Sustainable Wastewater Treatment from a Vision to a Reality

Dale L. Doerr MBA
City of Sheboygan Regional WWTP
Mayor’s Innovation Project Annual Meeting Washington DC
January 20 – 21, 2012
Agenda

- Where is Sheboygan, WI?
- Sustainability Rewards
- Sustainability Measures
- Savings/Revenues
- Payback
- Summary
Where is Sheboygan Wisconsin?
Sustainability allows for really, really, really, low wastewater rates.

2010 Sewer Rates
$2.05 / 1000 Gallons
Sustainability

Upgrades will satisfy heat, energy needs for wastewater plant

BY BOB PETRUE Sheboygan Press staff

It took a giant crane and a giant tug and about an hour longer than expected, but the job of lifting the huge lid off a huge anaerobic digester at the Sheboygan Regional Wastewater Treatment Plant was finally completed Wednesday morning.

Now comes the next step: clean, sandblast, paint and rehabilitate the 750,000-gallon digester so it can produce more methane gas, which will be used to help generate gas and electricity to provide nearly all the heat and power needed to operate the treatment plant at 3301 Lakeshore Drive.

The $4.9 million project to upgrade the plant also includes installing two, 350-kilowatt Capstone microturbines, which will boost the on-site electrical generation capacity from 225 kilowatts to about 525 kilowatts per hour, enough to take care of between 80 and 100 percent of the electricity needed to run the plant. The two new turbines bring the total number of the plant to 12.

The job of the digester is to take the sludge created at the plant, churn it up to create the methans and send the bugs to run the turbines. Exhaust from running the turbines will be used to heat water, the buildings and the digesters at the plant.

"I guess from the standpoint of sustainability it’s something about doing the right thing," said Dale Doerr, Sheboygan wastewater superintendent. "This isn’t costing us a lot of money, when you look at we had to do some of these things anyhow."
City of Sheboygan Wins Sustainability Best Practices Award at Wastewater Treatment Plant

CHATSWORTH, Calif., July 7, 2011 (GLOBE NEWSWIRE) -- Capstone Turbine Corporation (www.capstoneturbine.com) (Nasdaq:CPSI), the world's leading clean technology manufacturer of microturbine energy systems, today announced that the City of Sheboygan, Wisconsin received a prestigious award from the Great Lakes and St. Lawrence Cities Initiative (GLSLCI) for nearing self-sufficiency at its wastewater treatment plant using Capstone microturbines.

The city of Sheboygan was the only GLSLCI member city in the U.S. and Canada to receive the Wege Small Cities Sustainability Best Practices Award, which recognizes GLSLCI member cities working to protect the Great Lakes and St. Lawrence River, restore them, and improve the quality of the water resources for future generations. GLSLCI is a bi-national coalition of mayors and other local officials that work actively with federal, state, and provincial governments.

Rather than flare excess methane gas -- the byproduct from sewage treatment processes that has a greenhouse gas impact on the atmosphere 21 times greater than carbon dioxide -- the Sheboygan plant uses the methane to fuel 10 Capstone C30 and two C200 microturbines in a combined heat and power (CHP) application. Using waste methane as fuel, the microturbines fulfill 90 percent of the plant's annual energy needs and nearly eliminate the need to purchase natural gas for heating.
Sustainability Measures

- Variable Frequency Drives
- Premium Efficiency Motors
- High Efficiency Aeration System Blowers
- Aeration System Air Flow Control Valves
- High Efficiency Boilers
- Indoor Lighting Replacement
- Cogeneration Facility
- Co-digestion
Savings/Revenues

- Electricity Usage Reduced by
  - 950 MWs/Year = 16.5% = $60,000 @ 6.3¢/kW
- Cogeneration Facility Produces
  - 5,000 MWs/Year = 90% = $315,000 @ 6.3¢/kW
- Natural Gas Usage Reduced by
  - 130,000 Therms/Year = 85% = $84,500 @ 65¢/Therm
- Revenues from Tipping Fees Increased by
  - $700,000 Annually = 175% = 15.5% of Operating Revenues
### Annual Energy Savings Summary

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<td>Influent Pump VFDs</td>
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<td>Aeration Blower Replacement</td>
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<td>Aeration Valves Installation</td>
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| Energy Produced onsite         |          |           |          |           |          |           |          |           |          |           |          |           |          |           |
| CR 30 kW Micro-turbines Install | 60,449   | 66,369    | 65,602   | 60,247    | 61,888   | 65,000    | 1,350,000| 65,000    | 1,350,000| 65,000    | 1,350,000| 65,000    | 1,350,000| 65,000    |
| C 200 kW Micro-turbine Install |          |           |          |           |          |           |          |           |          |           |          |           |          |           |

| Total Energy Reduction         | 1,077,120| 159,571   | 1,077,120| 151,501   | 1,077,120| 215,716   | 1,995,120| 256,165   | 1,995,120| 194,524   | 3,615,120| 260,412   | 6,445,120| 329,412   |
| Energy Rate                    | $0.0665  | $0.9039   | $0.0720  | $0.8347   | $0.0769  | $0.8666   | $0.0782  | $0.7352   | $0.0816  | $0.6316   | $0.0816  | $0.6500   | $0.0816  | $0.6500   |
| Total $ Savings                | $71,628  | $144,236  | $77,553  | $126,458  | $82,831  | $186,939  | $156,018 | $188,333  | $162,802 | $122,861  | $294,994 | $169,268  | $525,922 | $214,118  |

| Total Combined Savings         | $215,865 | $204,011  | $269,770 | $344,351  | $285,663 | $464,262  | $740,040 |

| Total Energy Savings 2006 - 2011| $2,523,960|

| Total Project Costs            | $2,874,000|

Simple Pay Back 7 1/2 Years

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1 Due to technical issues the C200 Capstone Micro-turbines did not operate at full capacity for most of 2011

2 Estimated based on operating 90 percent of the year and our purchasing the 10 - C30 kW Micro-turbine Installation from Alliant Energy
Summary

- The Sheboygan Regional WWTP is one of a handful of WWTPs in the World that produces nearly all of its energy onsite.
- According to an independent rate study completed in 2010, Sheboygan’s Wastewater rates ranked the 19th lowest out of 343 responding communities in the State of Wisconsin.
- Sheboygan Regional WWTP has received visitors from Argentina, Brazil, Chili, China, Ecuador, Germany, Japan, Nigeria and from across the United States.
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