Composting Success at Spotsylvania County, Virginia

Doug Crooks
Spotsylvania County

Acknowledgements:
Todd Williams, CH2M
Demonstration Project
COMPOSTING FACILITY EXPANSION NEED

- Composted Dewatered Solids From Massaponax WWTP Only
  - 240 tons/week (12,800 tons annually)
- Landfilled Solids From FMC WWTP
  - 120 tons/week

Old Compost Facility was Operating at Capacity

Needed to Expand to Manage Solids Production Through 2025
- Planned Capacity of 560 tons per week or 29,250 tons WWTP Solids per year
COMPOSTING FACILITY EXPANSION
KEY DESIGN CRITERIA

• 18 DTPD (112.5 WTPD) capacity, 5 days per week
• 16%TS cake solids on average
• Ground yard waste primary bulking agent
• Mixing 4 hours per day, 5 days per week
• In-ground composting aeration system
• Continuous negative aeration during composting
• Odor control with maintenance redundancy
• Positive aeration during curing
SPOTSYLVANIA COMPOSTING PROCESS FLOW DIAGRAM

1. BIOSOLIDS
2. MIXING
3. BULKING AGENT
4. COMPOSTING (21 days)
5. ODOR CONTROL
6. SCREENING
7. BULKING AGENT RECYCLING
8. AIR
9. CURING (30 days)
10. STORAGE (14-90 days)
11. MARKETING/UTILIZATION

AIR

AIR
SPOTSylvANIA COMPOSTING EXPANDED FACILITY

- Odor Control
- Bulking Agent Storage
- Composting
- Curing
- Screening
- Solids Receiving and Mixing
BULKING AGENT STORAGE
MIXING WITH BATCH MIXERS

- Two 22 CY Mixers
- Weigh Scale Operation
- 30+ TPH Solids Capacity
PILE CONSTRUCTION

- Initial Mix Discharge
- Wood Chip Base
- Finished Compost Cover
Negative Aeration Static Pile
IN-FLOOR NEGATIVE AERATION SYSTEM
IN-FLOOR AERATION SYSTEM

- Below Ground HDPE Piping to Fans
- HDPE Risers with Flush Mounted Grates
- Engineered Patented Aeration Grate System
- 1872 Aeration Grates
COMPOST AERATION SYSTEM

- Negative Aeration Only
- Eighteen 1500 CFM Aeration Stations
- 5,000 cfh/dry ton capacity
- Continuous Aeration with Temperature Feedback and VFD Fan Control
PROCESS CONTROL

- 3 Wireless Temperature Probes/Pile
- Feedback to SCADA System to Control Blowers and Generate Operating and Regulatory Monitoring Records
Supervisory Control And Data Acquisition
TIME/TEMPERATURE REQUIREMENTS FOR COMPOST

• Pile temperature must be maintained at a minimum of 55 degrees Celsius (131 degrees Fahrenheit) for a minimum of 3 days to kill pathogenic organisms.

• Pile temperature must be maintained at a minimum of 45 degrees Celsius (115 degrees Fahrenheit) for a minimum of 14 additional days to reduce vector attraction.
Finished Compost Screening
Positive Aeration Curing
BIOFILTRATION SYSTEM

Biofilter
60 Seconds Nominal Detention Time

Humidification

Biofilter Fans

Odor Collection and Distribution Ductwork

MCC
BIOFILTRATION SYSTEM

Four Fans, 27,000 CFM Each

Aeration Lateral

Compost Process Offgas Inlet

Cooling Air Inlet

Two Biofilters, 4 Cells

Biofilter Media
  Screened, Sized Ground Wood
Residuals Resource Recovery

SPOTSYLVANIA COUNTY COMPOST MARKETING

- Done Using In-House Staff
- Quality Product – USCC STA Approved
- Registered as Fertilizer with Virginia Dept. of Agriculture
- Compost Produced is Widely Accepted
- Principal Users Are Landscapers, Soil Blenders, and General Public
- Principal Use is in Landscaping
Compost Sales are Strong, but Seasonal
SPOTSYLVANIA COUNTY COMPOST SALES

VOLUME (CY)
- 16%
- 80%
- 4%

REVENUE
- 24%
- 5%
- 71%

Nursery  Landscaping  Residential
# SPOTSYLVANIA COMPOSTING FACILITY CAPITAL COSTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Buildings/Facility/Engineering (2008)</td>
<td>$15,500,000</td>
</tr>
<tr>
<td>Moving Stock (2007)</td>
<td>$500,000</td>
</tr>
<tr>
<td>Original Facility Buildings/Improvements (2002-2006)</td>
<td>$1,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$17,000,000</strong></td>
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</table>
## SPOTSYLVANIA COMPOSTING
### ESTIMATED ECONOMICS at CAPACITY

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Capital Cost</td>
<td>$17,000,000</td>
</tr>
<tr>
<td>Annual Depreciation</td>
<td>$1,106,000</td>
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<tr>
<td>Projected Annual O&amp;M</td>
<td>$1,033,700</td>
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<tr>
<td>Subtotal</td>
<td>$2,139,700</td>
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<tr>
<td>Projected Annual Compost Revenues</td>
<td>$253,600</td>
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<tr>
<td>Total Annual Cost</td>
<td>$1,886,100</td>
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<tr>
<td>Projected Annual Tonnage Processed</td>
<td>29,250</td>
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<tr>
<td>Cost Per Wet Ton Processed</td>
<td></td>
</tr>
<tr>
<td>Annualized Capital</td>
<td>$37.81</td>
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<tr>
<td>O&amp;M</td>
<td>$26.67</td>
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<tr>
<td>Total Cost per Ton Biosolids</td>
<td>$64.48</td>
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</table>

Amortized at 4.5%

Original Facilities - 20 year life; New Facilities - 30 year life
Moving Stock - 8 year life
## SPOTSYLVANIA COMPOSTING FACILITY
### 2018 O&M at 64% Loading

<table>
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<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Actual O&amp;M including labor</td>
<td>$697,000</td>
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<tr>
<td>Biosolids Tonnage Processed</td>
<td>15,713</td>
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<tr>
<td>Cost Per Ton Biosolids Processed</td>
<td>$44.35/ton</td>
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<tr>
<td>Compost Revenues</td>
<td>$107,000</td>
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<tr>
<td>Cost Per Ton Biosolids Processed After Product Sales</td>
<td>$37.55/ton</td>
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## Contracted Land Application

<table>
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<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Biosolids Tonnage Applied</td>
<td>15,713</td>
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<tr>
<td>Cost Per Ton Biosolids Applied</td>
<td>$115.00/ton</td>
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<tr>
<td>Cost Land Application</td>
<td>$1,807,000</td>
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<tr>
<td>Cost Composting</td>
<td>$697,000</td>
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<tr>
<td>Avoided Costs</td>
<td>$1,110,000 Per Year</td>
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SPOTSylvania County
Composting Facility
Keys to Continued Success

• Commitment of leadership and staff to develop the facility and continue optimization
• No odor problems since facility started up in 2010
• Successful product marketing program with USCC Seal of Testing Assurance Registration
  – Compost Product is Excellent and Material is Sold Out
• Economics are very favorable to alternatives
• Award winning operation
SPOTSYLVANIA COUNTY COMPOSTING FACILITY AWARDS

• Solid Waste Association of North America – Environmental Excellence Gold Medal Winner
• Virginia Governor’s Environmental Excellence Bronze Medal Winner
• Rathman Foundation - $10,000 Grant Winner.
Composting Success at Spotsylvania County, Virginia

QUESTIONS?
Doug Crooks
540-507-7362
dcrooks@spotsylvania.va.us