



Exceed™ Stiff+

## Create strong and durable air tube bags with Exceed™ Stiff+ performance polyethylene for e-commerce packaging

Air tube bags are commonly used in e-commerce packaging to reduce friction and risks associated with impact and vibration during package transportation. Interest is growing to use less plastic in air tube bags by lowering film gauge, which often brings the risk of sacrificing performance. What if your resin did more to overcome the challenge? Now you can get high performance while using less material, and the exceptional balance of stiffness and toughness offered by Exceed Stiff+ PE grades.



Exceed Stiff+ performance PE resins excel at balancing the combination of stiffness and toughness, and are ideal for use in protective air tube bags. The high stiffness of Exceed Stiff+ PE resins helps prevent film elongation during the inflation process, contributing to outstanding burst resistance. Utilizing Exceed Stiff+ m 0820 and m 0926 resins in PE layers also delivers excellent needle puncture resistance and high film toughness. With balanced film stiffness and toughness, a robust, durable and thinner air tube bag can be created to give excellent protection during package shipping and delivery.

### Beneficial attributes

- Excellent burst resistance at lower gauge
- High needle puncture resistance
- Smooth tube formation and inflation

### Value

- Premium package durability to help reduce failures, which can help to reduce complaints and refunds
- Significant downgauging opportunity and cost-saving potential

A typical air tube bag film has a symmetrical structure, with polyamide (PA) in the core and PE in the skin layers. Two tie layers are also co-extruded as sub-skin layers to bond the PA and PE layers together during film production. In the two tests below, Exceed Stiff performance polyethylene demonstrated exceptional combinations of toughness and stiffness, enabling downgauged — but extremely strong — air tube bags.



Schematic diagram of typical air tube bag film structure

## PE-only downgauging test

In this test result, the solution comprising Exceed™ Stiff+ m 0926 PE delivered excellent burst resistance and enhanced film stiffness at 17% downgauging, with film thickness reduced from 60µm to 50µm and PA thickness unchanged. In addition, needle puncture resistance improved up to 31%, providing strong protection to products against vibration, impact and potential damage during transportation.

Rupture burst pressure (mbar)



MD force at 1% strain (N)



Needle puncture resistance (N)



	Reference 1: 60µm	Downgauge solution 1: 50µm
PA gauge*	9µm	9µm
PE layer formula	~20% performance PE-based market reference	Exceed Stiff+ m 0926 Exceed Stiff+ m 0238 C4 LL

R2112-005688

## Combined PE and PA downgauging test

In this test result, the solution comprising Exceed Stiff+ PE delivered excellent burst resistance and comparable film stiffness and needle puncture performance vs market reference at 10% downgauging. Downgauging of both the PA and PE layers offers the opportunity for material cost savings with comparable mechanical performance.

Rupture burst pressure (mbar)



MD force at 1% strain (N)



Needle puncture resistance (N)



	Reference 2: 50µm	Downgauge solution 2: 45µm	Downgauge solution 3: 45µm
PA gauge*	7.5µm	6.75µm	6.75µm
PE layer formula	~50% performance PE-based market reference	Exceed Stiff+ m 0820 Exceed Stiff+ m 0238	Exceed Stiff+ m 0926 Exceed™ Flow+ m 0516

R2201-005980

C4 LL = 0.918 g/cm<sup>3</sup>, 2.0 g/10 min MI at 190°C, 2.16 kg  
\*Calculated based on extrusion amount during film production, with assumption that all layers kept at same density.  
Data from tests performed by or on behalf of ExxonMobil.

Grade	Melt index (g/10 min)	Density (g/cm <sup>3</sup> )
Exceed Stiff+ m 0820	0.80	0.920
Exceed Stiff+ m 0926	0.85	0.926
Exceed Flow+ m 0516	0.50	0.916
Exceed Stiff+ m 0238	0.25	0.938

Test item	Test based on
MI (Melt Index: 190°C @ 2.16 kg)	ASTM D-1238
Density	ASTM D-792/ASTM D-1505
Rupture burst pressure	ExxonMobil test method
Tensile force at 1% strain	ExxonMobil test method
Needle puncture	ExxonMobil test method

Contact us for more information: [exxonmobilchemical.com/pe](https://www.exxonmobilchemical.com/pe)

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## 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™ S 9272	Exceed™ Stiff+ m 0820
Exceed S 9243	Exceed Stiff+ m 0926
Enable™ 4002	Exceed Stiff+ m 0238
Exceed™ XP 6056	Exceed™ Flow+ m 0516

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](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](https://www.exxonmobilchemical.com/sptransform)