



# Circular Economy for Flexible Packaging



March 17, 2021  
10:00 a.m. – 1:00 p.m. E.S.T.  
Virtual Conference  
**REGISTER TODAY**

# A Journey to Commercialize Recyclable Flexible Packaging

Nicolas Mazzola

The Dow Chemical Company



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**HAPPY ST. PATRICK'S DAY**



## OUTLINE

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- Dow™ Sustainability Efforts
- Designing for Recycling
- Case Study

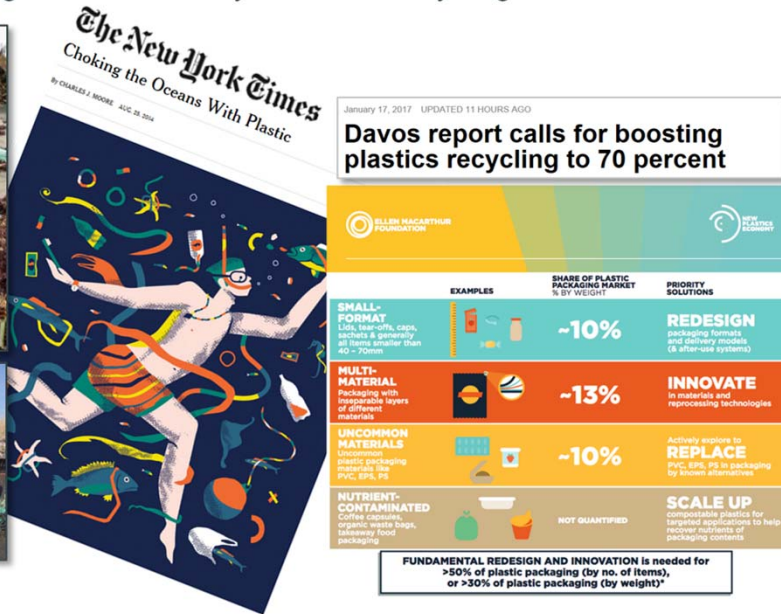


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# CORPORATE SUSTAINABILITY EFFORTS

Litter is a growing concern... Everyone wants recycling.

## What are Brandowners Committing to?



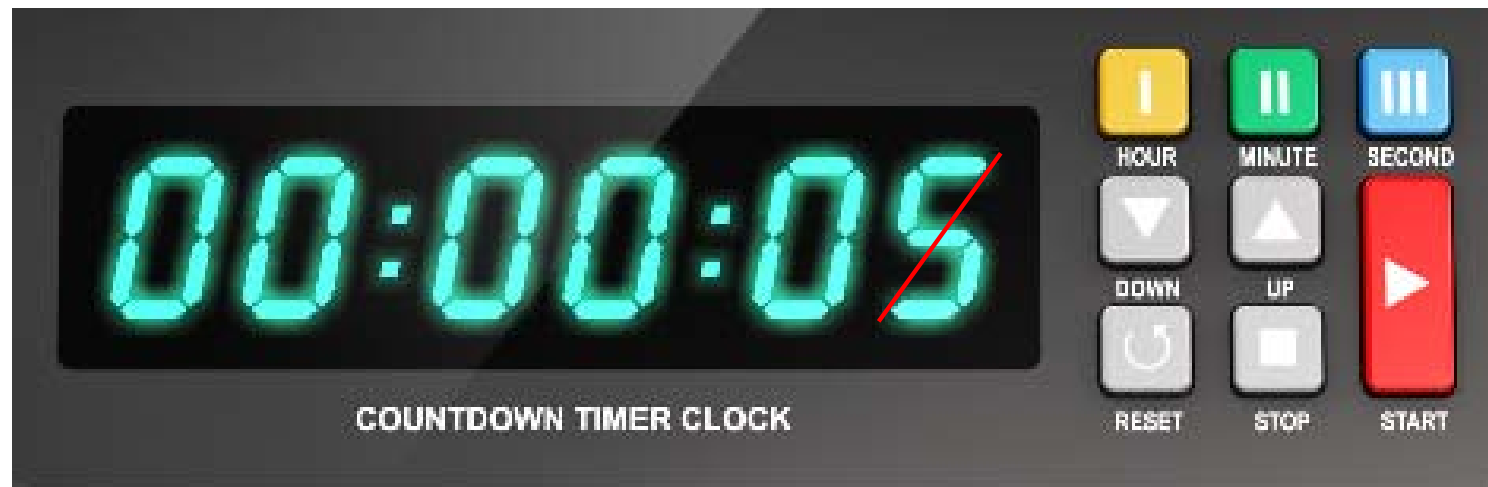
- Reduce overall environmental footprint
- Recyclability or reusability
- Light weighting, reduce product waste
- PCR incorporation
- Bio-based materials
- Bio-compostability



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## COUNTDOWN TO 2025, 2030 & 2035

*The clock is ticking. What is your plan to meet your goals?*



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## CORPORATE SUSTAINABILITY TARGETS

**STOP THE WASTE:** By 2030, we will help “stop the waste” by enabling 1 million metric tons of plastic to be collected, reused or recycled through its direct actions and partnerships.

**CLOSE THE LOOP:** By 2035, we will help “close the loop” by having 100% of our products sold into packaging applications be reusable or recyclable.



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A suite of technologies are needed to reach the goals



Plastics Circularity

**1.**  
Design for  
Recyclability

**2.** **pack**  
COLLABORATE • INNOVATE • ACCELERATE

Mechanically  
Recycled PCR

**3.**

Feedstock  
Recycling  
Solutions

**4.**

Bio-Based  
Solutions



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## BIO FEEDSTOCK: TALL OIL

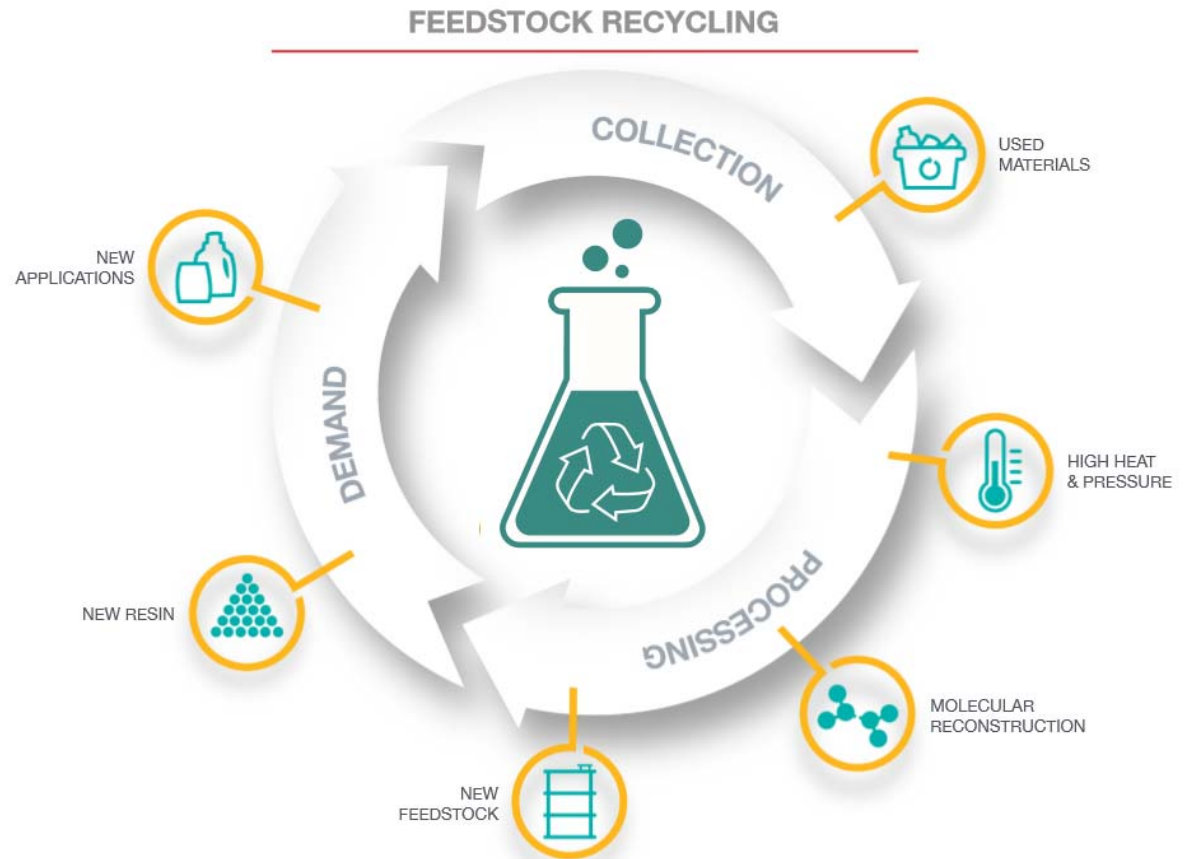
- Partnership with UPM on Bio-Naphtha
- Replaces fossil products and raw materials
- Non-food- competing feedstock
- Supports sustainable forestry
- 57% fewer CO<sub>2</sub> emissions



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## FEEDSTOCK RECYCLING

- Enables circular polymers with no compromise on performance
- Technology exists today but need to validate value chain affordability
- Partnerships and commitments critical to scale
- Small volumes available in both NA and Europe in 2021

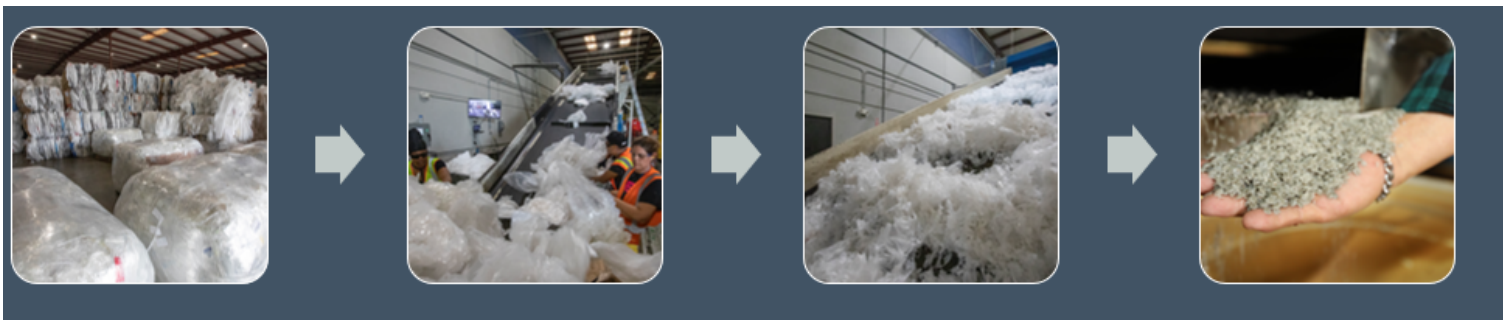


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## PCR OFFERING

### Post-consumer recycled (PCR) rich resin for shrink film in North America

- XUS 60030.01, (0.918 g/cc, 1.4 MI) – 70% certified PCR with LDPE
- XUS 60030.02, (0.918 g/cc, 1.8 MI) – 70% certified PCR with LLDPE
- When combined with other high-performance resins from us, the new PCR rich resins provide improved aesthetics and performance consistency over comparable PCR dry blends
- These resins are specifically tailored to the North America and Latin America markets
  - *NOTE: both products are NOT FDA approved for food contact*
- Samples are available



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## What makes a package commercially recyclable?

### WHAT IS RECYCLABLE?

- Certain conditions must be met to make a recyclability claim
- Need to meet all three basic requirements
- Does flexible packaging meet these requirements?



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# VALUE CHAIN COLLABORATION IS KEY FOR CREATING CIRCULAR PACKAGING

## Need to Design for the Entire Cycle

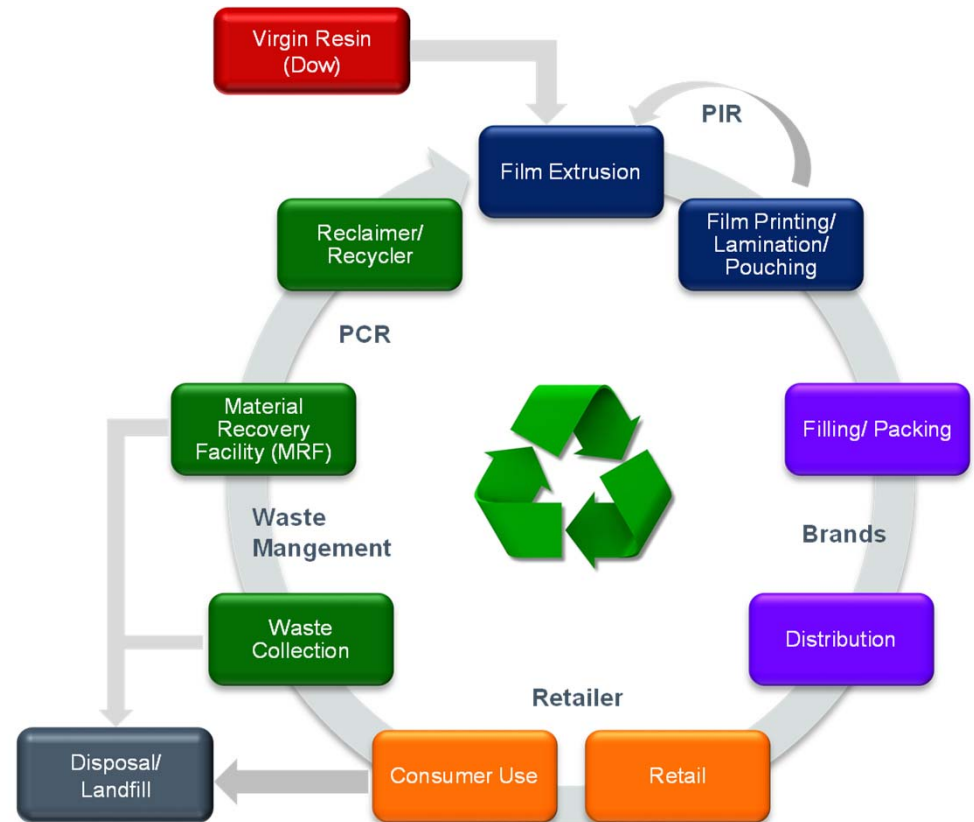
Historically designers have done well up to the consumer. Need to design beyond the consumer

- Monomaterial
- Collection, sortation, handling
- Reprocessing
- End markets

The package must still meet its performance requirements needed for the contents and fabrication processes

### Key Challenges-

- Multilayered films are typically made of dissimilar materials- no market for mixed resins
- Most material recovery facilities (MRFs) cannot handle flexible films



## PUTTING THE PIECES TOGETHER

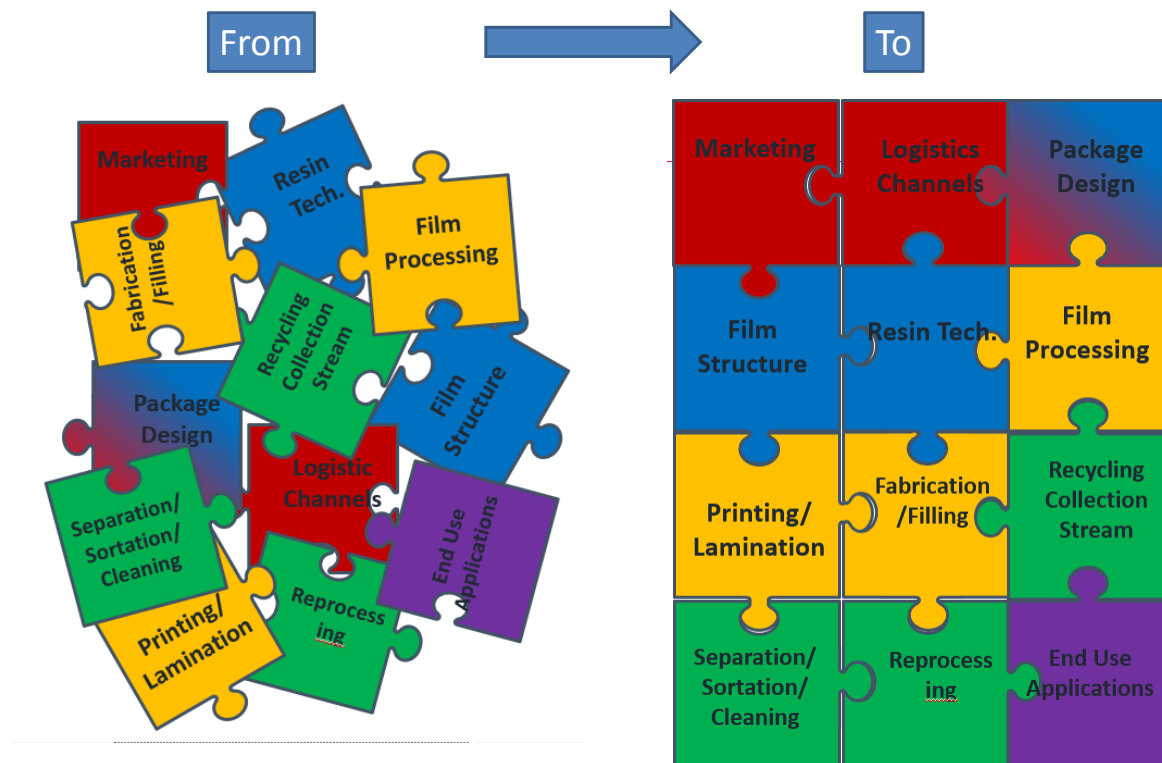
- It's not enough just to develop a material or film structure that can be reprocessed

- Have to design for the entire cycle

- Converter
- Fabricator
- Brand
- Retailer
- Consumer
- Recycling System

- Collaborative Team Effort

- Strong Channel Captain
- Flexibility
- Patience



## CASE STUDY – BEAR NAKED GRANOLA SUP

*GOAL- To make Bear Naked Granola Pouch fully recyclable for the How2Recycle Store Drop Off Logo*

How Kashi worked with Dow's Pack Studios to design recyclable granola pouches

Deonna Anderson

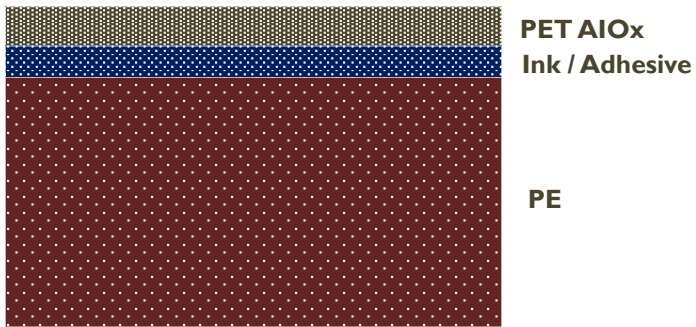
Wednesday, November 27, 2019 - 2:00am



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# REPLACING THE INCUMBENT

## Non-recyclable Structure (Multi-material)



Not recyclable due to *mixed materials*



## RecycleReady PE based Structure



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## KEY PERFORMANCE REQUIREMENTS

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- Surface matte printing with clear window (brand equity)
  - Premium look and feel
  - Showcase food – window clarity
- Ability to meet quality and sensory requirements
  - Modified atmosphere
  - Shelf life
  - Seal integrity
- Manufacturing requirements
  - Maintain existing run rates



# COLLABORATION IS KEY TO SUCCESS



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# DESIGNING FOR RECYCLABILITY – CHOOSING THE RIGHT MATERIALS

*Common oxygen barrier materials like Nylon and EVOH are not compatible with PE- makes recycling a challenge*

*This recyclable design enables **barrier films** to be **recycled in store drop-off stream***

## RecycleReady Structure



# ENABLING 100% RECYCLABLE PACKAGING

## DRIVING SUSTAINABLE SOLUTIONS

We offer a complete portfolio of products coupled with the capability and knowhow needed to create recyclable packaging.



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**Mono-material Design /  
Replacement of Not-in-Kind  
Materials**



**Protective Coatings**



**Unique Sealant Resins**



**Compatibilizers and Tie Layers**



**Lamination Adhesives**



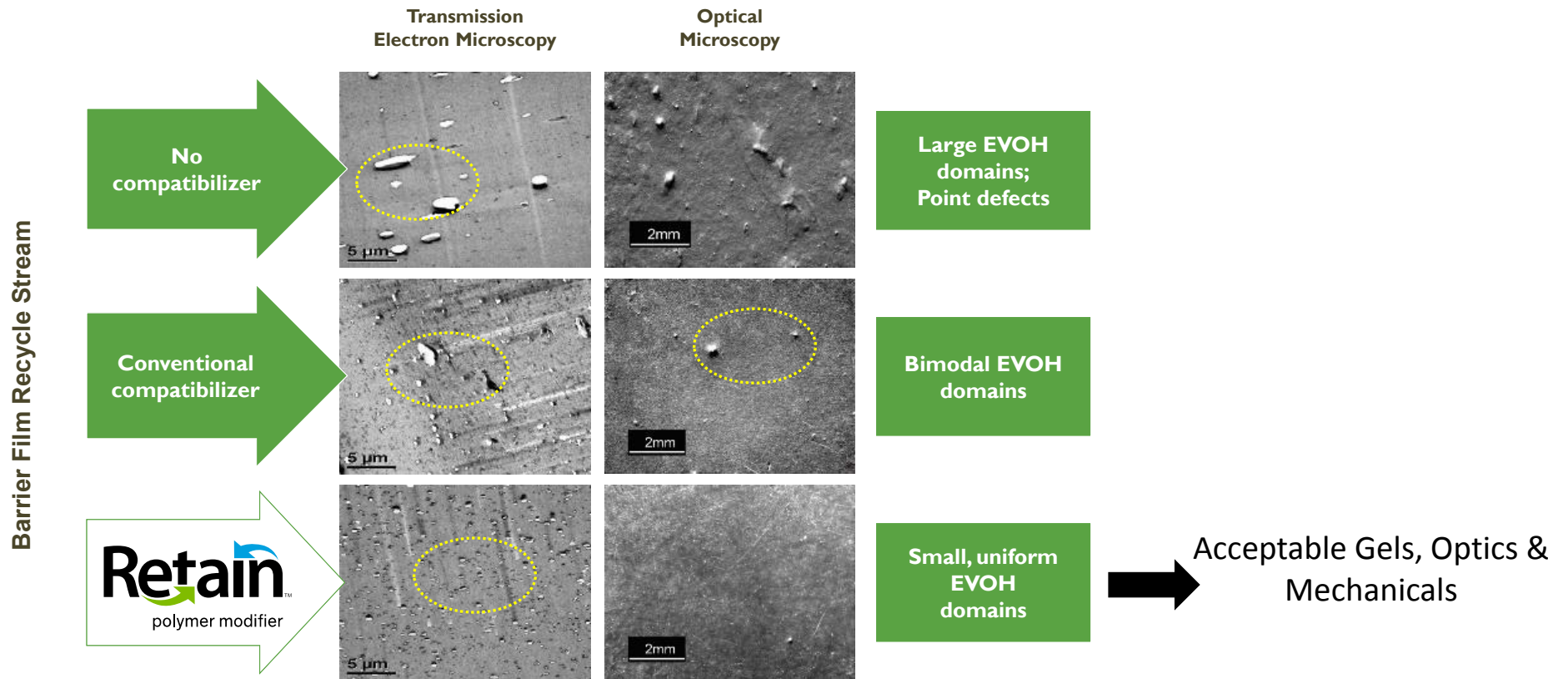
**Film Orientation Technologies  
(MDO, TF-BOPE)**



**Pack Studios**

Our capabilities for film production and packaging equipment capabilities to expedite structure testing

# DESIGNING FOR RECYCLABILITY – CHOOSING THE RIGHT MATERIALS



# DESIGNING FOR RECYCLABILITY – MAKING HERMETIC SEALS

## Challenge – Channel Leakers at Zipper Crush Points

### Solutions

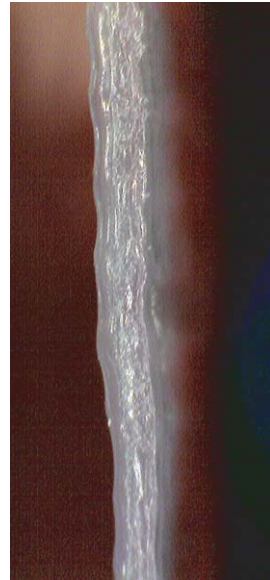
#### 1. Sealant – Polyolefin plastomer

- Low Seal Initiation Temp
- Optimum flow/mass to compensate for film and zipper profile differences (too much flow can cause thinning/splitting)
- Hermetic seal at low T

#### 2. Fresh-Lock® Soft Seal® Zipper

- Less time, temperature and pressure to seal
- Improved side seal appearance
- Minimizes leaks, gaps and distortion

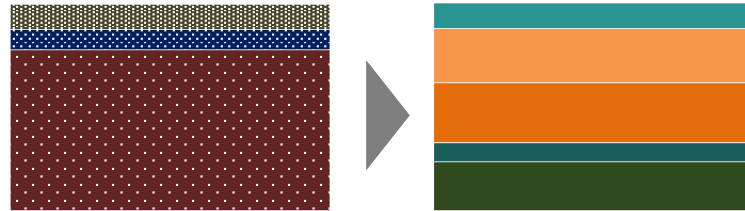
✓ *Note: Fresh-Lock® and Soft Seal® are registered trademarks of Presto Products Company*



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# DESIGNING FOR RECYCLABILITY – GETTING THE BARRIER RIGHT

- Polymer selection and layer distribution driving barrier performance
- 9-layer extrusion technology allowing precise material management
- Passed shelf life with the most critical products



Property	Non-recyclable Structure		Recyclable Structure	
WVTR <sup>1</sup>	0.06	(0.93)	0.04	(0.62)
OTR <sup>2</sup>	0.20	(3.10)	0.10	(1.55)
	g/100si	(g/m <sup>2</sup> )	g/100si	(g/m <sup>2</sup> )

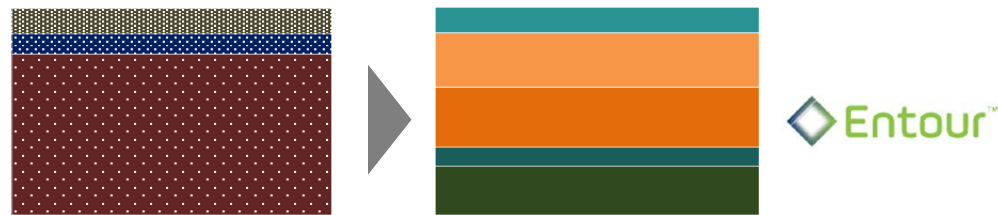
1=g/100si/24 hrs @100F/90% RH | g/sq meter/24 hrs @ 38C/90% RH  
 2=cc/100si/24 hrs @ 73F/0% RH | cc/sq meter/24 hrs @ 23C/0% RH



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## DESIGNING FOR RECYCLABILITY – RAISING THE MODULUS

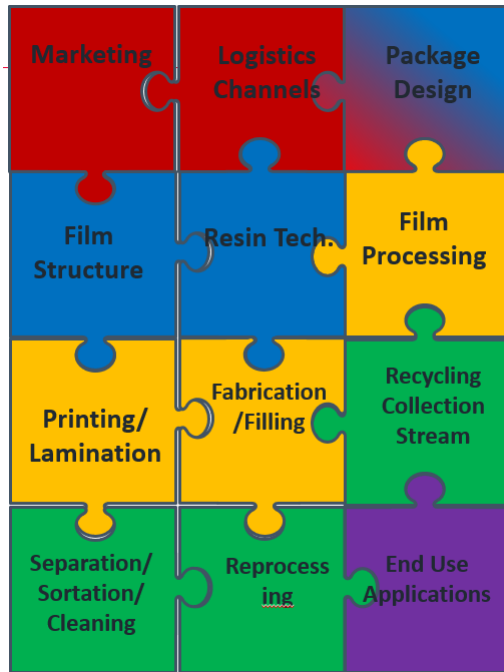
- Selecting the best polymers to drive stiffness and ability to stand on the store shelf
- I-beam effect with the multilayer approach
- Maintained gauge



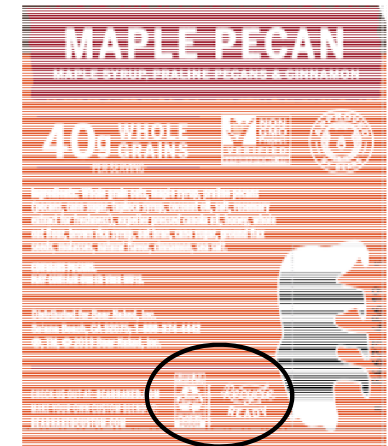
Property	Non-recyclable Structure		Recyclable Structure	
1% Secant Mod MD	125,200	(863)	125,450	(865)
1% Secant Mod TD	130,700	(901)	147,500	(1,017)
	psi	(MPa)	psi	(MPa)



# DESIGNING FOR RECYCLABILITY – WHEN THE PIECES COME TOGETHER



Non Recyclable



Recyclable

- Provided the needed package look and feel
- Exceeded shelf life requirements
- Maintained packaging rates
- Qualified for the How2Recycle® Store Drop Off logo

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## SUSTAINABILITY IS A TEAM SPORT

- *Value Chain Collaboration is key to meet current Sustainability challenges*
- *Materials needs to be developed to fit the circular business models*



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## SUSTAINABILITY AS A TEAM SUPPORT – OUR TEAM

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- Kellogg's
  - Shannon Moore  
Lead Packaging Engineer
- Berry Global
  - Paul Wolak  
Technical Director
- Colormasters
  - Keith Battles  
Sales Manager
- Fresh-Lock
  - Greg Heckman  
Sales Technician
- Dow
  - Ashley Leidolf  
Marketing Manager
  - Larry Effler  
TS&D Development Scientist





**Dow**

## QUESTIONS? THANK YOU!

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**Closing the loop.**