Starting with a Product in Mind: Biosolids Design Based on Beneficial Use Goals

Material Matters, Inc
Lisa Boudeman, Environmental Specialist
Overview

✓ Getting to know the plant
✓ Current beneficial use challenges
✓ Exploring new biosolids technologies
  ▪ Phase 1: Biosolids Master Plan
  ▪ Phase 2: Preliminary Engineering Report
✓ Take home messages
Getting to Know the Plant

- Little Patuxent Water Reclamation Plant
  - Savage, Maryland
  - 20 mgd (28.5 mgd)
- Enhanced Nutrient Removal (ENR) process
- RDP EnVessel Pasteurization
RDP EnVessel Pasteurization Process

- Heat + lime = Class A Exceptional Quality
- 40% lime addition
- Weekly production
  - 880 wet metric tons
  - 50 truckloads
- Contract to bulk agriculture
Upcoming Challenges

- Potential local agriculture limitations
  - Maryland’s Phosphorus Mgmt Tool
  - Elevated soil pH
  - Seasonal regulations
- Anticipated consequences
  - Longer hauling distances = $$$
  - Questionable long-term options
Deciding on a New Biosolids Technology

• Phase 1: Biosolids Master Plan
  - Develop Goals
  - Screen Management Alternatives
  - Beneficial Use Market Assessment
  - Select Management Alternative

• Phase 2: Preliminary Engineering Report
  - Visit Sites using Selected Management Alternatives
  - Refine Beneficial Use Market Assessment
  - Select Technology
Phase 1

Biosolids Master Plan
Step 1: Clearly Define Project Objective / Goals

- **Project objective:**
  - Foundation for all project decisions
  - “Develop a biosolids master plan that provides a framework for reliable, cost-effective treatment and beneficial use of LPWRP biosolids in a changing and uncertain future regulatory environment”

- **Specific project goals**
  - Clear, measurable
  - Established 6 goals

- Howard County input critical
Step 1: Clearly Define Project Objective / Goals

• Biosolids Master Plan goals:
  1. Social and environmental responsibility
  2. Biosolids beneficial use
  3. Biosolids product
  4. Volume reduction
  5. Optimize processes and facilities
  6. Reliable
**Step 2: Screen Management Alternatives**

*Unique combination of processing technologies + products + beneficial use markets*

<table>
<thead>
<tr>
<th>No.</th>
<th>Anaerobic Digestion</th>
<th>Dewatering</th>
<th>Added Stabilization</th>
<th>Energy Recovery</th>
<th>Product</th>
<th>Beneficial Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>Centrifuge</td>
<td>RDP</td>
<td>NA</td>
<td>EQ cake</td>
<td>Bulk agricultural</td>
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<tr>
<td>2</td>
<td>None</td>
<td>Centrifuge</td>
<td>Drying</td>
<td>NA</td>
<td>EQ granule</td>
<td>Bulk agricultural</td>
</tr>
<tr>
<td>5</td>
<td>Mesophilic</td>
<td>Centrifuge</td>
<td>RDP</td>
<td>CHP</td>
<td>EQ cake</td>
<td>Bulk agricultural</td>
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<tr>
<td>7</td>
<td>Mesophilic</td>
<td>Centrifuge</td>
<td>Drying</td>
<td>Dryer fuel</td>
<td>EQ granule</td>
<td>Specialty fertilizer, turf, soil blending</td>
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<tr>
<td>10</td>
<td>THP/Mesophilic</td>
<td>Centrifuge</td>
<td>None</td>
<td>THP, CHP</td>
<td>EQ cake</td>
<td>Bulk agricultural</td>
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<tr>
<td>13</td>
<td>THP/Mesophilic</td>
<td>Centrifuge</td>
<td>Drying/Screening</td>
<td>THP, Dryer</td>
<td>EQ granule</td>
<td>Specialty fertilizer, turf, soil blending</td>
</tr>
</tbody>
</table>
Step 3: Beneficial Use Market Assessment

- Understand local markets available
- Preferred/required customer product characteristics
- Market capacity
- Storage needed
Step 3: Beneficial Use Market Assessment

- Define target markets
- Assess product
- Assess regulatory environment
- Identify local customers
- Phone surveys/site visits
### Step 3: Beneficial Use Market Assessment

#### Survey Results

<table>
<thead>
<tr>
<th>Bulk Agriculture</th>
<th>Specialty Markets (turf, soil blending, fertilizer blending)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established market</td>
<td>Novel market</td>
</tr>
<tr>
<td>Low marketing effort required</td>
<td>Marketing effort required</td>
</tr>
<tr>
<td>Low value</td>
<td>Higher Value</td>
</tr>
<tr>
<td>MD options likely limited in long term</td>
<td>Local markets available in long term</td>
</tr>
<tr>
<td>One market option</td>
<td>Multiple markets</td>
</tr>
<tr>
<td>Wide range of characteristics accepted</td>
<td>Narrow range of characteristics</td>
</tr>
</tbody>
</table>
### Step 4: Select Management Alternatives

<table>
<thead>
<tr>
<th>No.</th>
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<th>Beneficial Use</th>
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<td>7</td>
<td>Mesophilic</td>
<td>Centrifuge</td>
<td>Drying</td>
<td>EQ granule</td>
<td>Dryer fuel</td>
<td>Specialty fertilizer, turf, soil blending</td>
</tr>
</tbody>
</table>

**Considerations:**

- Regulatory evaluation
- Market Survey results
- Meets project objective and goals:
  - Versatile, high quality product? 🟢
  - Volume Reduction? 🟢
  - Local beneficial use outlets? 🟢
Phase 2
Preliminary Engineer’s Report
Step 1: Visit Sites Using Selected Management Alternatives

- Interviewed plant operators
  - Dryer benefits/challenges
  - Manufacturer relations
- Obtain product samples
- Visualize dryer size/layout

Drum Dryer

Belt Dryer
Step 2: Refine Beneficial Use Market Assessment

- Revisit interviewed customers
- Conduct additional market interviews
  - Detail and confirm product preferences

Granule Size?
Dustiness?
Nutrient content?
Consistency?
Odors?
## Step 3: Select Technology

<table>
<thead>
<tr>
<th>Product</th>
<th>Market</th>
<th>Soil Blender</th>
<th>Fertilizer Blender</th>
<th>Bulk Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drum</td>
<td>Anaerobic</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Belt A</td>
<td>Aerobic</td>
<td>++</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Anaerobic</td>
<td>++</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Belt B</td>
<td>None</td>
<td>++</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td></td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

**Ranking of Maryland Market Availability (Year-round Capacity):**

1, 3, 2
Step 3: Select (Narrow) Technology

- Two technologies met market demands & regulatory evaluation
- Both technologies retained to promote competitive bid

<table>
<thead>
<tr>
<th>Product</th>
<th>Post Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dryer</td>
<td></td>
</tr>
<tr>
<td>Belt A</td>
<td>None</td>
</tr>
<tr>
<td>Belt B</td>
<td>Crushed</td>
</tr>
</tbody>
</table>
Take Home Messages

- Establish project objectives early in process
  - *Foundation for all project decisions*
- Technology decisions based on:
  - Biosolids product quality desired
  - Local market preferences and regulations
  - Long term biosolids product opportunities
- Result: Reliable & sustainable biosolids management solution
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