



# MONEY in the BANK

Hamilton, Ontario

## Cat® generator sets reduce greenhouse gas, and turn landfill gas into profits for City of Hamilton

**B**ased on an energy policy adopted by Hamilton, Ontario in 2007, the city is on track to become a low-carbon emission municipality.

The mandate calls for new corporate energy intensity reduction targets of 45 percent by 2030, and 60 percent in 2050, and also calls for an 80 percent reduction in greenhouse gas (GHG) emissions by 2050.

While there are numerous energy-saving targets identified in the plan, a key piece of the strategy involves reduction of

greenhouse gas (GHG) emissions at the city's 184-acre Glanbrook Landfill, which receives an average of 114,000 metric tons of waste annually.

### Waste to energy at Glanbrook

In 2006, Hamilton Renewable Power Inc. (HRPI) contracted with Toromont Cat Power Systems to develop a turnkey project to utilize available landfill gas from the landfill and convert it to electricity, which is sold to the grid. Toromont Cat undertook all onsite construction and oversaw the plant-commissioning process.

Methane gas is collected from the landfill, and is used to power two Cat® G3520C reciprocating gas generator sets with a power output of 1.6 MW each. The power plant also includes radiators, fuel gas trains, ventilation systems and various controls.

### CUSTOMER PROFILE

#### **Glanbrook Landfill, Hamilton Water and Wastewater Treatment Plant**

**Location:** Hamilton, Ontario

**Application:** Landfill Gas, Anaerobic Digesters

**Customer:** Hamilton Renewable Power, Inc.

**Cat® Equipment:** G3520C generator sets (3)



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The generators, landfill gas blower and gas conditioning equipment are housed in metal clad enclosures near the entrance to the landfill. The plant, which began operations in 2008, is fully automated and remotely operated by Toromont Energy Ltd.

The gas collection field is manually controlled and monitored in order to optimize landfill gas pressure and quality.

“Extracting methane from the landfill with horizontal and vertical wells has been effective,” says Tom Chessman, senior vice president of HRPI and manager of the Office of Energy Initiatives for the City of Hamilton.

“And we’re very pleased with the reliability of the Cat engines and the output at the site,” Chessman says. “The last time we checked we were at about 84,000 operating hours on each of these engines. So we’ve been really pleased with the consistent power output, and of course that translates into revenue for Hamilton Renewable Power, which returns a dividend to the City of Hamilton.”

Combined with the output from a similar waste-to-energy cogeneration plant at the city’s wastewater treatment facility, the total net benefit to the City of Hamilton averages about C\$1.3 million per year, Chessman says.

HRPI currently holds a 20-year contract with the Independent Electricity System Operator to sell its renewable energy. From an environmental standpoint, electric power produced by the gensets helps offset electricity that comes from the provincial electricity grid.

Further, a combined 94,000 metric tons of GHGs captured annually at the landfill and at the city’s wastewater treatment plant are not released into the atmosphere, says Frank Gazzola, vice president for HRPI and superintendent of energy engineering for the City of Hamilton.

“Since day one, Toromont has been a partner with the site here at Glanbrook, and also with our cogeneration system at Woodward Avenue Wastewater Treatment Plant,” Gazzola says. “They serve in an operations and maintenance role here, and what we’re most happy with is the uptime on the Cat generators. It’s all about uptime, and we’ve achieved a very satisfactory uptime with the units at Glanbrook.”

The high uptime is realized through strict adherence to regular maintenance activities by Toromont technicians. They monitor the gensets and perform regular maintenance, and are also available on call to restart the engines if they shut down—which is almost

always due to external factors beyond staff’s control.

“That effort is paying off by achieving over 95 percent uptime from these units,” Gazzola says. “So for engines that are over 80,000 hours each, we’re pretty pleased about that. And we receive a timely response from the Toromont service techs who are assigned to this site. It’s great to have somebody there to respond on a 24/7 basis and get things up and running as quickly as possible whenever needed.”

## Woodward Avenue Wastewater Treatment Plant

Starting in 2006, the Woodward Avenue Wastewater Treatment Plant was the City of Hamilton’s first foray into cogeneration. A daily average of 406 megaliters of effluent is collected at the central treatment plant and converted to methane gas inside anaerobic digester tanks. The methane is used to fuel a 1.6 MW Cat G3520C generator set, which produces electric power that is used to offset consumption of power from the grid.

HRPI contracted Toromont Power Systems for the turnkey project. Toromont was required to integrate the generation equipment into existing infrastructure, and was responsible for the detailed design, plus construct



Nearly 170,000 hours of renewable energy has been produced at Glanbrook Landfill

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**C\$1.3 MILLION PER YEAR**



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**TOM CHESSMAN,**  
Senior Vice President, HRPI  
Manager, Office of Energy Initiatives  
City of Hamilton



and commission the digester gas cogeneration system.

The system includes a jacket water/aftercooler waste-heat radiator, digester gas drying and filtration equipment, hot water pumping systems, electrical switchgear, motor controls, and electrical protection systems. The plant is fully automated and remotely monitored.

In addition to the electrical output, the facility produces thermal energy in the form of hot water that is distributed back to the wastewater treatment facility, which is utilized to heat the wastewater digesters. Heat generation consists of recovery of thermal energy from engine lube oil, engine aftercooler, engine jacket water and engine exhaust.

The wastewater treatment facility is producing approximately 20,000 cubic meters of biogas per day through the

normal wastewater treatment process. Electrical interconnection of the facility is behind the meter, and the generation effectively results in displacing 1.6 MW of the water treatment facility’s 8 MW load.

“That was a great project which has yielded great results,” Chessman says. “It’s more than 11 years old now, and it’s paid off, so we’re reaping the benefits of having a true triple bottom line—environmental, societal, and monetary.”

To help ensure HRPI meets its business objectives and optimizes returns from this asset, Toromont Cat Power Systems and HRPI entered into a long-term maintenance contract which leverages Toromont’s extensive parts and service infrastructure, and the expertise of their service technicians.

“There are numerous activities that happen regularly, so there’s a consistent

effort between both parties to keep these two facilities operating at a high level,” Chessman says, citing an example where HRPI and Toromont Energy came up with a strategy to sandblast sparkplugs, thereby extending their useful life and holding down replacement costs. “We work together as a team to minimize lost production, and it’s a good partnership.”

Most of Hamilton’s public-owned buildings have standby generators—which are almost entirely backed up by Cat gensets and ancillary equipment.

“There’s a reason why it’s such a high percentage,” Gazzola says. “Because Caterpillar provides a good product and competitive pricing. And Toromont is providing us with great service, otherwise we wouldn’t be working together with them as partners.”



G3520C Genset



Biogas collection tank