

powerprofile

DIGESTER GAS

CUSTOMER: City of Hamilton

LOCATION: Ontario, Canada

Customer Requirement: Win Ontario Ministry of Energy renewable energy program contract for digester-gas-fueled cogeneration system

Scope of Supply: Equipment –
One Cat® 1.6 MW gas generator set powered by a Cat G3520C low-energy-fuel engine
Fuel conditioning system, heat recovery equipment, switchgear and utility interconnections, PLC-based controls, and a sound-attenuated enclosure

Services –
Turnkey design, construction, operation and maintenance with fixed-fee Customer Service Agreement

Cat Dealer: Toromont Power Systems
Concord, Ontario, Canada



Toromont Power Systems installed this turnkey 1.6 MW digester-gas-fueled cogeneration system at the Woodward Avenue Wastewater Treatment Plant in Hamilton, Ont. It's powered by a Cat® G3520C gas engine configured for low-energy fuel.

POWER NEED

When the Ontario Ministry of Energy announced a renewable energy initiative in 2004, the City of Hamilton saw an opportunity.

Anaerobic digesters at the city's Woodward Avenue Wastewater Treatment Plant produced 6 million cubic meters of biogas per year at 65 percent methane. The plant burned some of the gas in a boiler for heating, but flared the majority of it.

Seeing the gas as a source of renewable energy, the city responded to a Request for Proposals from the Ministry of Energy with plans for a 1.6 MW cogeneration facility fueled exclusively with digester methane. The project would also ultimately meet a need for increased backup generation at the treatment plant, as identified by a power study.

The ministry selected the city's proposal through competitive bidding based on the price of energy per kilowatt-hour. It was one of ten winning projects totaling 395 MW of renewable generating capacity. The city then turned back to Toromont Power Systems in Concord, Ont., which had developed the project proposal, to build, operate and maintain the cogeneration plant.

SOLUTION

To generate electricity, the city formed a corporate entity under the Ontario Business Corporations Act (OBCA) called Hamilton Renewable Power Inc. (HRPI), with the City of Hamilton as the sole shareholder. Toromont Power Systems, which in 2002 had supplied the city with a 3.5 MW Cat® G3616 gas generator set for a district energy project in the downtown area, took turnkey responsibility for renewable energy project. The local office of Conestoga Rovers & Associates provided engineering and project management support through construction.

Toromont delivered the complete cogeneration system in a stand-alone module with a sound-attenuated enclosure. At the heart of the system is a Cat G3520C gas engine in a configuration designed to be durable and reliable in burning low-energy fuels without needing extensive fuel conditioning.

A specially designed cooling system elevates jacket water to the optimum temperature to prevent condensation of fuel-borne sulfur compounds and the formation of sulfuric acid, which can damage engine components. A crankcase ventilation pump ejects potentially acidic blowby gases and draws in fresh, filtered air. In addition aluminum and

unprotected steel are eliminated from key components including aftercooler cores and main and connecting rod bearings.

“Because we chose this engine, the digester fuel conditioning system requires only a moisture removal system followed by a coalescing filter to remove remaining moisture droplets and particulate,” says Peter Ronson, Toromont account manager. “We made provision to add other fuel conditioning steps in the future, but we do not expect them to be necessary.”

The enclosure contains jacket water and first-stage aftercooler heat exchangers and an exhaust gas boiler. Heated water from the engine passes through a plate-and-frame heat exchanger connected to the treatment plant process heat loop.

The package also includes 4,160V switchgear, utility interconnections, paralleling and synchronization controls, and protective relaying. A PLC-based control panel designed and built by Toromont regulates the heat recovery and gas delivery systems as well as the engine and generator.

RESULT

The cogeneration facility was commissioned in July 2006. Under the city’s contract with the Ministry of Energy, it will supply renewable energy for 20 years at a fixed price per kilowatt-hour, with escalators.

The facility operates continuously, fulfilling nearly all of the wastewater treatment plant heat load and 20 percent of its electrical load. Total cogeneration plant efficiency exceeds 80 percent. Projected simple payback on the cogeneration equipment is five years.

HRPI signed a long-term Customer Service Agreement with Toromont at a fixed price per kilowatt-hour, covering all maintenance, service, overhauls and replacement parts. In addition, for at least the first year, Toromont will operate the facility.

A Toromont technician makes regular visits to the site, and critical engine and generator functions, shutdowns and



Toromont Power Systems provides complete maintenance and service support for the cogeneration plant under a Customer Service Agreement with a 97 percent availability guarantee.

alarms are monitored remotely from Toromont headquarters. The service agreement includes a 97 percent availability guarantee.

Jim Harnum, vice president of HRPI, expresses pride in the installation. “We had been producing high-quality methane for years,” he says. “We had an opportunity to make a positive contribution to Ontario’s renewable energy program and at the same time save on treatment plant operating costs.

“We needed more backup generating capacity, but instead of simply making an expenditure for that purpose, we made an investment in long-term revenue generation. Toromont Power Systems developed a highly competitive project plan and then did a great job of execution. We look forward to a long working relationship with them as we supply renewable energy for the residents and businesses in Ontario.”