ExxonMobil
Signature Polymers

Case study

Exceed™ Stiff+

Infinity Bulk Logistics collaborated with ExxonMobil Signature Polymers to develop hot fill flexitanks for end-to-end transportation

Excellent mechanical performance

Outstanding heat resistance

Downgauging opportunity

Cost effectiveness

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 develop a high performance hot fill flexitank for specific industries (such as bitumen, oleochemical etc.) at heated stage operation.

Infinity Bulk Logistics is a leader in global bulk liquid transportation, offering a wide extent of flexitank solutions, compatible with a diverse range of liquids from non-hazardous industrial chemicals to consumer food grade liquid.

A flexitank is a large bladder with valves that is designed to fit within a general freight container. It often has a capacity of 24,000 liters (more than 20 metric tons) per unit and is a flexible packaging alternative to rigid packaging, like drums or ISO tanks (a tank container built based on International Organization for Standardization). It is regarded as an attractive transportation mode because of its lower packaging cost and higher operation efficiency versus these alternatives.

Flexitanks can be used in non-hazardous infills with various requirements. Due to rapid growth in demand for construction, edible oil and oleochemical are increasingly popular infill. As high melting point of edible oil and oleochemical can only flow in a heated state, it requires hot filling into flexitanks. Therefore, heat resistance is an important requirement for this type of flexitank film, while mechanical performance and flexibility are also needed.

Flexitanks are currently produced using polyethylene (PE) and/or polypropylene (PP), and both have limitations. To maintain structural integrity at high temperature, PE film must be considerably thick, with some PE films reaching as much as 300 µm. This is significantly greater than the standard 125 µm film currently used in flexitanks, which raises cost considerations. While the higher melting temperature of PP provides significant heat resistance, it requires higher sealing temperature or longer sealing time, thus slowing production speeds. There is a need to simplify welding operation at optimal temperature. Today, flexitanks are often produced with a blend of PE and PP to obtain the desired thickness and heat resistance properties.

To address the challenge, ExxonMobil Signature Polymers collaborated with Infinity Bulk to develop customizable and cost-effective solutions to address the requirements of hot-filling applications. These solutions, using Exceed™ Stiff+ m 0820 and Exceed™ Stiff+ m 0238, can deliver exceptional mechanical performance and remarkable heat resistance. Historically, it has been particularly challenging to maintain bubble stability without LDPE for 8 meter wide film, but with Exceed Stiff+ m 0238, it is possible due to its excellent melt strength. Translating into downstream need, it allowed a flexitank to withstand demanding conditions, ensuring structural integrity during hot-filling, while helping prevent leakage during transportation.

infinity
PEOPLE | DIGITALISATION | SUSTAINABILITY

Solution

Enabling heat resistant mono-material PE-based solution using Exceed™ Stiff+ performance polyethylene.

Flexitanks are typically extruded from formulations that contain low-density polyethylene (LDPE) for bubble stability, PP for heat resistance and mLLDPE for toughness. However, when downgauged, this film can lack the heat resistance and toughness coupled with its integrity which are crucial criteria for hot fill flexitank.

To overcome this limitation, Exceed™ Stiff+ m 0820 and Exceed Stiff+ m 0238 performance polyethylene were incorporated into the film formulation. This enabled solutions without LDPE while meeting heat resistance and toughness performance requirements. The resulting film demonstrated:

- Monomaterial PE with heat resistance and optimal sealing performance.
- Similar flex crack to help prevent leakage during long transportation distance.
- High dart impact that provides a liquid shock shield during transportation.
- High melt strength material to address thickness variation induced leakage.
- Avoidance of end product condensation during end-to-end transportation.

Result

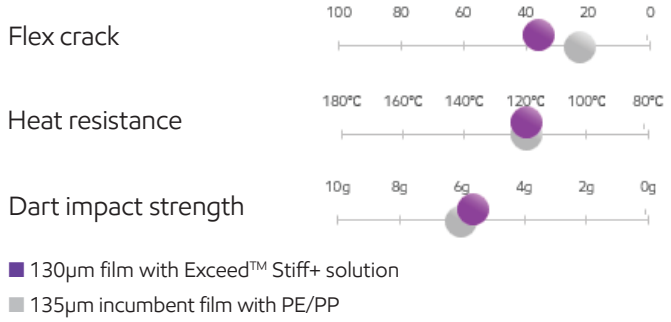
A downgauged flexitank with excellent heat resistance to fill product in a heated state up to 120°C*.

The hot fill flexitank developed primarily with Exceed Stiff+ m 0238 and Exceed Stiff+ m 0820 met the critical needs of end-to-end transportation:

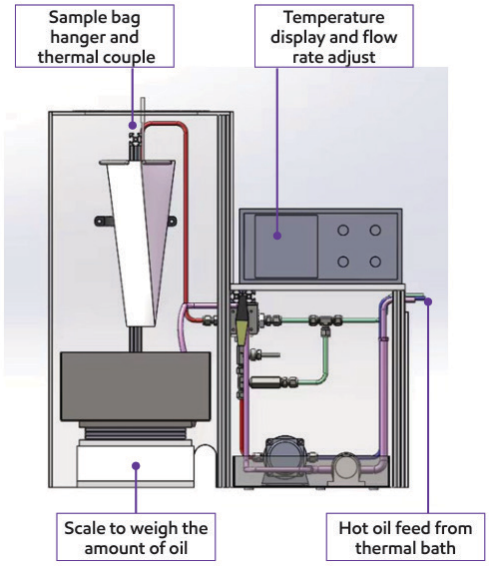
- Heat resistance: Filled products did not melt the film at 120°C.
- Flex crack: Similar pinholes to avoid leakage of filled content through rigorous test of 3000 cycles.
- Downgauging: Reduced film thickness while maintaining film functionality for flexitank with infill at elevated temperature for filling production efficiency.

*Comparing incumbent at 135µm with ExxonMobil Signature Polymers solution at 130µm

Test item	Based on
Heat resistance	ExxonMobil method
Flex crack	ExxonMobil method
Dart impact strength	ExxonMobil method



Additionally, ExxonMobil converted the practices of our customers into a measurable testing methodology, enhancing the test's measurability and repeatability. As a result, specialized hot-oil filling equipment was custom-designed and implemented.



Mr. Teo Guan Kee, Technical Director at Infinity Bulk, shared, "At Infinity Bulk, we strive to be a trusted partner to our customers by offering full polyethylene-based solutions that support their efforts to produce thinner films that maintain functionality. Through our collaboration with the ExxonMobil Signature Polymers team and the use of the latest performance PE, we are proud to help make this vision a reality."

"With ExxonMobil Signature Polymers performance resins, we were able to deliver a solution that not only met our downgauging targets, but also offer critical functionality with Infinity Bulk, striking the perfect balance between performance and material efficiency," commented Mr. Yeo Weijian, General Manager - South Asia Pacific Polyethylene Market Developer at 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.