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

Lisa C. Boudeman, Material Matters, Inc.
Lawrence Hentz, HDR Engineering, Inc.
Joshua Gliptis, Howard County DPW-Utilities
Overview

• Getting to know the plant
• Current beneficial use challenges
• Exploring new biosolids technologies
  • Biosolids Master Plan
  • Preliminary Engineering Report
• Results and Next Steps
• Take home messages
Getting to Know the Plant

- Little Patuxent Water Reclamation Plant
  - Savage, Maryland
  - 20 mgd (build out design capacity 28.5 mgd)
- Enhanced Nutrient Removal Plant
- 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 = $$$
  • Long term options???

• Addressing challenges
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 Technologies
- Refined Beneficial Use Market Assessment
- Use Findings to Select Technology
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>
</tr>
<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>
</tr>
<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>
</tr>
<tr>
<td>10</td>
<td>THP/Mesophilic</td>
<td>Centrifuge/BFP</td>
<td>None</td>
<td>THP, CHP</td>
<td>EQ cake</td>
<td>Bulk agricultural</td>
</tr>
<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

WHY????

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

Critical steps

• 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</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</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>
<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>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>
</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 Engineering Report

Goals:
• Refine process and equipment concept
• Select specific dryer technology

Drum Dryer

Belt Dryer
Step 1: Visit Sites Using Selected Technologies

• Identified utilities in US with selected technologies
• Conducted preliminary interviews
  – Pros / cons of selected technology
    • Hindsight is 20/20
  – Biosolids end use
• Site visits
Step 2: Refined Beneficial Use Market Assessment

• Obtain biosolids samples
• Confirm solids processing / digestion
• Conduct market interviews
  • Detail and confirm product preferences

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

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

**Ranking of Maryland Market Availability**

<table>
<thead>
<tr>
<th>Material</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

**Material Matter, Inc.**
PER Results & Next Steps

• Selected options for Design Phase
  – Belt A
  – Belt B (with crusher)

• Both products equally favored by soil blenders

• Provide for competitive bid by dryer companies

• Project is currently in Design Phase
  – MM and HDR awarded bid
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**
Questions?

Mailing Address
Material Matters, Inc.
P.O. Box 224
Elizabethtown, PA 17022

Phone
(717) 367-9697

Email: lboudeman@materialmatters.com
Web: http://www.materialmatters.com