The Future of Packaging:
Tomorrow’s Solutions to Today’s Challenges
Established 1994  ||  Lexington, Ohio

Four Manufacturing Facilities
Annual Capacity – 400+ million lbs
Extrusion Lines – 44+ Lines
207 Acre Campus

A. Corporate & Films Plant 2
B. Quality Control Laboratory
C. Films Plant 3
D. Films Plant 1
E. Quality Control Laboratory
F. Training & Maintenance
G. World Distribution Center
H. Films Plant 4 & New R&D Innovation Center
I. Printing & Human Resources
J. Converting & Recycling
Global Standard for Packaging and Packaging Materials (GFSI Global Food Safety Initiative)

First Blown Film Manufacturer to Achieve BRC A in USA (2012-2015)

First Blown Film Manufacturer to Achieve BRC AA in USA (2016, 2017 & 2018)

7+ Consecutive Years with highest possible BRC Rating

AIB International Superior Rating since 2009

IMS Certified 12 Consecutive Years

100% FDA Approved Resins in Manufacturing

Food Safety & Traceability is Next’s #1 Priority!
Global Leader in Produce Chain Packaging Manufacturing
Mulch Film

• UV Protection
• Chemical Resistant
• Resist Flex Cracks, Abrasions, and Tears
Field Pack
Printed & Unprinted Bags & Liners

- OTR Controlled
- Abrasion & Puncture Resistant
- High Clarity
- Wicket, Perforated Lip & Flip Bag Construction
Retail Laminations & Surface Print

- 3-7 Layer Construction
- Extremely High Clarity
- High Speed Processing
- Wide Seal-ability Window
- Peelable Sealants
- Embedded Anti-fog
Food Service
Films & Surface Print

- Extended Product Shelf Life
- Custom Oxygen Transmission Rate
- High Speed Processing
- Wide Seal-ability Window
- 3-5 Layer Construction
High Barrier Films
Fruits & Veggies

- Designed for Long Shipping Distances
- Products Remain in Cold-Chain
- Extremely High Barrier, Low OTR
- Extended Product Shelf Life
Banana Film Technology

- Designed for High Ethylene Respiration
- Reduces Spoilage, Extended Shelf-life
- Extremely High Breathability, High OTR
The Future of Packaging: Tomorrow’s Solutions to Today’s Challenges

Nico Shaut
Next Generation Films, Inc.
United Fresh Show
June 12, 2019
The Facts…

- The U.S. recycles about 9.1% of plastics produced. 78% still goes to landfills.
- Plastic bags are not wanted in standard curb-side recycling and cause process disruptions at the MRF’s.
- Composting facilities now banning bio-resin films due to complications.
- Bio-resin films are NOT recyclable.
Ocean Plastics

Just 10 rivers carry 90% of plastic polluting the oceans

- Yangtze River, China
- Hai he River, China
- Yellow River, China
- Mekong River - various countries
- Nile, Africa
- Pearl River - China and Vietnam
- Indus River - China, India, Pakistan
- Ganges River - India and Bangladesh
- Amur River - Russia, China
- Niger, Africa
US contributes only about 0.3% to ocean plastic.

More than half comes from just 5 countries:
- China
- Indonesia
- Philippines
- Thailand
- Vietnam

Sources of Plastic Marine Debris

Much of the world's unmanaged plastic waste ends up fouling global waters.

Origin by country of unmanaged plastic waste in 2010 (metric tons)

Sources: Science; University of Georgia; University of California; Sea Education Association.
- State bans and fees legislation for single use bags all around the country.
- NY now banning as well.
- More states now in preemption
- Collaboration between Dow Chemical and Hefty
- Hard to recycle products
- Refuge to Energy
- Curbside pick-up
- New. Limited availability/municipal programs
  - Omaha, NE
  - Cobb County, GA
  - Boise, ID
Solutions

- Consumer collection and responsible for bringing to store
- TREX approved plastics / not all plastics
- Outlet for bags that clog MRF centers
Solutions

Plasma Arc Gasification

• Syngas is a simple fuel gas comprised of carbon monoxide and hydrogen that can be combusted directly or refined into higher-grade fuels and chemicals.
• Inorganics turn to slag that can be used to build roads
• Allows package design to focus on product performance
There is no single answer to the issue of true sustainability in plastic packaging. Sustainable design requires careful consideration of the entire life cycle to minimize depletion of resources, greenhouse gases emissions, and plastic waste released into the environment.
Life Cycle Analysis

Design Considerations
- End of life / Who? Where?
- Total GHG from process / energy consumption

Use LCA tools
- Available online
- Through SPC
- Work with your NGF technical rep
## LCA Metrics – Retail Example

**Overview**

**Functional Unit:** 1 g

<table>
<thead>
<tr>
<th>Unit(s)</th>
<th>Package Name</th>
<th>Recycled Content (PCR) %</th>
<th>Bio-Renewable Content %</th>
<th>Certified Content %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flexible Package</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>1</td>
<td>Rigid Container</td>
<td>27.37 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
</tbody>
</table>

![Graph showing comparison between Flexible Package and Rigid Container](image-url)
LCA Metrics – Retail Example

### Fossil Fuel Consumption (MJ-equiv)
- **Flexible Package**
  - Material: Ref.
  - Manufacturing: +71%
  - Transportation: 
  - End Of Life: 
- **Rigid Container**
  - Material: Ref.
  - Manufacturing: +192%
  - Transportation: 
  - End Of Life: 

### GHG Emission (kg CO2-Equiv)
- **Flexible Package**
  - Material: Ref.
  - Manufacturing: +192%
  - Transportation: 
  - End Of Life: 
- **Rigid Container**
  - Material: Ref.
  - Manufacturing: +192%
  - Transportation: 
  - End Of Life: 

### Water Consumption (l)
- **Flexible Package**
  - Material: Ref.
  - Manufacturing: +160%
  - Transportation: 
  - End Of Life: 
- **Rigid Container**
  - Material: Ref.
  - Manufacturing: +160%
  - Transportation: 
  - End Of Life: 

### Human Impacts (Total) (DALYs)
- **Flexible Package**
  - Material: Ref.
  - Manufacturing: +21.7%
  - Transportation: 
  - End Of Life: 
- **Rigid Container**
  - Material: Ref.
  - Manufacturing: +21.7%
  - Transportation: 
  - End Of Life: 

*Note: The diagrams illustrate the comparison between a reference (Ref.) and other scenarios. The percentage changes indicate the relative increase or decrease in environmental impact metrics.*
NEXT GENERATION FILMS was founded over 2 decades ago with the philosophy to invest in the highest output lines and engineer films with the end goal of creating the most efficient packaging available – resulting in the least waste to minimize depletion of virgin resources. We use recycled materials where applicable along side the latest manufacturing technologies to keep every facet of our process as truly sustainable as possible to have a positive impact on our environment.
Our Contribution…

**MANUFACTURING**
- Highest efficiency lines
- Extreme gauge control +/- 3%
- Zero PE waste

**INNOVATION**
- First to market
- Recycled, Renewable, Compostable content formulations
- Light weighting

**PERFORMANCE**
- Optimized barrier and breathability film
- Optimized line speeds and efficiencies.
- High Performance Resin Technology
Our Commitment…

MANUFACTURING

Highest Technology Co-Extrusion Blown Film Lines

• Throughputs of over 3,500 lbs / hr
• Energy Efficient
• Extreme Gauge Control
• Automatic Change-over Technology

Best Manufacturing Practices

• Zero PE Waste
• Pallet & Packaging Sharing Systems
• Misc. Waste Recycled or Repurposed
Our Commitment…

**INNOVATION**

- Down gauged products with enhanced properties
- Cutting edge recyclable resin technologies
- New bio-resin alternatives
- Advanced co-ex films containing post consumer recycled plastic
- Suitable product technologies enabling use to utilize 80% recycled content into our products
LCA Example
Kale Film Structure Analysis

**GHG Emissions (kg CO2 eq.)**

<table>
<thead>
<tr>
<th>Impact Categories</th>
<th>Today</th>
<th>Opt. 1</th>
<th>Opt. 2</th>
<th>Opt. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Value</td>
<td>0.000</td>
<td>0.005</td>
<td>0.010</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>0.020</td>
<td>0.025</td>
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**Human Impact (DALY)**

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Today’s Structure 🟥
PIR Content (Opt. 1) 🟦
Bio-Based Content (Opt. 2) 🟢
PCR Content (Opt. 3) 🟪
**LCA Example**

**Kale Film Structure Analysis**

### Fossil Fuel Use (MJ deprived)

- **Today**
- **Opt. 1**
- **Opt. 2**
- **Opt. 3**

### Water Use (liters)

- **Today**
- **Opt. 1**
- **Opt. 2**
- **Opt. 3**

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Today’s Structure  
PIR Content (Opt. 1)  
Bio-Based Content (Opt. 2)  
PCR Content (Opt. 3)
LCA Example
Kale Film Structure Analysis
INNOVATION

- Up to 80% Recycled Material
- Proprietary resin and multi-layer film design to maintain product attributes
- Complies with FDA regulation 21 CFR 177.1520©3.2a for direct food contact
- Auditable production records
INNOVATION

- Post-Consumer Recycled Content Products
- Several sustainable sources
- Complies with FDA regulation 21 CFR 177.1520©3.2a for direct food contact
INNOVATION

- Bio resins from renewable resources
- Resins ASTM D6400 Certified Compliant for Industrial Compost
- Resin additives to degrade polymers
- Several sustainable sources for each
INNOVATION

- Full range of instore drop-off recyclable products
- TREX approved films
- Barrier products
- Higher strength
Our Commitment…

PERFORMANCE

Sustainable Solutions Through Performance

- Enhanced barrier alternatives to maximize shelf-life
- Increase Packaging Process Throughput
- Decrease Waste
- Decrease Shrinkage