Milliken

## Better Barrier Performance for More Recyclable Packaging

# Unlocking a New Resin Formulation for Flexible HDPE

### The Challenge:

Shelf-stable packaging is an integral part of today's food supply chain—preserving and protecting food contents until they are consumed by the customer. These types of packaging, especially those using films or flexible materials, may rely on barrier layers to fortify the package and protect interior contents from permeants.

This barrier performance is critical to flexible packaging. While some barrier solutions are highly effective, they comprise multiple materials or layers, which are hard to isolate at the end of a product's intended life. Barrier layers, like those made with ethylene vinyl alcohol copolymer (EVOH) and nylon, can achieve barrier performance in a single-material layer, but they are expensive to produce and can be difficult to recycle.

The ideal solution when designing flexible food packaging for circularity would be to specify a single material compatible with existing recycling infrastructure—creating a mono-material solution with no detriment to barrier performance. Creating this mono-material solution also improves the package's recyclability. High-density polyethylene (HDPE) certainly offers many characteristics needed from a mono-material packaging solution: It is lightweight, strong, transparent, and highly compatible with current recycling methods. Historically, though, its barrier performance hasn't measured up to other alternatives on its own.

Creating flexible packaging for circularity, therefore, is a complex task. NOVA Chemicals hoped to create a resin with increased barrier performance metrics capable of supporting mono-material flexible packaging solutions. The company tested the resin by creating an all-polyethylene (PE) flexible soup pouch that would provide proof-of-concept that demonstrates how this resin could enable alterative packaging solutions that replace multi-layer, metalized biaxially oriented polypropylene (BOPP) or polyethylene terephthalate (PET)-laminate films packaging.

### The Solution:

To achieve the required superior moisture barrier performance necessary for this project, NOVA Chemicals turned to additives expert Milliken & Company. The two organizations combined their respective technologies, NOVA's SURPASS® PE architecture and Milliken's UltraGuard 2.0 additive chemistry, to elevate the barrier performance of HDPE to new levels. UltraGuard 2.0 has been shown to improve the barrier properties of base HDPE by up to 70%.

With enhanced barrier performance, NOVA's SURPASS HPx267-AB HDPE resin supports a flexible packaging solution. Using PE as a barrier layer is a significantly lighter option compared to traditional soup cans and creates more opportunities for an all-PE mono-material solution, reducing barrier layers needed. End-stage recycling was also prioritized, given that UltraGuard-enhanced HDPE can be more compatible with current recycling methods and eliminated the need for alternative expensive, difficult-to-recycle barrier solutions for this application.

### The Result:

NOVA Chemicals showcased an example soup pouch utilizing their newly formulated SURPASS HPx267-AB resin enhanced with Milliken's UltraGuard 2.0 barrier solution on May 6, 2024. This resin provides a 20% improvement in barrier performance compared to existing benchmark resins. Packaging engineers utilizing this resin have more flexibility to design a wide range of barrier films without sacrificing moisture barrier performance, toughness, or processability. The resin is designed for blown films and is ideal for a wide variety of food packaging applications, including meat, cheese, cereals, and crackers, baking staples, high-fat content foods, pet food, and more.

Thanks to the improved barrier properties, this soup pouch harnessed circular plastics economy design principles while performing on par with the functional metric required of food-safe packaging.


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NOVA Chemicals