

**City of Portland
Columbia Boulevard Wastewater Treatment Facility
1.75 MW CHP Application**

**F
A
C
T

S
H
E
E
T**

**Digester
Gas
for
Fuel**

Project Overview

Columbia Boulevard Wastewater Treatment Plant (CBWTP), the largest wastewater plant in Oregon, is operated by the Portland Bureau of Environmental Services (BES). The facility is the collection point for about 1,800 miles of wastewater sewer pipes and includes 92 pumping stations. CBWTP treats 80-90 million gallons of sewage and wastewater each day.

CBWTP's wastewater treatment process produces about one million cubic feet of anaerobic digester gas each day and about 55 percent of the gas is methane. The plant has investigated several technologies over the years to reclaim this "biogas" for electrical power generation to reduce utility costs and has installed a number of these advanced systems.

CBWTP installed a 200 kW anaerobic digester gas fuel cell power generation project in 1999, but it was decommissioned in 2005. In April 2003 four 30kW Capstone microturbines were installed.

Typically, treatment plants like CBWTP flare or burn excess biogas. Using this fuel source to generate power provides the facility with a free, renewable energy source that displaces local utility electricity (likely generated from natural gas or coal fuels).

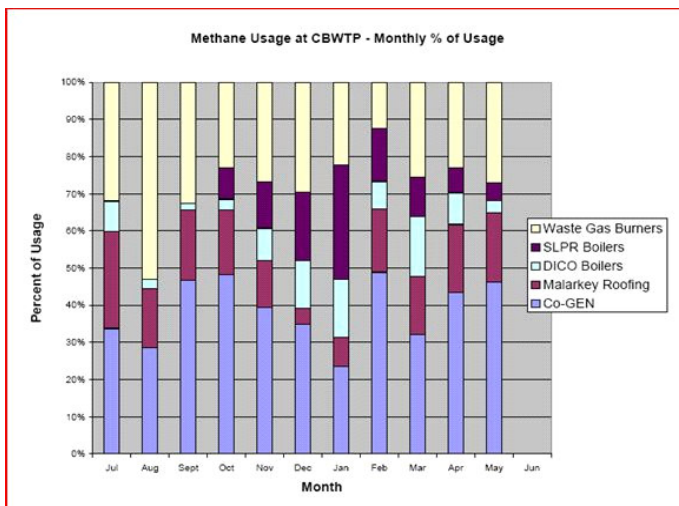
Quick Facts

- ◆ **Location:**
Portland, Oregon
- ◆ **Wastewater Treatment:**
80 – 90 MGD Sewage and Wastewater
- ◆ **Biogas Usage:**
Digester Gas Composition
 - Methane – 50-62%
 - CO₂ – 38-50%
 - H₂S – 350 ppm
 - Siloxane – 25 ppmv
 Pressure Boost–1.2–2.9 psi
 Approx Usage– 13,810 SCF/Hr/ Unit
- ◆ **Project Equipment:**
Two 850kW GE/Jenbacher I/C Engine-Generators
- ◆ **Thermal Heat Recovered:**
3,549 MBtu/Hr Heat Recovery
- ◆ **Equipment Cost:**
Engines/Electrical Switchgear = \$1,444,000
 Installation (incl. Gas treatment) = \$5,346,000
 Design, Const Admin, Startup = \$2,170,000
 Total Cost= \$8,960,000 (\$5,270/kW)
- Cost reduced by the combined Oregon Energy Trust/BETC (effective 25% credit - \$2.24M)**
 Final Cost = \$6,720,000 (\$3,950/kW)
- ◆ **Annual Savings:**
Electricity = \$438,000
- ◆ **System Online:** June 2008

Operating Strategy

This system, with the other BES use of digester gas for CHP projects, has resulted in significant environmental benefits because instead of flaring a large portion of the methane (one of the most powerful greenhouse gases), most of the gas is now used for power generation on-site. Although CO₂ is still released from burning biogas in the engines, it offsets the CO₂ that would be emitted by the electric utility serving the treatment plant. The portion of biogas used beneficially to save utility costs is shown in the chart below (the amount used in the I/C engines is included in the Co-Gen amount).

In addition to reducing the treatment plant electricity demand and cost, the I/C Engine design incorporates a heat recovery subsystem. This heat recovery process reclaims heat from the engines to heat digesters used to further convert process biosolids into soil enhancement material sold and then trucked to farming operations in Eastern Oregon.



Lessons Learned

- ◆ Waste Heat – Previous biogas recovery process systems deployed by CBWTP did not take full advantage of the energy available to help heat the sludge digesters; this design does.
- ◆ Immediate and continuing coordination with the local utility is highly recommended. As a result of such coordination, this system allows for independent operation from the grid to maintain plant operation and provide energy to over ninety wastewater pumping stations throughout the City. The system is fully synchronized with the utility grid.
- ◆ Based on previous systems deployed, the design specified rigorous scrubbing of the digester gas prior to being burned in the engines.

“It’s about running a more efficient plant. Although the engines still emit CO₂, the City is avoiding generating greenhouse emissions that our local utility, Portland Gas & Electric, would be generating using natural gas or coal.”

Garry Ott
Senior Engineer
BES
City of Portland

Contributions Made by:

- ◆ City of Portland – Bureau of Environmental Services
- ◆ Mr. Garry Ott, Senior Engineer
- ◆ Camp Dresser & McKee Inc. (CDM), design engineering consultant firm
- ◆ James W. Fowler Co. – general contractor
- ◆ GE/Jenbacher – engine-generator supplier



For further information

contact:

David Terry,
Executive Director, ASERTTI
(703) 395-1076

Dterry@asertti.org
www.ASERTTI.org