City of Rochester
Rochester Wastewater Reclamation Plant
2,000 kW CHP and Anaerobic Digester Project

FACT SHEET

Utilizing Biogas to Generate Electricity On-Site

Project Overview

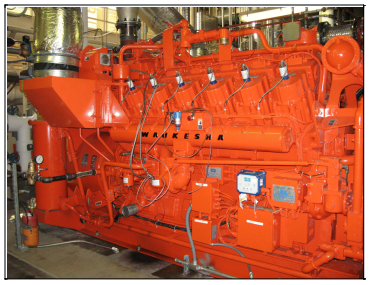
The City of Rochester Wastewater Reclamation Plant (WWRP) serves the residential, commercial and industrial residents of the City of Rochester, Minnesota. The city has a population of approximately 100,000 people, and the plant has the capacity of processing approximately 24 million gallons per day (MGD) of sewage and wastewater.

A two-phase project was initiated in 2002 to upgrade a CHP system originally installed in 1982. The original 880 kW CHP system was replaced with two 1,000 kW dual fuel (biogas and natural gas) Waukesha engine generators with both jacket water and exhaust gas heat recovery. One engine generator set was installed in 2002, the second in 2008. The new engines are 20% more efficient than the original engines.

The installed capacity of 2,000 kW is more than sufficient to handle the amount of biogas produced by the digesters. For example, the average flow of 338,000 cuft/day of 66% methane biogas produced in 2007 can generate approximately 700 kW to 850 kW of electric power. All the electricity generated by the CHP system is utilized on-site to offset the electrical base-load requirements of the facility.

Quick Facts

- **Location:**
  Rochester, Minnesota
- **Wastewater Treatment:**
  Wastewater Reclamation Plant
  24 MGD capacity
- **Project Equipment:**
  Two Dual Fueled Waukesha IC Engines-1,000 kW Each
- **Heat Recovery:**
  4.46 MMBtu/hr Capacity per Engine
- **Anaerobic Digesters:**
  Two Continuous Complete Mix Digesters
  Total Capacity of 3.7 MG – 2007 Average Biogas Production - 338,000 cfd; 66% Methane
- **Implementation Cost :**
  $4 million ($2,000/kW)
- **Annual Savings:**
  2007 Savings - $564,000

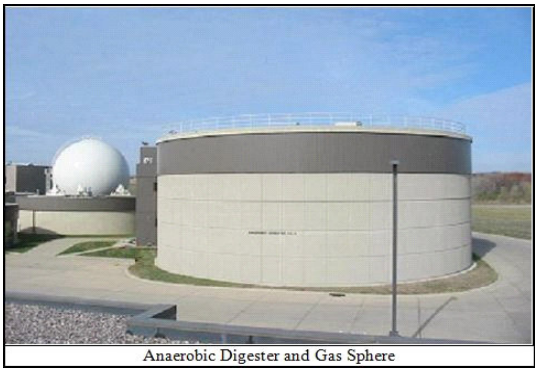


Waukesha 1,000kW Lean Burn, Turbo-Charged Dual Fuel Engine Generator Set

September 2009

Operating Strategy

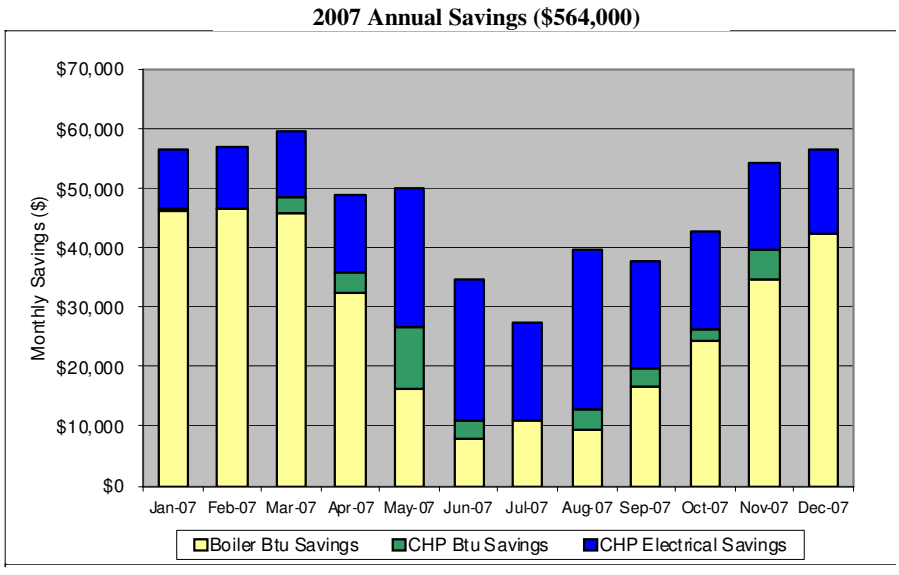
During the extremely cold Minnesota winters, it has been determined that a greater financial return can result from reducing the operating time and/or capacity of the CHP system and utilizing the produced biogas first as a direct fuel into the existing boilers to meet the thermal requirements of the plant. Any biogas not used in the boiler system during the winter months is then utilized to generate electricity in the CHP system.


Anaerobic Digester and Gas Sphere

During the remaining months, the CHP system operates on average at 700 kW to 850 kW with full heat recovery. In 2007, the CHP system in this mode, produced 2,021,481 kWh of electricity, about 11% of the plant's entire electric load, and saved $564,000. The full generation capacity of 2,000 kW is utilized when back-up power is needed during utility grid outages by powering the system with either a combination of biogas from the process with biogas stored in a 50 foot diameter sphere, or by natural gas.

Lessons Learned

- Be alert for unforeseen project startup issues
- Provide additional training for operations and maintenance personnel
- Systems can operate on a relatively stand-alone basis if tied into a SCADA or other monitoring and control system
- CHP projects require due diligence from design through operation and maintenance



"We are very pleased with the operation of the CHP system. It allows the city to utilize the renewable biogas produced at the plant for energy cost savings while also providing a source of emergency power. The system is also environmentally friendly because it eliminates flaring of the digester gas to the atmosphere."

Chet Welle
Assistant Plant Manager
Wastewater Reclamation Plant

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