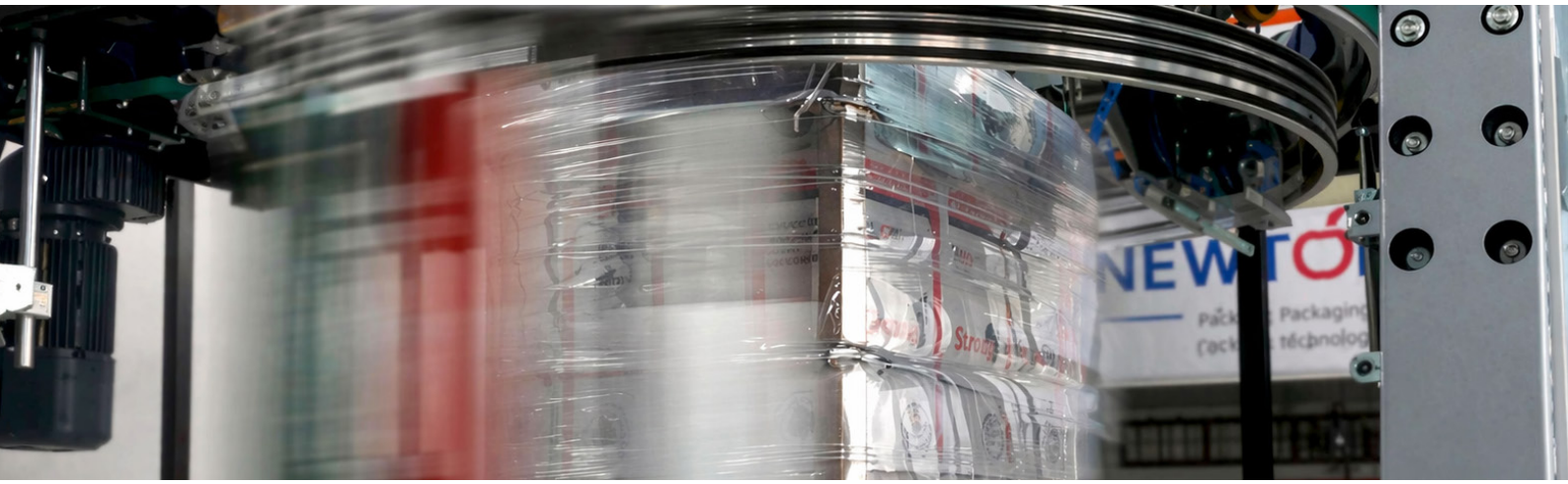
ExxonMobil
Signature Polymers

Case study



Exceed™ Flow

Thong Guan and ExxonMobil Signature Polymers develop a high-tenacity performance machine wrap with Exceed™ Flow m 1716

High tenacity | Excellent stretchability | High holding force | Easy processability

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

Develop a high-tenacity machine wrap capable of maintaining load stability under challenging transportation conditions.

Stretch film is widely used for pallet wrapping and load bundling to protect products from dust, moisture, pilferage and shifting during transportation and storage, while not obscuring product visibility. High-performance stretch wrap can significantly help in reducing the risk of damaged goods during transit.

Extensive analysis done on an acceleration bench shows that effective load security requires minimal pallet displacement when tested on an acceleration bench. Currently, many commercially available stretch films are unable to withstand high acceleration conditions, creating potential safety risks during end-to-end transportation. While high holding force films can improve load stability, they often do so at the expense of stretchability, resulting in sub-optimal film yield.

Thong Guan Industries Bhd (Thong Guan), a company that specializes in plastic packaging production that includes stretch film, flexible packaging, food wrap, additives and food & beverage manufacturing, and Newton Research & Development Centre Sdn Bhd (Newton), a research and consulting firm that focuses on load safety through testing, analysis and material optimization, partnered with the ExxonMobil Signature Polymers team to develop a high tenacity stretch film that can offer high holding force and stretchability.

Solution

Incorporating Exceed™ Flow m 1716 performance polyethylene (PE) into the film formulation to deliver outstanding film performance.

High-tenacity resins typically have a low melt index (MI), resulting in poor flow properties that limit extrusion rates. These materials often require blending to achieve acceptable processability. In this application, Exceed Flow m 1716 metallocene PE was used in discrete layers (without blending) to produce a multilayer, power pre-stretched film.

The film was manufactured on a wide, nine-up extrusion line at a high extrusion rate, achieving consistent flow performance across more than five meters of die width. Exceed Flow m 1716 demonstrated excellent processability while maintaining the high-tenacity attributes required.

Incorporating Exceed™ Flow m 1716 into the power pre-stretch film formulation resulted in:

- Higher holding force compared to traditional power pre-stretch film
- Higher load stability due to increased stretch force at any given stretch level
- Improved cling force enabled by the polymer's unique molecular structure

888 Since 1942

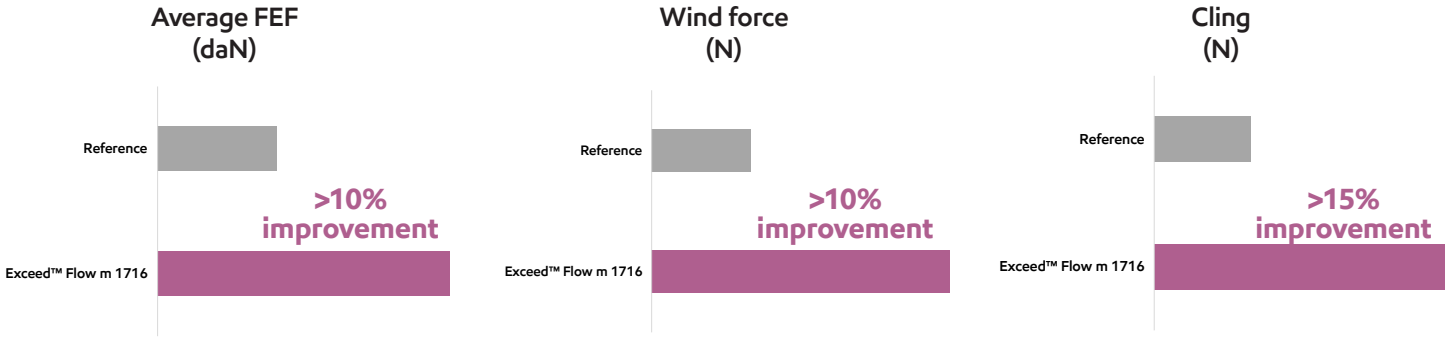
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Results

Exceed™ Flow m 1716-based stretch film solution delivered significantly improved load stability compared to commercially available films.

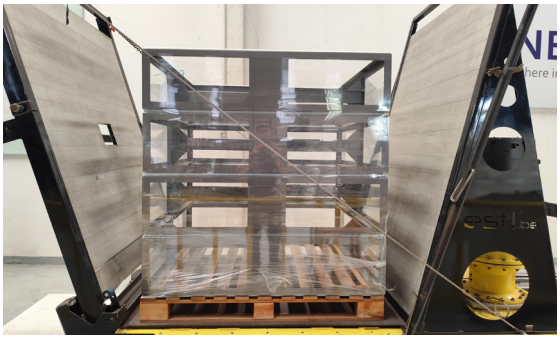
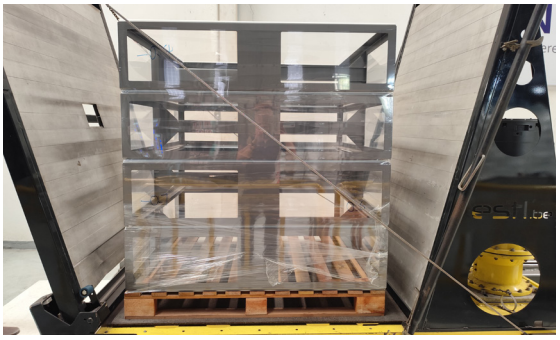
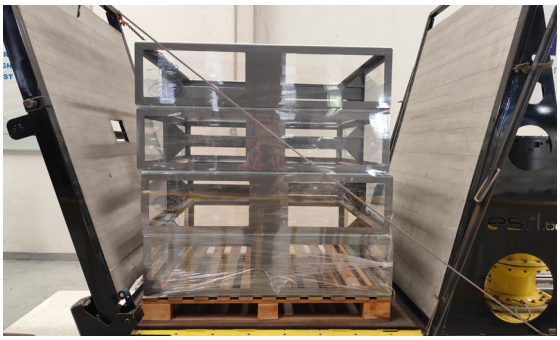
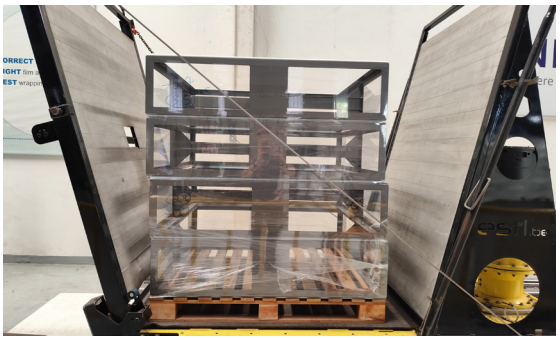
Despite having the same film thickness as the market reference film used in the acceleration tests, the Exceed Flow m 1716-based solution delivered excellent load containment. The polymer enabled improved tenacity, resulting in higher holding force and load stability. Notably, Exceed Flow m 1716 combined two seemingly contradictory properties – high flow and high tenacity.

At the same pre-stretch level, consistent film edge force (FEF) translation improvement was observed with a 10% increase in wind force. Additionally, cling force improved due to the polymer's unique molecular structure, allowing the film tail to adhere securely to the pallet after wrapping.



The combined increase in holding force (via FEF) and wind force produced a more stable load, demonstrated by reduced pallet displacement across five consecutive acceleration bench tests at 0.5g (equivalent to accelerating from 0 to 90km/h in five seconds).

Acceleration attempt (0.5g)

	High tenacity machine wrap market reference	Exceed Flow m 1716-based machine wrap solution
Before		
After		

After five acceleration attempts, the Exceed Flow m 1716-based machine wrap showed better load stability with pallet displacement reduced by more than 10% compared to the reference high-tenacity machine wrap. These results indicated that pelletized goods secured with Exceed Flow m 1716-based machine wrap are better suited to withstand long transportation distances. The strong rebound behavior observed after acceleration testing highlighted the unique second yield effect performance of Exceed Flow m 1716.

Mr. Teoh Keah Guan, Head of Cast Division at Thong Guan, shared, "At Thong Guan, we strive to be a trusted partner to our customers by offering palletization solutions that can secure loads, allowing their goods to arrive without damages until last mile of transportation journey. Through our collaboration with the ExxonMobil Signature Polymers team and the use of the latest performance PE, we are proud to make this vision a reality."

Ms. Ooi Lin Chia, Head of Newton, commented, "For a pallet to survive under tough transportation conditions, it requires a secured load to work as a unit during high acceleration tests. At Newton, seeing lesser pallet displacement during such tests would indicate that a secured pallet is more stable, reducing the possibility of pallet tilting and need for re-packing after a long transportation journey."

"With ExxonMobil Signature Polymers, we were able to deliver a solution that not only met our market needs but a breakthrough on how Exceed™ Flow m 1716 is able to add a new game changer that not only met market needs but provided a breakthrough in the context of load stability where there is no longer a tradeoff between holding force and stretchability," commented Mr. Yeo Weijian, General Manager – South Asia Polyethylene Market Development at ExxonMobil.

Test item	Test method
Wind force	ExxonMobil method
Film edge force (FEF)	ExxonMobil method
Cling force	ExxonMobil method

Data from tests performed by or on behalf of ExxonMobil.

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.

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