Energy Choices for Ohio: Impacts of Efficiency, Technology & Carbon Management

Breakout B:
Energy Efficiency: Technologies, Initiatives & Solutions

“By-Product” Synergy – A Unique Networking Tool To Improve Ohio’s Sustainability

Presented by:
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Ohio BPS Network Leader
Basic Premise

Waste = Food = Value = Profit
Definitions

• By-Product Synergy: the matching of wastes and wasted resources from one facility with potential users at another facility to create new revenues or savings, environmental and societal benefits (adapted from US Business Council).

• Wasted Resources: those resources (including by-products, excess transportation and storage capacity, energy, etc.) that are left over after a product has been made or a service provided.

• BPS Networks: member driven organization focused on local and regional sustainability issues that affect organizations within a specific geographic market.
Typical Manufacturing Process

Material A
Energy
Water

Product A
Waste
Disposal
Manufacturing with BPS Process

- Material A
- Energy
- Water

- Product A
- Waste

- Material B
- Energy
- Water

- Product B

Disposal
Manufacturing with BPS Process

Network of Companies

Material A → Energy → Water → Processing?

Output from A → Less Energy → Less Water

Product A → Resource?

Disposal

Improved Product B
Barriers and Struggles

• Legal
• Regulatory
• Technical
• Communication

• Economic
• Perception
• Geographic
• Time
The Key to Unlocking Synergies

• Signed agreements set up confidential consortium

• Data collection allows for understanding across fence lines

• Regulators engaged from the beginning

• Diverse participants
Ohio BPS Network

- Provides a collaborative network to address sustainability related issues important to member companies
- Provides a structured process through which companies can identify and vet partners
- Helps companies identify and implement synergies where wasted resources at one facility are used at another
- Provides tools for the management of materials and synergy data
- Only statewide BPS Network
BPS Work Process Overview

US BCSD Tools
- Data Templates
- Eco-Flow™ Software
- BPS Project Charter

Project Deliverables
- Project Launch
- Data Collection
- Synergy Identification & Analysis
- Barrier Analysis
- BPS Action Plan Development & Implementation

US BCSD Tools
- cirrus™ Materials Database
- Initial BPS Benefits Estimates
- Detailed Benefits Analysis
- BPS Benefit Tracking & Reporting

Approximately 1 year

Working meetings approximately every 2 months
Example – Tire Reuse and Alternative Fuel from the Houston BPS Network

Organizations Involved
- Cherry Companies
- Cemex Cement
- National vehicle fleet manager

Materials
- All types of used tires

Achievements
- 500,000 tires diverted annually from landfill
- Annual reduction of 8,000 metric tons equivalent CO2
Locations of Ohio BPS Members
<table>
<thead>
<tr>
<th>Ohio BPS Members</th>
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<tbody>
<tr>
<td>Armstrong</td>
</tr>
<tr>
<td>Barnes Nursery</td>
</tr>
<tr>
<td>Belden Brick</td>
</tr>
<tr>
<td>City of Columbus</td>
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<tr>
<td>Cincinnati Children’s Hospital</td>
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<tr>
<td>Cytec Industries</td>
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<tr>
<td>Dow Chemical</td>
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<tr>
<td>Fairmount Minerals</td>
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<td>Frank Road Recycling Solutions</td>
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<tr>
<td>Givaudan Flavors</td>
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<tr>
<td>G&amp;J Pepsi Cola Bottlers</td>
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<tr>
<td>Goodwill Columbus</td>
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<tr>
<td>J.M. Smucker LLC</td>
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<tr>
<td>Kurtz Bros.</td>
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<tr>
<td>Marathon Oil</td>
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<tr>
<td>Mount Carmel Health</td>
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<tr>
<td>MTD Products</td>
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<tr>
<td>Ohio Mulch</td>
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<tr>
<td>Procter &amp; Gamble</td>
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<tr>
<td>Ross Environmental Services</td>
</tr>
<tr>
<td>Samuel Adams Brewery</td>
</tr>
<tr>
<td>St. Bernard Soap Company</td>
</tr>
<tr>
<td>The Ohio State University</td>
</tr>
<tr>
<td>Tosoh SMD</td>
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<tr>
<td>United McGill</td>
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<tr>
<td>Worthington Industries</td>
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</tbody>
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Examples of Synergies Analyzed (Did not work or in progress)

- Water treatment alum & lime material
- Glycerin bottoms for fuel or raw material
- Transportation backhauling
- Paint, welding, bag house dust, iron fines and incinerator ash for bricks
- Wood waste for compost/fuel
- Cracker bottoms for fuel
- Air filter recycling
Synergies Developed

- **Wastewater processing**
  - Direct use of waste material to offset virgin
- **Sugar water to anaerobic digestion**
  - Next step – dewatering
- **Syrup barrels reuse**
  - Saves money
  - Reduces transportation
- **Food scraps to anaerobic digestion to electricity and fuel**
  - Reduced collection costs
- **Scrap Wood to Mulch**
  - It’s everywhere
  - Milk run example
BPS Metrics

Direct Metrics
- Landfill diversion
- Offset virgin material
- Hazardous waste reduced
- Water conserved
- GHG Emissions (scope 1 & 2)
- New sales revenue
- Cost savings
- Energy conserved

Indirect Metrics
- Job creation/retention
- Private capital investment
- Return on dollar invested

Life-Cycle Metrics
- Water, energy, GHG
- Air emissions
- Land use
- P and N discharges
- Mineral & fossil fuel consumption
Benefits

- Create and retain jobs for Ohio manufacturing and help restore Ohio’s sustainability.
- Reduce the landfilling of certain OEPA targeted materials such as glass and organics for Belden partners of Honda and Timken.
- Reduce other materials going to Ohio landfills including mill scale and swarf from Timken.
- Allow Belden to produce a “green” brick containing 5 percent or more post-industrial material with a goal of competing vigorously in the LEED era of green building and achieving a competitive advantage.
- Improve many qualities of the brick including increased durability, reduced permeability, and creation of many unique colorizations of bricks.
- Saving energy in the brick-making process.
- Lengthening the life of Belden’s clay mines improving sustainability of a local resource.
- Helping the Stark-Tuscarawas-Wayne and other solid waste districts meet goals for industrial waste recycling as well as helping the state achieve its goals of the recently adopted Ohio Solid Waste Management Plan.
Eco-Flow Applied to City of Columbus

Modeling Biosolids w/ Eco-Flow

- Investigated a wide variety of scenarios for biosolids treatment and utilization using the Ohio State University Center for Resilience’s Eco-Flow™ model
  - Extreme scenarios (e.g. only a single disposal option)
  - Diverse scenarios
  - Model-chosen pathways
  - Include new process technologies
- Over 25 options at each plant
• Web-based application of the management and reporting of resource and synergy data
• Both Private and Public Sections
  o Private sections are limited to network participants
  o Public sections are accessible to all
• Links each of the regional BPS Networks to form a National Network
• Provides common platform for data management and analysis
The cirrus™ Synergy Map
The following case studies represent a short list of synergy opportunities identified through the BPS work process in active projects around the country. Click the titles for process diagrams and detailed environmental benefits.

**Acetic Acid to Acetate Manufacturing**

Two companies have identified a synergy involving the use of Acetic Acid, a manufacturing by-product from Company A’s facilities, for use to manufacture acetates or for descaling operations in Company B. Acetic acid recycling displaces the need for petrochemical feedstock necessary for manufacturing acetates.

**Asphalt Recycling**

Two companies have identified a synergy involving the recycling of asphalt disposed of by Company A in pits for use by Company B to be remade into roads or parking lots. Asphalt recycling displaces the need for additional asphalt production.

**Bulk Bag Reuse**

Two companies have identified a BPS opportunity involving the use of bulk bag from Company A by Company B which displaces the need for use of new bags. Ordinarily, the bulk bag would be disposed in a landfill.

**Filter Cake to Brick Colorant**

Two companies have identified a BPS opportunity involving the use of filter cake from three facilities of Company A by Company B for brick colorant, which displaces the need for use of virgin brick colorant material. Ordinarily, the filter cake would be disposed in a landfill.

**Filter Cake to Composting Material**

Two companies have identified a BPS opportunity involving the use of 2,500 tons per year filter cake as a new material for a composting process to produce soil amendments. This by-product synergy involves the diversion from landfill of calcium oxide filter cake generated by Company B’s wastewater filtration operations. The filter cake provides a source of organic nutrients, and will be mixed with soil by Company A for purposes of composting. The resulting compost provides soil nutrients that are an alternative to synthetic fertilizer.

**Food Waste for Anaerobic Digestion**

Two companies have identified a BPS opportunity involving the use of food waste from Company A as an alternative feedstock for Company B’s anaerobic digestion process. The outputs of anaerobic digestion are soil amendment and biogas which is used for electrolysis generation. The resulting soil amendment is used as an alternative to synthetic fertilizer and biogas displaces the need for fossil fuels for energy. Ordinarily, the food waste would be disposed in a sanitary landfill.

**Foundry Sand to Soil Amendments**

Two companies have identified a BPS opportunity involving the use of foundry sand from Company A by Company B for soil amendments, displacing the need for use of virgin sand. Ordinarily, the foundry sand would be disposed in a landfill.
BPS Networks are Good for Communities

- Stimulates economic development
- Supports job retention and growth
- Reduces impacts to local infrastructure
- Improves air quality
- Improves environmental conditions

Greater Houston Region
- $4.5 million+ annual cost savings
- Annual reduction of 19,000 metric tons CO$_2$e and 32,000 metric tons of non-renewable resources

Chicago
- $5.5 million per year in economic impact
- Reduction of 50,000 tons/yr CO$_2$e emissions

Kansas City
- 33,650 tons of solid waste per year from local landfills
- Reduction of 19,000 tons CO$_2$e

Ohio BPS Network
- Avoidance of approximately 30,000 tons/yr. of waste to the landfill
- Avoidance of approximately 660,000 metric tons/yr. of greenhouse gas emissions
- Approximately $3.5 million/yr. in cost savings
BPS Networks lead to Operational Improvements

- Reduces waste management and disposal costs
- Reduces procurement costs
- Reduces air emissions at facility level
- Reduces environmental impacts
- Provides opportunity to collaborate with peers to solve complex waste and materials issues

October 4, 2011

General Motors making about $1 billion a year from selling scrap byproducts, waste reduction manager John Bradburn told the Corporate Recycling & Waste Conference in Orlando.
BPS Networks Help Corporations Meet CSR Commitments and Obligations

• Investing in BPS demonstrates progress toward GRI goals
  • Economic Indicators (EC6, EC8, EC9)
  • Environmental Indicators (EN1, EN2, EN3, EN5, EN6, EN8, EN10, EN12, EN14, EN16, EN18, EN21, EN22)
• Participating in BPS reduces impacts on ecosystems material to operations
  • Reduced virgin material consumption
  • Reduced water consumption
  • Reduced energy consumption
The BPS Network Vision as provided by the US BCSD

*This map depicts regional BPS networks in various stages of development. The US BCSD goal is more than 25 regional networks by 2015