ThermAer: Autothermal Thermophilic Aerobic Digestion

Advanced Aerobic Digestion

Biosolids Treatment

Thermal Process Systems

ThermAer Process
B.C.

Every time I rest near this beautiful valley, I get all choked up.

'Cause you realize how insignificant we all are?

Because it's downwind from the sewage plant.
ThermAer System

- Aerobic Process
- High Rate Advanced Digestion
- Operates at High Temperature
- Reduces Volume and Mass of Biosolids
- Produces Class A Biosolids
- Easy to Install
- Easy to Operate
ThermAer System

- Thickening step (WAS, MBR, SBR, etc)
- Main processing reactor (ThermAer)
- Liquid storage and nutrient reduction (MesoAer)
- Dewatering (belt press, centrifuge, etc.)
- Class A disposal options (land application, soil blending, fertilizer marketing)
ThermAer System

- Maintains thermophilic temperatures of 131°-160°F without an outside source of heat (typically 145°F for ease of operation)
- Provides for approximately 50% total solids reduction
- Provides for 60 – 70% volatile solids reduction
- Produces a Class A end product that is easily dewaterable for storage and land application
SNDR

- Maintains mesophilic conditions (95°F) and pH control allowing for nitrification/denitrification and ammonia reduction
- Allows for an additional 10% TS destruction by satisfying additional residual oxygen demand
- Reduces overall dewatering costs by conditioning the sludge
- Lowers N & P recycle
- Provides a wide spot in the line prior to dewatering
**WWTP Size in ppd vs. Number of Plants**

**TPS ThermAer Facilities**

Where do most plants it In?

- **Very small projects** to Lime and classical aerobic digestion
- **2 – 10 MGD** fits right here!
- **Very large projects** to Anaerobic Digestion & Incineration
TPS ThermAer Vs Lime

- Replaced 6 Liming Units in Midwest
  - Middletown, OH
  - LATA, PA
  - Middletown, PA
  - Maryville, TN
  - Huntingdon, PA
- Reduces volume, not increases it (x5)
TPS ThermAer Vs AnD

- Unclassified versus Class 1 Div 1
- Lower solids volume for T&D
- Corrosive atmosphere for Dewatering
- Retro-fitted 13 anaerobic digestors
- Smaller tank volumes – no new tanks
- Plants rethinking – NG prices drop
- Class A – easy disposal
TPS ThermAer Vs AD

- Lower Energy (approximately 50% bhp)
- Much smaller tank size 5% feed
- Better VSR
- Drier cake solids
- Class A disposal options
• ~50+ Installations in US
  • All (every plant) are still in operation
  • 5 plants have included in Phase 2
  • Continued Plant Operator Support
  • Growing US small company (20 years)
TPS ThermAer

- T & D
  - Most WWTPs have free land app.
  - Should use $0 as T & D
- Electric Cost
  - Use bhp not nphp
  - Significantly lower – PLC
- Green Technology
Delphos, Ohio

• 3.83 MGD design (1.5 MGD average)
• 70% combined / 7 permitted CSOs
• 8,700 lbs/day (2006)
• 72% VS and 52% TS reduction
• 25% average TS off of belt press
• 350 to 450 dry ton per year
• Land application by farmers (lottery system)
<table>
<thead>
<tr>
<th>Month</th>
<th>Avg. TS lb/day Feed</th>
<th>Avg. % VS in feed</th>
<th>TS Dest. %</th>
<th>VS Dest. %</th>
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<tbody>
<tr>
<td>January</td>
<td>5951.0</td>
<td>75.7</td>
<td>49</td>
<td>63</td>
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<tr>
<td>February</td>
<td>7370.0</td>
<td>78.9</td>
<td>60.3</td>
<td>72.6</td>
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<tr>
<td>March</td>
<td>5563.0</td>
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<tr>
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<td>7645.0</td>
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<td>47.1</td>
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<tr>
<td>May</td>
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<td>81.7</td>
<td>64.3</td>
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<tr>
<td>July</td>
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<td>45.5</td>
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<tr>
<td>August</td>
<td>2546.4</td>
<td>68.5</td>
<td>68.1</td>
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<tr>
<td>September</td>
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<td>74.5</td>
<td>48.6</td>
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<td>October</td>
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<td>75.4</td>
<td>24.3</td>
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<td>November</td>
<td>3076.5</td>
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<td>December</td>
<td>3285</td>
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<tr>
<td>Average</td>
<td>5143.4</td>
<td>77.2</td>
<td>51.7</td>
<td>63</td>
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</table>
Delphos ThermAer Advantages

- Provided a Class A biosolids product that Delphos gives away resulting in an annual savings of up to $200,000
- Odor free biosolid material that dewatered on a belt press up to 28% TS (average is 22-25%)
- 50% TS reduction (meant less storage for cake)
- 60 – 70% VS destruction
Bowling Green, Ohio

- 10 MGD design (5.0 MGD average)
- 60% combined / 1 permitted CSO
- 15,430 lbs/day (2005)
- 65% VS and 60% TS reduction
- 38% TS off of the centrifuge
- ~850 dry tons per year
- Topsoil generator
- Total cost savings of over $188,000 annually
Middletown, Ohio

- 16.5 MGD Average Daily Flow
- 33,800 lbs/day (2009)
- 50% VS and 35% TS reduction
- 34% TS off of the centrifuge
- ~1845 dry tons per year
- Land application by contract operations
- Estimates total savings of at least $216,000 annually
Lower Allen Township Authority, Pennsylvania

- 6.25 MGD Average Daily Flow
- 9,000 lbs/day (2011)
- 74% VS and 50 - 60% TS reduction
- 26% TS off of the centrifuge
- Land application program both liquid and solid
- Single stage reactor – wants to add on
Holiday Inn Express

11/02/2015
Design Flow 6.25 MGD
Peak Flow 20 MGD
1/4 " Bar Screen
Primary
Secondary BNR
Final Clarifiers
UV Disinfection

ATAD at 9000 ppd
82% VS
Cake solids average about 28% TS
Exceptional Quality
Class A Biosolid

• Class A Pathogen Regime D Time and Temperature
• Fecal coliform
• Vector Attraction Volatile Solids Reduction 75% VSR
• Dewatered Cake Solids 27-30%
• Final Product Stability

06/01/2012
## Product Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Concentration</th>
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<tr>
<td>N</td>
<td>2.3 – 5.5 %</td>
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<tr>
<td>P</td>
<td>1.3 – 3.6 %</td>
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<tr>
<td>K</td>
<td>0.5 – 1.0</td>
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<td>OM</td>
<td>50 – 60 %</td>
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<tr>
<td>C/N</td>
<td>6 -10 : 1</td>
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Additional Benefits

- Filamentous Foam Control
- Biological Organism Seed Source
- Limited Recycle Load
ThermAer ATAD typical process flow diagram

WAS at 1%

Thickener 4-6% TS  
TWAS  
ThermAer ATAD Primary Reactor 12 day HRT  
Storage SNDR 6-10 day HRT  
Biofilter Odor Control Unit  
Atmosphere  
Land Application  
Dewatering 25-30% TS  
Centrate or Filtrate Back to Headworks
ThermAer Process Flow
Conclusions - ThermAer

Advantages

• Class ‘A’ as a liquid or solid biosolid material,
• Odor free product for land application programs,
• Ease of retro-fit, often gaining additional capacity without new tanks,
• Ability to handle septage and grease,
• 60-75% VS destruction,
• No odors from process,
• Little operator attention required,
• Can be integrated into almost any design scheme,
• Cost competitive with anaerobic digestor rehabs,
• Class ‘A’ process at Class ‘B’ price.