Food Contact and how we got there for SPE

May 8, 2017
The Technology Leader in Recycled Polyolefin Resins

The only FDA compliant, food grade HDPE PCR in North America

EcoPrime™

High speed, high output, custom color sorted HDPE PCR. Don’t just recycle the plastic, recycle the color.
Points of Discussion

• Brief introduction to Envision Plastics
• Getting to an LNO
• Food Grade for HDPE: EcoPrime™
• Markets served using recycled HDPE
• Our Newest LNO and Patent
• LCA and Conclusions
Announcing...

The First FDA LNO, Post Consumer Recycled HDPE Resin in North America for direct contact on curbside HDPE collected plastic
1996-1998 Union Carbide worked on their LNO

- It was all lab work
- It was all in flake
- Not every batch passed
- Union Carbide’s work was the foundation for other LNO’s
- Envision bought the LNO IP after Union Carbide received it in 1998
- Envision did not commercialize the process and made many changes, first in 2008 with an R&D line and then full scale in 2011
- Added a second line in 2013
### Challenge Test
#### Chemicals and Surrogates

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Surrogate</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroform</td>
<td>Trichloroethane</td>
<td>Polar, Volatile</td>
</tr>
<tr>
<td>Diazinon</td>
<td>Benzophenone</td>
<td>Polar, Non-volatile</td>
</tr>
<tr>
<td>Lindane</td>
<td>Phenyldecane</td>
<td>Non-polar, Non-Volatile</td>
</tr>
<tr>
<td>Gasoline</td>
<td>Toluene</td>
<td>Non-polar Volatile</td>
</tr>
<tr>
<td>Disodium Arsenate</td>
<td>Copper Octoate</td>
<td>Organo metallic</td>
</tr>
</tbody>
</table>
March 24th 2015

• We received a PNC (Prenotification Consultation) from the FDA PNC 1579 that states 100% recycled content in contact with Food Type IV-B (oil in water emulsions both high and low fat) which include milk and milk products, sweet cream, sour cream, cottage cheese, cream cheese, and ice cream and similar oil and water dairy products under the conditions of Use F are suitable for direct contact in use at 100% recycled content.
FDA Vessel Process

We added EcoPrime™ capacity to our Southern California plant, December 2013
What is EcoPrime Made From?

- EcoPrime™ is produced from curbside collected, natural, HDPE (#2) bottles.
  - Envision purchases bales of natural HDPE (#2) bottles from waste haulers and community MRF’s.
  - Envision further sorts the natural bales to remove non-food grade natural bottles from its recycling process.
  - Envision grinds the bottles into flakes and then washes the flakes to remove labels and other contaminants from the plastic, providing a clean source of natural HDPE plastic flakes.
  - Flakes are then color sorted to remove any residual colored caps and closures that have made it through the process thus far.
  - Flakes are then melted in a large, vacuum vented extruder and pelletized.

Curbside Collected Natural HDPE bottles
What is EcoPrime™?

EcoPrime™ is a recycled resin specifically manufactured for direct food contact that’s also sturdy enough to be recycled, again and again.

Our patented cleaning process is designed to eliminate contaminants from recycled food and beverage packaging, making our resin the first of its kind for the packaging of beverages, vitamins, medicines and personal care products.
What Makes EcoPrime™ Food Grade?

- Envision then subjects the pellets to its patented process designed to remove volatiles and semi-volatiles from the pellets.
- Envision’s decontamination process is the safest possible method for cleaning resins.
- The process consists of placing the pellets in a large silo like vessel and subjecting the pellets to heat and airflow over a period of time.
- There are no added chemicals, nor any added ingredients to achieve a food grade product.

Envision’s process produces ultra-clean material that is better than the FDA’s requirement for daily dietary contaminant intake of less than 0.5ppb.
EcoPrime™ level of residual volatiles is consistently below the FDA’s threshold of 320 ppb as published in its Guidance Document; “Use of Recycled Plastics in Food Packaging: Chemistry Considerations”
Customer Testimonial of EcoPrime™

• From a Research & Development Packaging Director from a Global Beverage Company

“I just want to let you know that we have analyzed the high-L* natural color “Fragrance Free”, food grade EcoPrime™ sample that you sent me and we are very happy with the results. Our headspace analysis by GC/MS (Gas Chromatograph / Mass Spectrophotometer) suggests that this EcoPrime™ sample is as clean as virgin resin. You certainly have done a great job in making the EcoPrime™ product. Congratulations!”
Food Grade Natural Post Consumer Recycled HDPE

- **Deodorized**
  - The EcoPrime™ process removes all volatiles and semi-volatiles from the material that may impart unwanted scents or fragrances.
  - Since all unwanted fragrances are removed EcoPrime™ smells like prime HDPE resin
    - This is a significant advantage in high content applications and where the flavor of foods and the fragrance of beauty and personal care products must be protected
  - Customers must conduct their own organoleptic, stability and other tests with EcoPrime™ to ensure its suitability and safety for uses with their products
Markets Served

Broad Market Participation but 2/3 of PCR Produced Goes Back into Primary Packaging

- **Food & Beverage**
  - Overwraps / Films / Bags
  - Bottles
  - Netting

- **Personal Care**
  - Tubes / Bottles
  - Films / Overwraps

- **Household**
  - Tubes / Bottles
  - Films / Overwrap

- **Automotive**
  - Seats, air ducts

- **Construction / Agricultural**
  - Pipes / Conduit
  - Landscape edging
  - Overwraps / Films / Bottles / Pots / Pails

- **Thermoforming**
  - Food service
  - Sheet

- **Toys**
  - Playsets
  - Gardening sets
  - 100% recycle content toys
Customers and Companies that Use our Products

- P&G
- ESTÉE LAUDER
- Aveda
- L’ORÉAL
- SONOCO
- CLOROX
- Kimberly-Clark
- Johnson & Johnson
- Myers Industries, Inc.
- Danone
- ALPLA
- GF
- Poly-Tainer
- Prestone
- Albéa
- Burt’s Bees
- PakTech
- TricorBraun
- Sun Products Corporation
- Whole Foods Market
- Sun Products Corporation
- BERRY PLASTICS CORPORATION
- UNILEVER
- GS
- TDS
- Remis
- Silgan Plastics Corporation
- Graham Packaging Company
- H2
- Heritage
- Envision Plastics
- EcoPrime
- SPE ANTEC® Anaheim 2017
Customers and Companies that Use EcoPrime™
More uses for Envision’s Ecoprine™

PUREOLOGY HAIRCARE
Environmental Impact

Resources Consumed to Produce 1 Pound of Recycled Resin

- The production of recycled plastic resin uses far less resources than producing new, virgin plastic resin

- Production of recycled resin uses 90% less energy and emits 78% less greenhouse gases than producing virgin resin
- Recycling plastic saves twice as much energy as burning it in an incinerator
- Moreover, recycling plastics creates 6 times more jobs than landfilling recyclables and 36 times more jobs than incinerating them
Reduced Impact on the Planet
Lower Carbon Footprint

Franklin Associates Life Cycle Analysis for Recycled HDPE

<table>
<thead>
<tr>
<th>Times Recycled</th>
<th>Allocation of Virgin %</th>
<th>Allocation of Virgin Energy in mm Btu</th>
<th>Incremental Recycle Energy</th>
<th>Total Energy in mm Btu</th>
<th>Total Energy % of Virgin</th>
<th>Energy Savings vs. Virgin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virgin HDPE</td>
<td>100%</td>
<td></td>
<td></td>
<td>35.80</td>
<td>100%</td>
<td>0%</td>
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<tr>
<td>HDPE Cut off</td>
<td></td>
<td></td>
<td></td>
<td>3.72</td>
<td>10%</td>
<td>90%</td>
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<tr>
<td>HDPE Open Loop</td>
<td>1</td>
<td>50.0%</td>
<td>17.90</td>
<td>3.72</td>
<td>55%</td>
<td>45%</td>
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<tr>
<td>HDPE Open Loop</td>
<td>2</td>
<td>25.0%</td>
<td>8.95</td>
<td>2.79</td>
<td>33%</td>
<td>67%</td>
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<tr>
<td>HDPE Open Loop</td>
<td>3</td>
<td>12.5%</td>
<td>4.48</td>
<td>3.26</td>
<td>22%</td>
<td>78%</td>
</tr>
<tr>
<td>HDPE Open Loop</td>
<td>4</td>
<td>6.3%</td>
<td>2.24</td>
<td>3.49</td>
<td>16%</td>
<td>84%</td>
</tr>
</tbody>
</table>

- Association of Postconsumer Plastics Recyclers (APR) funded an LCI / LCA for plastics recycling
  - Results indicated that recycling HDPE used 10% of the energy required to produce an equivalent amount of virgin resin (cutoff method – no burden of original virgin resin production energy)
  - Results table above indicates energy savings for recycling HDPE based upon how many times you think the plastic will be recycled (open loop method – burdens recycled resin with a portion of the energy use to produce the virgin HDPE resin)
What can Brand Owners do?

- Promote packaging that is recyclable
- Request recycled content
- Request standardization
- Resin markers
- Reward EPR so that it is not mandated by Government
- Look at other materials in large quantities that can be recycled.
Why Use of Recycled Plastic in Packaging & Products is growing?

It’s the Right Thing to Do

Recycling Plastics

– Conserves energy
– Conserves natural resources
– Reduces greenhouse gas emissions
– Saves space in landfills
– Creates new jobs
– Preserves our environment

Learn more about plastics recycling @

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