We are very pleased with how ExxonMobil’s Exceed Stiff performance polyethylene helped boost the stiffness and offered good process stability.”

Mr Ong Kai Liang, Business Development Manager of Aegis Packaging added, “At Aegis Packaging, we are privileged to be at the forefront of a packaging revolution that focuses on sustainability benefits. Our barrier coating O2X represents a paradigm shift in mono-material packaging, enabling businesses to achieve product shelf-life protection while actively contributing to packaging that offers sustainability benefits. The barrier function works in both directions – keeping oxygen and contamination away from the food and locking in the aroma and freshness inside. By collaborating with Aegis Packaging, companies can leverage our innovation while helping to reduce waste.”

Mr Yeo Weijian, ExxonMobil Polyethylene Market Development Manager for South Asia said, “We are pleased to be part of this plastic production technology evolution and working with key industry players to bring about this new mono-material packaging using our Exceed Stiff performance polyethylene. Exceed Stiff performance polyethylene can help simplify film formulations and designs while improving film performance, conversion efficiency, and packaging durability. We look forward to working with the next brand owner to bring packaging with sustainability benefits to more consumers.”



About our value chain partners

Tobe Packaging

Tobe Packaging Industries, established in 1987, with more than 30 years of experience in the industry, we are one of the longest established plastic packaging manufacturers in the local market. At Tobe Packaging, we specialize in delivering a diverse range of flexible packaging solutions tailored to meet the unique requirements of various sectors. Our comprehensive packaging offerings cater to the Food, Non-Food, and Healthcare Industries, empowering businesses with high-quality and efficient packaging solutions. Tobe Packaging holds ISO 9001 and FSSC 22000 certifications, ensuring high-quality management and food safety standards. Tobe Packaging embarked on a transformative journey in 2022. Tobe Packaging embraced sustainability, leading the charge by developing innovative eco-friendly food packaging solutions. Our commitment to a greener future is reflected in our unwavering dedication to reducing environmental impact and promoting responsible practices within the packaging industry. For these efforts, Tobe Packaging was awarded the Sustainable Brand Award in 2023.

Aegis Packaging

Aegis Packaging, a Singapore-based barrier coating manufacturer, is committed to delivering sustainable solutions for the packaging industry. Our focus lies in recyclable mono-material packaging, and we offer the O2X barrier coating as a barrier alternative to non-recyclable materials like Nylon, PET, and Aluminum foil. By applying O2X to mono PP or PE substrates, we enable existing mono-material packaging to incorporate effective barriers while maintaining similar functionalities to multi-material solutions. This breakthrough innovation reduces reliance on non-recyclable materials, minimizes waste, and supports the circular economy.

Ravago

Since its foundation in 1961 by Raf Van Gorp, Ravago provides a superior distribution, resale, compounding and recycling service for plastic raw materials serving sophisticated functions that improve the sustainable quality of our life. Ravago serves more than 50,000 customers with multiple products and services. Recycling has been our legacy and core since our inception. Ravago's production competence consists of 45+ manufacturing facilities, which include 19 recycling and compounding plants in North America, Europe, Asia, and Africa with a combined annual capacity of over one million metric tons. Our growth has been possible thanks to the 9,000 employees that make up our family, and the values we represent: human focus, professionalism, entrepreneurship and humility.

Contact us for more information: exxonmobilchemical.com/pe

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