Sheboygan Regional WWTP

Journey to Energy Independence

Paulette Enders

February 2010
Sheboygan Regional WWTP
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- Built 1982
- 18.4 MGD Permitted Flow
- 11.0 MGD Average Flow
- Serves 68,000 People
  - City of Sheboygan
  - City of Sheboygan Falls
  - Village of Kohler
  - Town of Lima
  - Town of Sheboygan
  - Town of Sheboygan Falls
  - Town of Wilson

- 2009
  - Operating Budget ~$4M
  - Energy Costs $387K

3333 Lakeshore Drive
## Energy Costs Increasing

### Annual Average Total Cost for Energy

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost Per Therm</th>
<th>Cost Per KWH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>$0.4520↑</td>
<td>$0.0430↑</td>
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<tr>
<td>2003</td>
<td>$0.5940↑</td>
<td>$0.0500↑</td>
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<tr>
<td>2004</td>
<td>$0.6666↑</td>
<td>$0.0538↑</td>
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<tr>
<td>2005</td>
<td>$0.8366↑</td>
<td>$0.0578↑</td>
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<tr>
<td>2006</td>
<td>$0.9353↑</td>
<td>$0.0653↑</td>
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<tr>
<td>2007</td>
<td>$0.8575↓</td>
<td>$0.0695↑</td>
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<tr>
<td>2008</td>
<td>$0.9403↑</td>
<td>$0.0738↑</td>
</tr>
<tr>
<td>2009</td>
<td>$↑↑↑↑</td>
<td>$↑↑↑↑</td>
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</table>
WWTP Projects

- Influent Pump Stations
- Aeration Blower Replacement
- Sludge Boiler Replacement
- Cogeneration Project
One Turblex Centrifugal Blower
VS:
Two Gardner Denver PD Blowers

$3.00 Per Hour
THROWN AWAY
Cogeneration Project
Cogeneration Project

• Why
  – We were Flaring Off Excess Methane Gas
  – Reduce Electricity and Natural Gas Costs

• What
  – Installed 10 – 30 KW Capstone Micro-turbines
  – Installed Gas Compression Gas Filtration System
  – Installed 2 – Cain Heat Exchangers
  – Installed Piping and Pumps to Utilize Heat Generated by Micro-turbines
  – Installed Monitoring and Control System
Cogeneration Project 2008

• 2008 Micro-turbine Net Energy Production, (Down 3 Days)
  – ~65,602 Therms (Averaged 18,072,124 BTUs Per Day)
  – ~1,666,200 KWH (Averaged 4,590 KWH per Day)
• Total Value of Heat Produced in 2008 = $61,686
• Total Value of Electricity Produced in 2008 = $122,966
• 2008 Payment from Alliant Energy = $25,730
• 2008 Renewable Energy Credit Revenue = $5,100
• Total Revenues = $30,830

• The City recovered its investment in the first two years of operation
Summary All Projects

- **Project Costs**
  - North Ave PS $ 50,000
  - Kentucky Ave PS $ 63,000
  - Influent PS $ 87,000
  - Aeration Blowers $ 504,000
  - Sludge Boilers $ 350,000
  - Micro-turbines $ 200,000
  - Total $1,254,000

- **Energy Savings** – includes FOE grant, monthly payments from Alliant Energy and revenue from the sale of the Renewable Energy Credits.
  - 2006 $ 177,824
  - 2007 $ 138,830
  - 2008 $ 165,439
  - 2009 Estimate $ 173,711
  - 2010 Estimate $ 182,396
  - 2011 Estimate $ 191,156
  - 2012 Estimate $ 201,092
  - 2013 Estimate $ 211,147
  - Total $1,441,956

- In less than 7 Years the City will recover all funds expended for All Projects
  - Based Upon a 5 % increase per Year for years 2009 - 2013
Recycling Bio-solids
High Strength Wastes

- High Soluble Organic Wastes
  - High Biochemical Oxygen Demand (BOD) > 25,000 mg/l
  - Low Total Suspended Solids (TSS) < 10,000 mg/l
  - Easy to pump
  - Provides increase in Methane Gas Production within minutes

- Currently using the following Food Processing Waste
  - Schreiber Foods
    - co-mingled Cheese Processing Waste, ~40,000 BOD
  - Adel Whey
    - Mother Liquor, ~120,000 BOD
    - Permeate, ~100,000 BOD
    - Permeate Rinse Water, ~60,000 BOD
  - Jeneil Biotech
    - Flavorings for Dairy Products, ~25,000 BOD

- Evaluating the following Food Processing Waste
  - Saputo Foods
    - Permeate, ~330,000 BOD, 30% Total Solids, 80% Volatile Solids
Total Methane Gas Produced (Used)
December 2005 compared to March 2008

- December 2005 without high strength waste: 233,065 Average
- March 2008 with high strength waste: 435,673 Average

Mar-08, With High Strength Waste
Dec-05, Without High Strength Waste
• Installing energy efficient motors saved 2,171,000 kWh over the past three years.
• This reduction in kWh means that we produced 3,000,000 pounds less carbon dioxide in 2006, 2007 and 2008.
• To offset this three year emissions reduction we would need to plant 8,400 trees.
• Through the use of methane gas to produce energy on-site, we have reduced our dependency on outside energy sources. (electric and natural gas).
• Burning the methane gas in the micro-turbines reduces our greenhouse gas emissions (Methane and Carbon Dioxide).
• By metering-in the High strength wastes into our Anaerobic Digesters we have increased our methane gas production by up to 90 percent.
• The optimization of biogas production has resulted in lowered energy consumption and has allowed our energy costs to remain relatively flat.
• The land application of Bio-solids on agricultural land saves the farmer $$$$$$$ and saves landfill space