



# Paul L. Bruner Water Pollution Control Plant Fort Wayne, Indiana

## 800 kW Biogas CHP System

### Background

The Paul L. Bruner Water Pollution Control Plant (WPCP) provides wastewater treatment for the City of Fort Wayne, Indiana and its surrounding communities. The original plant was opened in 1941. Today, after numerous upgrades, the WPCP serves over 310,000 people providing primary, secondary, and tertiary wastewater treatment with a design treatment capacity (wet weather conditions) of 100 million gallons per day (MGD). Its normal average operating flow rate is 42 to 45 MGD. The treated water (effluent) is released into the Maumee River (part of the Great Lakes Watershed), and the organic matter removed from the wastewater (sludge) is treated, dried, mixed with composted yard waste, and made available as a soil enhancer/fertilizer.

In 2014, the City of Fort Wayne considered several cost saving options as they were planning upgrades at the WPCP. The analysis included options to better utilize the biogas produced during the anaerobic digestion treatment of the sludge. The decision was made to invest in a biogas fueled combined heat and power (CHP) system with heat recovery that would provide both utility grade electricity and heat (hot water) to reduce their overall energy costs.

### Quick Facts

**LOCATION:** Fort Wayne, Indiana

**MARKET SECTOR:** Wastewater Treatment

**Plant Capacity:** 100 MGD Peak: 42 to 45 MGD typical operation

**CHP GENERATION CAPACITY:** 800 kW

**CHP Heat Recovery Rate:** 3.37 MMBtu/hr (hot water)

**CHP Fuel Source:** Biogas from municipal + high strength wastes

**PRIME MOVERS:** Two – 400 kW IC Engines (Dresser Rand/Guascor engines with heat recovery)

**Project Cost:** \$3.3 M

**Estimated Annual O&M Cost:** \$60,000

**Simple Payback:** Estimated 9 to 10 years

**Began Operation:** October 2015

**National Recognition:** 2018 “Utility of the Future Today” award issued by the Water Environment Federation in the category of Energy Generation and Recovery.

### Project Description



*Ft. Wayne Anaerobic Digester Tanks  
Courtesy of Ft. Wayne WWTP*

In October 2015, the operation of two 400 kW spark ignited reciprocating engine/generator CHP systems began. The two units have operated on average at over 91% availability, providing approximately 6,426,300 kWh annually, satisfying approximately 31.5% of the facility’s electric requirements. In addition, the waste heat recovered from the CHP systems totals over 3.37 MMBtus per hour, utilized to keep the anaerobic digesters at their required 91°F operating temperature. The CHP units are fueled by a renewable energy source—methane rich biogas, which is a byproduct of the sludge handling process.

The sludge from the primary and secondary treatment process is sent to six anaerobic digesters that produce approximately 68.5 tons per day of stabilized bio-solids, suitable for soil enhancing land application. In addition, the anaerobic digestion process produces approximately 43 million cubic feet of biogas per day. The biogas is sent through a clean-up system to remove impurities (mainly siloxane) that can harm the operation of the CHP engines. The methane rich biogas is then used to operate the CHP systems (replacing the need for natural gas) as well as the onsite boilers utilized to supplement the facility’s heating requirements.

## Project Economics



*Two 400kW Engine Driven CHP Systems with Heat Recovery  
Courtesy of Ft. Wayne WWTP*

The WPCP is part of the City of Fort Wayne City Utilities (City Utilities), whose responsibility is to improve the operation, increase the sustainability, and implement a business-minded approach to providing management of the water assets for Fort Wayne residents and businesses at affordable prices. City Utilities treats and distributes reliable and safe drinking water, collects and treats sewage, and manages storm-water runoff. In 2015, they invested in the design and installation of two 400 kW engine driven CHP systems with heat recovery. These units, located at the WPCP facility, provide the wastewater facility with greater operating reliability at lower operating costs.

City Utilities utilized a Guaranteed Savings Contract, qualifying for the use of Indiana's State Revolving Funds as a low interest "green energy" funding source, to purchase and install the CHP systems. The factory pre-packaged Dresser Rand/Guascor units were purchased and installed at a total cost of approximately \$3.3 million (including the cost of the biogas cleanup system). The units have a dual fuel capability (biogas or natural gas). The primary fuel utilized is biogas, generated as part of the sludge handling anaerobic digestion process. The estimated annual savings (reduced electricity and natural gas purchased from the local utility) is \$425,800, which results in a 9 to 10 year simple payback after considering both initial purchase and annual operating costs.

## Project Drivers

The long range goal of City Utilities is to expand the operation of the WPCP into a Resource Recovery Facility, providing the added service to local commercial and industrial customers of collecting and treating their high strength waste (HSW) and converting the HSW into a useful renewable energy resource. This service will reduce their customers' cost to dispose of the HSW while allowing the WPCP to become "energy neutral" by 2030. Energy neutral means the facility will annually generate all needed energy.

- The investment in the CHP system was a giant first step in meeting this goal, replacing almost one third of the facility's purchased electricity.
- In 2016, WPCP began accepting HSW from a nearby Nestle Plant that converts milk into coffee creamers. The HSW (liquefied greasy orange sludge) increased the biogas energy production from the anaerobic digestion process at the WPCP by 25%.
- City Utilities is now implementing several programs to accept fats, oils, and greases (fog) from their commercial customers, providing their customers an alternative disposal option while again significantly increasing WPCP's production of a renewable energy source (biogas).
- WPCP is analyzing the most efficient and profitable use of the increased production of biogas, including increasing the energy content of the biogas by removing the high levels of CO<sub>2</sub> and selling the renewable energy into the natural gas pipeline, converting the high quality gas into compressed natural gas (CNG), and/or expanding their on-site CHP capacity.

*"The installation and operation of the CHP system has provided us both greater operating efficiency and resiliency, while launching our corporate efforts to become energy neutral".  
- Douglas J Fasick, Sr. Program Manager, City Utilities Engineering*

## For More Information

**U.S. DOE Midwest CHP Technical Assistance Partnership**  
Phone: (312) 996-4490 [www.mwchptap.org](http://www.mwchptap.org)

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