EPA Sustainable Materials Management
Web Academy
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WASTED FOOD TO ENERGY

Sharon Thieszen, Superintendent
Sheboygan Regional WWTF
Sheboygan, Wisconsin
Sheboygan Regional WWTF

- 7 Communities, Western Shore of Lake Michigan
- Population 68,000
- 18.4 MGD Average, 56.8 MGD Max
- 10 MGD Average Daily Flow
- Activated Sludge with Biological P Removal and backup Ferric Chloride Addition
- Anaerobic Co-Digestion, Biogas Recovery, and Combined Heat & Power
- Liquid Storage of AD Biosolids and Biosolids Drying & Storage
- $4.7 Million O&M Budget
- 2013 ACEC Engineering Excellence Grand Award - Net Zero Energy
Biogas to Energy

2005
Energy conservation initiatives & Co-digestion implemented

2006
Co-digestion program increased biogas

2006
Partnered with Alliant Energy - installed biogas conditioning and turbines; 300 kW, 1MMBtu/hour heat

2010
Installed additional biogas conditioning and turbines; 400 kW, 1.4MMBtu/hour heat

2012
Purchased biogas conditioning equipment and turbines from Alliant Energy - City recoups all cost savings from biogas to energy systems
Initial CHP Generation Project

- 10—30 kW Capstone Turbines
- 2 Cain Heat Exchangers
- Unison Gas Conditioning
- 300 kW Electrical Power
- 1 MMBtu per hour heat recovery
- Electricity and heat produced is used onsite to power equipment and heat the digesters and plant buildings in the winter

Alliant Energy-Wisconsin Power & Light funded the turbine project and recovered costs through the sale of generated electricity to the WWTF
Co-Digestion Program Implemented

- Repurposed existing unused digesters
- Predominately dairy waste
- Tanker trucks 24/7 access
- 6000 gal/load
HSW Receiving & Feeding Components

In-line Strainer

HSW Unloading

HSW Feed Pump
Second CHP Generation Project

• 2—200 kW Capstone Turbines
• 2 Cain Heat Exchangers
• Unison Gas Conditioning
• 400 kW Electrical Power
• 1.4 MMBtu per hour heat recovery
• Allowed beneficial use of excess biogas
Biosolids Storage Requirements

• NR 204 Requires 180 day biosolids (winter) storage
• Increase in biosolids production attributable to HSW program
• 10.08 MG required; 5.96 MG available
• Alternatives considered to expand biosolids storage capacity
  • Minimal additional liquid storage & eliminate HSW receiving program
  • Large scale liquid storage
  • Liquid storage & drying
Biosolids Process Improvements
10 Years of HSW Program

- Process 60,000 gpd High Strength Waste
- Biogas Produced: 500,000 ft³/day
- Biogas Quality: 65% Methane
- Equipment Installed: 700kW Electrical Generation
- Electrical Energy Produced: 5,010,000 kWh annually (2013)
- Thermal Energy Produced: 42,000 therms annually (2013)
- Energy Savings: $270,000 annually (2013)
  \$0.05/kwh=$250,000; \$0.51/therm=$21,000
- CHP Program Produces: 90% Electrical Needs & 85% Heating Requirements
HSW Challenges
## CAPITAL INVESTMENTS

<table>
<thead>
<tr>
<th>Project</th>
<th>Project Cost</th>
<th>Funding Assistance</th>
<th>City's Cost</th>
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<tbody>
<tr>
<td>Co-digestion</td>
<td>$75,000</td>
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<tr>
<td>CHP Phase I</td>
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<td>$899,000 Alliant Energy</td>
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<td>CHP Phase II</td>
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<td>$205,000 Grant</td>
<td>$1,295,000</td>
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<td><strong>Total</strong></td>
<td><strong>$2,775,000</strong></td>
<td><strong>$1,104,000</strong></td>
<td><strong>$1,671,000</strong></td>
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Competition for HSW

2005
• Sheboygan only regional HSW program
• Increasing revenue from tipping fees
• Significant grant money available
• Utilized existing tank capacity

2014 – BOD Wars
• Multiple POTW co-digestion programs
• Multiple agriculture co-digestion programs
• Private co-digestion programs
• 90% HSW from one supplier
• <$100,000 Tipping Fees
• Minimal grant money available
• Significant capital improvements to continue HSW and co-digestion
• Offset in energy costs sufficient to fund capital improvements
Future of Co-Digestion Program

- **Discontinue HSW Receiving and Electricity Generation**
- **Sustain Existing HSW Receiving and Biogas Utilization**
- **Increase HSW Receiving and Biogas Utilization**

![Graph showing future revenue projections for co-digestion program](image-url)
Moving Forward
Reducing Energy Consumption

- Team Effort
- Evaluate Payback Costs for New Projects
- Partner With the Local Utility
- Keep User Rates Low
- Continue Path to Sustainability & Being a RESOURCE RECOVERY FACILITY

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