Salt River Project (SRP) Waste Management Project

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Cross-linked Polyethylene (XLPE)
Two Alternatives

Combustion as alternative fuel

- Essentially polyethylene, with a simple chemical structure
- Less carbon intensity and higher energy density
- Fewer contaminants—the aluminum flakes is a useful ingredient for cement production
- No further processing needed

De-crosslinking

- Use methanol in super-critical status to selectively break the carbon bonds;
- High pressure (150 Bar) and temperature (380°C) required to maintain methanol’s super-critical status;
Three End-of-life options
Three Scenarios for Comparison

<table>
<thead>
<tr>
<th>Landfilling</th>
<th>Alternative fuel</th>
<th>De-crosslinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Transportation</td>
<td>• Transportation</td>
<td>• De-crosslinking</td>
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<td>• Landfilling</td>
<td>• Coal mining</td>
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## Results:

- For global warming potential:
  - De-crosslinking scenario < Alternative fuel scenario ≈ Reference scenario
- For human health impact:
  - Alternative fuel scenario < De-crosslinking scenario < Landfilling scenario
- Other considerations: scalability, color requirement, and process control requirement.

**Figure 4: Impact summary chart**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Carcinogen (CTU cancer)</th>
<th>Non-carcinogen (CTU non-cancer)</th>
<th>GWP (kg CO₂-eq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>De-crosslink scenario</td>
<td>1.03E-03</td>
<td>4.74E-03</td>
<td>1.65E+06</td>
</tr>
<tr>
<td>Alternative fuel scenario</td>
<td>5.36E-04</td>
<td>3.79E-03</td>
<td>2.24E+06</td>
</tr>
<tr>
<td>Reference scenario</td>
<td>1.43E-03</td>
<td>1.43E-01</td>
<td>2.34E+06</td>
</tr>
</tbody>
</table>
SRP’s Sustainability Program Assessment

- Stuart L. Hart’s sustainable value framework
- Two dimensions
  - Today’s business vs tomorrow’s opportunities
  - Internal capacity building vs external engagement

SRP's Biosphere
- 67 tons of TRI toxic chemicals to air in 2015
- est. 20 million tons of CO2 equivalent emission**

SRP's Lithosphere
- 0.77 million acre feet (AF) of water delivery;
- est. 74k AF of water used for power generation*

SRP’s Customer
- 33,912 GWhr electricity;
- Over 1 million electric customers
- over 20 energy efficiency programs;

SRP’s Community
- Over 5,000 direct job position;
- more than 28000 volunteer hours;
- 200 thousand dollar funding education

SRP’s Recycling partner
- 202 tons of wooden products;
- 350 tons of recyclable material (paper, plastic and tires, etc);
- 604 tons of metal from cable in 2016
- 324989 tons of fly ash in 2013

1910 tons of TRI toxic chemicals within 1.3 million tons of coal combustion residual to land in 2015***

**Based on 2012 newsletter of Water Resources in the Tucson Basin
https://cals.arizona.edu/swes/tucwater2/
*** The amount of CCR is estimated based on 2012 Coal Combustion Product (CCCP) Production & Use Survey Report by American Coal Ash Association
Findings

- **Pollution Prevention**
  - Compartmentalization
  - Traditional mindset

- **Clean Tech Development**
  - Out-sourced
  - Extensive

- **Product Stewardship**
  - Energy and water efficiency
  - Earthwise Energy Program
  - Supplier engagement

- **Growth Path Crystallization**
  - Lack of clarity in the sustainability vision
Some opportunities

- Cross-functional communication to break the silos
- Selecting sustainability champions from departments
- Trigger a sense of urgency
- Visioning workshop
- A waste audit
- A platform for waste management information exchange between suppliers and customers
THANK YOU