

POWER PROFILE

Cedar Rapids Linn County Solid Waste Agency

POWER NEED

The Cedar Rapids Linn County Solid Waste Agency operates the 75-acre landfill in Marion, which serves 17 communities in the county. The facility includes a 44,000-square-foot resource recovery building that is used for processing hazardous household materials and transferring recycled materials.

When it started accepting waste from the entire county, the landfill near Marion developed quickly, with four new cells added between 2007 and 2013. The landfill currently accepts about 180,000 tons of municipal waste annually. In 2009, the agency installed a system of wells to collect methane gas from the original 30-acre cell and a 13-acre plot.

Landfill gas is typically made up of 50% methane, 50% carbon dioxide, and trace amounts of various hazardous air pollutants known as non-methane organic compounds (NMOCs). The EPA requires large landfills that emit NMOCs from landfill gas in excess of 50 megagrams (Mg) per year to control emissions.

SOLUTION

In general, controlling emissions involves drilling collection wells into the landfill and routing the gas to a suitable energy recovery system or combustion device. Combusting the landfill gas destroys most of the NMOCs in the gas while oxidizing the methane gas to carbon dioxide. This process also reduces the landfill's greenhouse gas footprint since methane has a 25 times greater global warming potential compared to carbon dioxide.

Five years ago, Cedar Rapids Linn County Solid Waste opted to install a Cat® G3520C gas generator set, which uses the methane as fuel to run the engine and rotate the generator, which produces electricity.

About 500,000 cubic feet of gas is consumed daily by the agency's Cat generator set. Condensation is removed from the landfill gas before it is combusted in the engine. Otherwise, the gas receives essentially no pretreatment. One of the strengths of the Cat G3520C is the ability to run on relatively low concentrations of methane. The concentration of methane at the Marion landfill averages about 50 percent.

"This Cat engine is a lean burning unit, which means it has additional inerts within the gas stream," says Garrett Prestegard, an environmental engineer with the Cedar Rapids Linn County Solid Waste Agency. "The inerts in the gas stream absorb heat during the combustion process, which reduces exhaust temperatures. This limits the formation of NOx emissions and helps us meet our air quality requirements.

The 2242 horsepower Cat G3520C advanced gaseous-fueled generator set features high efficiency and long service life to support low-energy fuel from landfill applications. The G3520C 60 Hz generator set is specifically designed to protect engine components against landfill gas contaminants, eliminating the need for elaborate fuel-treatment systems and special maintenance and service practices. The G3520C generator set also provides a lower installed cost per kW, with power densities as high as 100 kW per cylinder.



Cat® G3520C Gas Generator Set

CUSTOMER

Cedar Rapids Linn County Solid Waste Agency

LOCATION

Marion, Iowa

CUSTOMER BUSINESS ISSUE

U.S. Environmental Protection Agency (EPA) emission standards for landfills

SOLUTION

G3520C gas generator set

CAT DEALER

Altorfer

RESULTS

The electric power produced by the Cat generator set is sold back to the local utility, Central Iowa Power Cooperative (CIPCO). Annual revenue generated from power production is more than \$500,000.

“Having a gas system in place that diverts landfill gas to a control device which burns it off is greatly beneficial to the environment and public health because it reduces our emissions footprint,” says Prestegard. “To be able to collect landfill gas and not only burn it to help control our emissions, but have the added benefit of generating electricity and selling it to the grid is a very positive thing.”

By purchasing renewable energy, CIPCO enables its member systems like East Central Iowa REC to offer energy options. Nearly 60 percent of CIPCO’s electricity is generated from emission- and carbon-free resources, minimizing impact to the environment. All or some of the renewable energy credits associated with this generation may have been sold or will be sold in the future, to other parties, or may be used to comply with future regulatory requirements.

Waste heat generated from the power plant can be used directly by adjacent businesses. The Cedar Rapids Linn County Solid Waste Agency collects the excess heat from the Cat generator set to provide heating needs to its nearby 44,000-square-foot resource recovery building.

A heat exchanger unit rests on a skid adjacent to the Cat generator enclosure. There are two parallel coolant systems, one that runs through the engine and another one that runs through the heat exchanger to the resource recovery building. The heat is transferred from one coolant system to the other, and the heated coolant is piped back to the resource recovery building. At that point, it’s sent through a radiant heating floor system in the drive-through aisle and is also sent to a snow-melt system adjacent to the truck bays outside. The generator waste heat is also used to provide heating through three makeup air units.

“Capturing the thermal energy and using it to heat our resource recovery building is a nice added benefit,” Prestegard says.

Cat dealer Altorfer provides all maintenance to the generator set through a 10-year Customer Support Agreement. That includes regularly scheduled maintenance, oil changes, spark plugs, top end in-frame overhauls, and a major overhaul, once the genset reaches 60,000 hours.

“We’ll be at the point where we have enough waste depth to go out and drill wells into those areas,” Prestegard says. “And when we do that, we certainly anticipate maxing out the capacity of our current engine. We’ll probably be at a stage where we will be collecting enough methane to support the installation of another Cat genset.”

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This landfill near Marion currently accepts about 180,000 tons of municipal waste annually.

For more information, please visit cat.com/powersystems