Overview

• ACC’s Plastics Division
• Plastics & Sustainability
• Recycling
• Energy Recovery
• From Chemistry to Energy
ACC’s Plastics Division

BASF Corporation
Bayer Material Science
Braskem America, Inc.
Chevron Phillips Chemical Company
The Dow Chemical Company
DuPont
ExxonMobil Chemical Company
LANXESS Corporation
LyondellBasell Industries
SABIC Innovative
Solvay America, Inc.
Styron LLC
Total Petrochemicals & Refining USA
Vinyl Institute*
Plastics & Sustainability
Why do we use plastics?

- Reduce Material Use and Weight
- Maintain Freshness
- Reduce Breakage
- Reduce transportation costs through light weighting
- Economical
Plastics & Sustainability
Coffee Packaging

Greenhouse gas

<table>
<thead>
<tr>
<th>Package</th>
<th>Lbs CO2 Equivalent</th>
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</thead>
<tbody>
<tr>
<td>Steel Can</td>
<td>4377</td>
</tr>
<tr>
<td>Plastic Canister</td>
<td>3310</td>
</tr>
<tr>
<td>Plastic Brick</td>
<td>1051</td>
</tr>
</tbody>
</table>
Recycling Success

Plastic Bottles

• US EPA: more than 4.7 billion pounds of plastic are recycled annually.

• 2011: more than 2.6 billion lbs. of plastic bottles were collected for recycling.

• In 2010 nearly 820 million pounds of post-consumer rigid plastics were collected for recycling.

• In 2010 over 970 million pounds of bags, wraps, and films collected for recycling.

• Growth continues in access to recycling plastics beyond bottles.
What to do with Multi-Layer, Multi-Polymer Pouch

- Huge environmental impact reductions versus glass jars
  - landfill volume - 95%
  - GHG - 93%
  - Energy - 87%

- Rapid market growth

- Yet, multi-layer means very difficult to recycle economically

Source: Battelle Memorial Institute for the Flexible Packaging Association
Plastics are Captured Energy

- Natural Gas: 20,300 Btu/lb
- Crude Oil: 18,400 Btu/lb
- Non-Recycled Plastics: 14,000 Btu/lb
- Petroleum Coke: 12,700 Btu/lb
- Coal (High): 11,200 Btu/lb
- Coal (Low): 9,800 Btu/lb

Individual energy values:
- Natural Gas = 20,300 Btu/lb
- Crude Oil = 18,400 Btu/lb
- Non-Recycled Plastics (NRP) = 14,000 Btu/lb
- Petroleum Coke = 12,700 Btu/lb
- U.S. Coal (High) = 11,200 Btu/lb
- U.S. Coal (Low) = 9,800 Btu/lb
# Recycling + Energy Recovery = Higher Diversion Rates

## Plastics Packaging

<table>
<thead>
<tr>
<th>Country</th>
<th>Mechanical Recycling (%)</th>
<th>Energy Recovery (%)</th>
<th>Landfill (%)</th>
<th>Annual ‘Waste’ Generated per capita (Tons / Person / Yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>30</td>
<td>66</td>
<td>03</td>
<td>0.66</td>
</tr>
<tr>
<td>Belgium</td>
<td>30</td>
<td>50</td>
<td>20</td>
<td>0.52</td>
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<tr>
<td>Austria</td>
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<td>70</td>
<td>01</td>
<td>0.70</td>
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<tr>
<td>Switzerland</td>
<td>30</td>
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<td>Netherlands</td>
<td>30</td>
<td>66</td>
<td>04</td>
<td>0.68</td>
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<tr>
<td>U.S.A.</td>
<td>20</td>
<td>80</td>
<td>00</td>
<td>0.80</td>
</tr>
</tbody>
</table>

N.A. recycling includes composting

Source: American Chemistry Council Plastics Division (ACC PD) / Plastics Europe / The Canadian Plastics Industry Association (CPIA)
Recycling & Waste-to-Energy are Complementary
What is the Opportunity?

• If we recovered all of our MSW to energy, we could power 16.4 million households for a year.

• If we recovered all of the non-recycled plastics in MSW and converted to energy, we could power 5.2 million households for a year.

• Or, if we converted all of the non-recycled plastics in MSW to oil, we could power 6 million cars for a year.
Solid Fuel Project

Phase I

• Collaboration with 3 Key Partners
• 130 Tons of Alternative Fuel
  • 60/40 - Plastics/Paper
  • 60/40 - Post-consumer MRF residue/Post-Industrial
• Trial at Texas Cement Kiln
• Modeled 3 Scenarios
  • Energy Savings
  • Greenhouse Gas Reductions
  • Other emissions benefits
• Successful Communications
Plastics to Oil

- Report Released 2011
- Phase II report released late 2012
- 2013 Project(s)
  - Process Bulky Rigid/Toys
  - Flexible Packaging/Foodservice
Gasification Project w/ WTERT

- Partnership w/ City of Edmonton
- Process 4 controlled trials
- Measure Impact of Plastics
- WTERT Report
From Chemistry to Energy Campaign

- Three Key Pillars
  - Shale Gas
  - Energy Efficiency
  - Energy Recovery
- Advocacy
- Education
plastics.americanchemistry.com/energyrecovery

http://chemistrytoenergy.com/

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