Sustainable Biosolids Management: Case Study Edwards, CO

Presented by
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Presentation outline
- Biosolids Overview
- Biosolids Sustainability Decisions
- Edwards Case Study
  - What is ATAD?
  - ATAD Benefits
  - Improved Design Leads to Sustainability
- Results

Wastewater Process

Biosolids Overview
- Begin with the end in mind
  - Landfill
  - Land Application
- Land Application EPA 503 Regulations
  - Class B, Class A
- Match Stabilization and Dewatering Process to Achieve End Goal

Class A vs Class B

<table>
<thead>
<tr>
<th>Class B Land Application (1)</th>
<th>Class A Land Application (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access Restrictions</td>
<td>Virtually Unrestricted Marketing and Distribution</td>
</tr>
<tr>
<td>Land Reclamation (such as mine site)</td>
<td></td>
</tr>
<tr>
<td>Agriculture (feed crops only)</td>
<td></td>
</tr>
<tr>
<td>Agriculture (food crops after set amount of time)</td>
<td></td>
</tr>
</tbody>
</table>

(1) Application may apply

Triple Bottom Line

Social
Environmental
Economical
Example Biosolids Decision Flow Chart

Is There a Class B Land Application Site Nearby?

- Yes
  - Are There Social or Economical Benefits For Class A?
    - Yes
      - Perform Triple Bottom Line Evaluation
      - Landfill Application
    - No
      - No
      - Evaluate Class A Stabilization Processes
      - Evaluate Class B Stabilization Processes

Edwards, CO Biosolids Improvements

- Project 2008 through June 2011
- Improvements to ATAD stabilization process
- Design improvements = improved sustainability

What is ATAD?

A – Autothermal (no external heat)
T – Thermophilic (temps 45 - 60°C)
A – Aerobic (with oxygen)
D – Digestion (solids stabilization)

Keys to ATAD

- Thermophilic Temperatures
- Thermophilic bacteria
- Fast cell lysis of mesophilic bacteria
- Low pathogens in biosolids
- Thickened Sludge
- Low water
- Thermophiles produce enough heat to automatically maintain thermophilic temperature

Edwards ATAD Process

Edwards Layout
1st Generation ATAD Issues

- Odor Problems
  - Reduced sulfur compounds from anaerobic conditions
  - High solids loading
  - Inadequate mixing
  - Inadequate aeration
- High ammonia production
  - Centrate 1,200 to 1,500 mg/L ammonia
  - Significant ammonia load contribution
- Foaming problems

Triple Bottom Line Progress

- Environmental
  - High Centrate NH3
  - Lower Biosolids Quality
- Social
  - Odors
  - Dangerous Odor Control Chemical
  - Wasted Heat
- Economical
  - High Odor Control Cost
  - Poor Aeration Control

1st Generation Odor Control

- Bio Trickling Filter
- Ozone Oxidation
- Dilution Fan
- 3-Stage Chemical Scrubber

2nd Generation ATAD

- Odor Prevention
- Continuous Aerobic Conditions
  - Higher mixing energy
  - Longer SRT – 12 days
  - Lower solids loading
  - Aeration control

2nd Generation ATAD

- Odor Control
  - 2-stage biofilter
  - Ammonia scrubber
  - Lower reduced sulfur compounds
    - H₂S – 6 ppm
    - Methyl mercaptans 10 ppm
- Foam control
  - Yet to have a foaming event that overflowed the reactors

Design Improvements

- Improved Mixing
- ORP Aeration Control
Aeration Control

1st Generation ATAD

2nd Generation ATAD

Social
- Odor
- Dangerous Odor

Control Chemical
- Wasted Heat

Environmental
- High Centrate NH₃
- Lower Biosolids Quality

Economical
- High Odor Control Cost
- Poor Aeration Control

Social
- Wasted Heat

Economical
- Improved Odor Control

Triple Bottom Line Progress – Improved Odor Control

Post Digestion Tank

- Benefits
  - Lowers Centrate NH₃
  - Improves dewatering
  - Chance for heat recovery
  - Improved VSS destruction
  - Produces additional nitrifiers for aeration basins

- Design Parameters
  - 5-7 day SRT
  - 300 – 500 mg/L TIN
  - Temperature ~ 100°F
  - Expected dewater solids concentration 20 – 30%
  - Additional 10% VS reduction

High Quality End Product

- Class A Product
- Good Dewatering Characteristics
  - 20 to 30% Solids
- High TKN Content
- High Phosphorus Content
- Non Detectable Fecal Coliform
- Low Odor

Heat Recovery

- ATAD Process
  - Typically 130°F without external heat source
- Heat Exchangers
  - Building Heat
  - Expandable to glycol system for other uses

Triple Bottom Line Progress – Post Digestion Reactor

Environmental
- High Centrate NH₃
- Lower Biosolids Quality

Social
- Wasted Heat

Economical
- Improved Sustainability
## Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Old ATAD System Average</th>
<th>New ATAD System Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Solids Concentration</td>
<td>% Solids</td>
<td>2.0%</td>
<td>3.3%</td>
</tr>
<tr>
<td>TWAS Concentration</td>
<td>% Solids</td>
<td>6.0%</td>
<td>6.0%</td>
</tr>
<tr>
<td>ATAD HRT</td>
<td>Days</td>
<td>3.5</td>
<td>9.5</td>
</tr>
<tr>
<td>ATAD Temperature</td>
<td>°F</td>
<td>65°</td>
<td>60°</td>
</tr>
<tr>
<td>Volatile Solids Reduction</td>
<td>% Solids</td>
<td>50-60%</td>
<td>63%</td>
</tr>
<tr>
<td>Total Solids Reduction ATAD</td>
<td>% Solids</td>
<td>40-50%</td>
<td>52%</td>
</tr>
<tr>
<td>Cake Solids</td>
<td>% Solids</td>
<td>18-22%</td>
<td>23-25%</td>
</tr>
<tr>
<td>Centrate Ammonia</td>
<td>mg/L</td>
<td>1,200 – 1,500</td>
<td>67</td>
</tr>
<tr>
<td>Centrate NO₃ + NO₂</td>
<td>mg/L</td>
<td>0</td>
<td>21</td>
</tr>
</tbody>
</table>

- Low odor production
- Safer and cheaper odor control
- Fewer foaming problems
- Better control
- Drier biosolids cake
- Outstanding VS and TS reduction
- Good Class A biosolids treatment option

## Questions