

RUNREADY™

10
YEARS OF
RUNREADY
2010-2019

TESTAMENT TO **POWER**

Pensacola Christian College
relies on Cat® gas power

NET ZERO
Wastewater plant achieves
energy independence

**Robust growth forecast
for gas generation**



Powering Ahead

Now entering its 10th year, *RunReady* magazine highlights best practices in distributed power generation. Over the last decade, we have profiled scores of businesses and institutions that utilize Cat® generator sets, switchgear and ancillary equipment—all with the goal of ensuring continuous power, increasing energy efficiency while reducing greenhouse gas emissions.

Since the inaugural issue in 2010, we have showcased over 100 separate customers supported by more than 40 Cat dealerships in North America and internationally in applications ranging from cruise ships to papermills, and just about everything in between. A constant theme that emerges in these application stories is the reliability of Cat generator sets combined with unparalleled dealer support.

Expert guidance from Caterpillar on product selection, installation, operation and maintenance is also part of the *RunReady* editorial mix. Plus, you can find corresponding customer application videos at youtube.com/user/CatPowerGeneration/videos.

As we look ahead to another year covering a broad range of industries and applications, we plan to take a look back at some of the businesses profiled in the past with an eye toward gauging the measure of reliable power and savings they have achieved with Cat power.

We invite readers to contact us and share their success stories with Cat power systems installations.



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DID YOU KNOW?

In 2003, Caterpillar provided the majority of power generation and dealer support during the largest power outage in U.S. history.

More than 300 backup generators and two megawatt trailer units were trucked to cities such as New York, Cleveland and Detroit to get them up and running again. Thanks to Cat power, trading on Wall Street was uninterrupted.

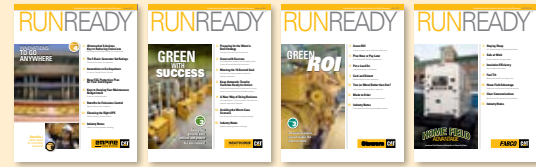


August 14, 2003: 38th and 8th Ave. Manhattan. People walk home after a massive power outage.

2010



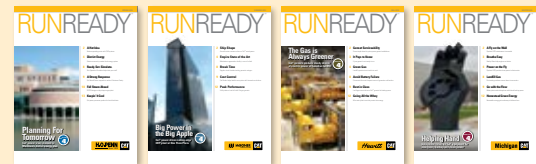
2011



2012



2013



2014



2015



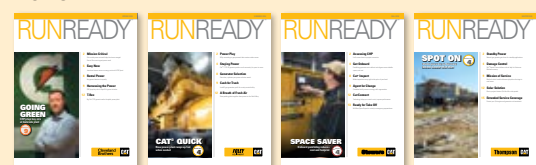
2016

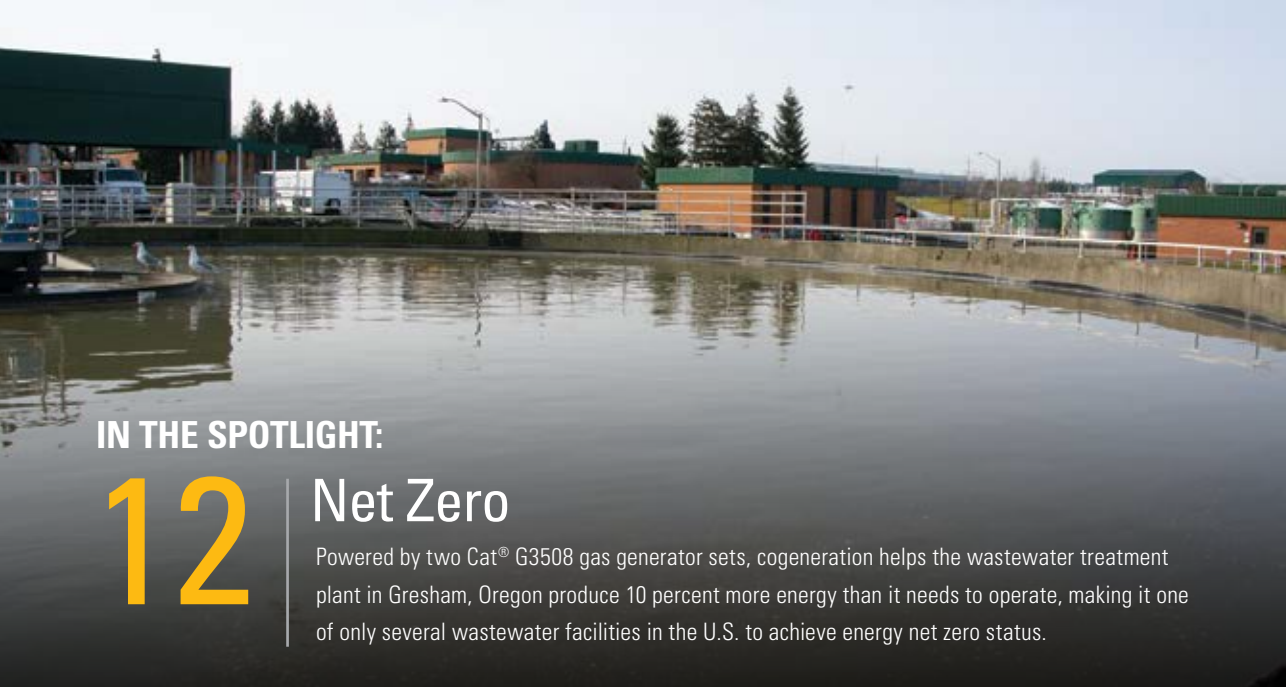


2017



2018





IN THE SPOTLIGHT:

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Net Zero

Powered by two Cat® G3508 gas generator sets, cogeneration helps the wastewater treatment plant in Gresham, Oregon produce 10 percent more energy than it needs to operate, making it one of only several wastewater facilities in the U.S. to achieve energy net zero status.

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ENERGIZING

the future



Robust growth forecast for gas-powered generation

Traditionally, electricity for business and industry has been provided by central power plants and utility power grids.

But the efficiency of delivering power from a fossil fuel plant to the end user is relatively low at about 33 percent.

While global power requirements are growing annually, utilities have not been able to ramp up their generation capacity to match the growing demand, which has created a market for generator sets.

Reciprocating internal combustion engines are playing a fast advancing role in utility-scale power generation and clean energy grid stabilization, according to a new report from the U.S. Energy Information Administration (EIA). The nation's capacity in natural gas-fired reciprocating internal combustion engines used to power the grid has grown to more than 4,600 MW, the EIA reports.

The influx of renewable power to the grid has created the need for supplemental power when wind power wanes or the sun doesn't shine. Because these sources of grid power are subject to sudden load swings, reciprocating engines that start fast and load fast help fill the void, says Claudio Martino, sales manager for Caterpillar Energy Solutions North America unit.

"Thousands of megawatts can vanish, and you need to have technology that can ramp up in seconds and run at a highly efficient rate on partial loads," Martino says. "Internal combustion reciprocating engines are the best technology to meet this need."

Having assured access to reliable heat and power 24/7 is critical for the functioning of a modern economy. Uninterrupted thermal and electric

power supplies are especially critical for hospitals, nursing homes, water supply and wastewater treatment plants, research facilities, and large refineries and chemical plants. An interruption in heat and power at these types of facilities could cause significant economic harm, injuries, and threaten public health.

Yet, increasingly, extreme weather events are bringing the power grid down across the country—sometimes for days or weeks at a time.

Distributed generation on the rise

Over the last decade, more and more businesses have chosen greater power autonomy and reduced costs through distributed power generation, where power is produced on site. Distributed energy generation systems produce clean, low-cost power.

Beyond reduced operating costs, distributed generation applications that utilize biogas by converting a waste product into energy significantly decrease harmful greenhouse gas emissions (GHGs).

At the forefront is the growth of Combined Heat and Power (CHP) systems (also known as cogeneration) that generate electricity and useful thermal energy in a single, integrated system. Heat that is normally wasted in conventional power generation is recovered as useful energy, which avoids the losses that would otherwise be incurred from separate generation of heat and power. While the conventional method of producing usable heat and power separately has a typical combined efficiency of 45 percent, CHP systems can achieve levels as high as 80 percent.

New engine technologies from Caterpillar deliver power, heat, or cogeneration with world class-electrical and thermal efficiency. Cat® generator sets are ideally suited to serve the CHP


market, in that they can supply base load power, are highly efficient, and come factory-equipped with CHP solutions.

According to industry observers, the long-term outlook for CHP growth is robust. The U.S. government aims to install more than 40,000 MW in CHP plants by 2020.

Gas generator sets, which account for about nine percent of the overall market, are expected to witness a large increase in market share in the coming years. Stringent regulations to reduce GHG emissions coupled with growing demand for clean fuel energy will augment the industry growth.

World-class power

Over the last 10 years, installed capacity for Cat® gas generator sets grew worldwide by 14,608 MW, including 2,064 MW in North America.

Ranging from 20 to 9700 kW, with customizable options to match your power needs, Caterpillar gas generator sets are designed to run on your most abundant gas sources with fuel-flexible options. Cat gensets are engineered for high efficiency, low life-cycle costs and have the ability to meet most global emissions specifications. 

TESTAMENT to POWER

Cat® power plant keeps campus prepared for emergencies

Pensacola, Florida, was one of the cities hardest hit when Hurricane Ivan blasted ashore on September 16, 2004.

Twelve miles inland, students and faculty at Pensacola Christian College (PCC) rode out the Category 3 storm, waking up to a widespread power outage that lasted for three days.

While school administrators credited the spirit of the student body for weathering the hurricane—a student video shows students assisting with the storm cleanup, and coeds drawing water from the school swimming pool for bathing purposes—the experience served as a valuable lesson for a faith-based academic institution where nearly all of its 4,700 students live on campus.

“We didn’t have the capacity to provide our own campus power after Hurricane

Ivan, and we were kind of dead in the water for a few days,” recalls Louis Slaughter, who was appointed shortly thereafter as standby power facility manager. “It showed that we need to have the ability to provide power to ensure the safety of our students and the ongoing operation of the campus.”

With a dedicated emergency operations center, PCC strives to maintain a safe and secure campus and avoid major disruptions, adds Amy Glenn, chief communications officer for PCC.

“If we have an extended outage, it’s difficult for us to support the students in the best possible way, and we decided

after the hurricane in 2004 that reliable power was essential in order to provide for their needs,” Glenn says.

Standby power essential

In 2005, PCC elected to install a 10.4 MW standby power plant that was commissioned in early 2006. Eight Cat® G3516 gas generator sets can be dispatched one-by-one or collectively to

Continued on page 6



The Campus Church holds regular services at Pensacola Christian College.



meet the entire power need of the 149-acre campus, which includes the adjacent Pensacola Christian Academy—a K-12 school.

Emergency power needs can range from something as simple as bringing up the gensets after a truck knocked over a utility pole and downed a power line, or as involved as switching over the entire campus to standby power in the event of a hurricane, such as it did last October in advance of Hurricane Michael, which skirted the Pensacola area but created instability on the power grid.

“Hurricane Ivan showed us that for our college campus, having a standby source of power was a necessity and not just a commodity,” Slaughter says. “We have high-rise residence halls where we house our students. It’s important to us that we are able to provide air conditioning, flushing water and other utilities for just regular hygiene and comfort of living.

“Even a mild tropical storm coming through is going to impact us, and we’ve done really well by having standby power for those basic things you need,” he continues. “We need to keep those things in place because after a storm passes through, we want to get back to normal operation as quickly and as smoothly as possible. And having the standby generation plant to provide complete power to the campus has really been a help to us.”

During the hot summer months, PCC has the option to utilize the generator sets to offset peak demand charges from the



Cat Switchgear

grid when utility rates increase.

“We take a look at the utility rate and determine if peak shaving is in our best interest,” Slaughter says. “During the dog days of summer, there are times when bringing the Cat generators on and providing power to the campus is in our best interest, so in those instances we pull the trigger and run from 12 to 6 p.m.”

Natural gas: a clean, reliable fuel source

PCC opted for natural gas generator sets due to the reliability of the fuel source.

“After Hurricane Ivan, a lot of the roads here were blocked and with diesel fuel sources, the fuel transport was interrupted to various areas,” Slaughter says. “With natural gas we’ve been able to maintain a very reliable source of fuel for our generation plant without concerns about fuel delivery.”

Comparatively low emissions from the gas engines is another benefit.

“We’re always concerned about emissions, and the exhaust that comes out of the engines is fairly clean, so we waste a minimal amount of energy from the fuel in, to the electrical product out,” Slaughter says.

PCC chose Cat generator sets based on their reputation for reliability and first-rate dealer support.

“We looked at several different types of power generation facilities and it was deemed that natural gas generators and using Cat gensets for this location would be our best option,” Slaughter says. “The

plant is fairly complex, and our Cat dealer (Thompson Power Systems) has really worked hand-in-hand with us as far as programming the switchgear and tailoring the plant to our usage.

“And as far as the engines and the generators themselves, they just run really well,” he adds. “We count on the reliability and the durability of the engines so that when they are called upon we can trust that they’re going to perform the functions that we need to keep the power on.”

Ease of operation

Earlier this year, PCC modernized its Cat Switchgear by commissioning a new automation system, enabling the standby power plant to run with minimal input from an operator.

“With such a high level of automation, having an operator is optional for an initial response to an outage,” Slaughter says. “The plant really does take care of most of our immediate needs. With the new Cat Switchgear, it can do that without any operator intervention. When I’m 20 minutes away and it’s the middle of the night, I can sleep well knowing that if some type of power disruption occurs, the plant will perform the initial operations and get us to a stable platform of providing power to the campus before I even arrive here.”

Ease of operation is another advantage of the new switchgear configuration.

CUSTOMER PROFILE

Pensacola Christian College

Location: Pensacola, Fla.

Application: Standby power, peak shaving

Cat® Equipment: G3516 gas generator sets (8), Switchgear (12,470V)





Generator enclosures

“The touch screen is very user friendly,” Slaughter says. “It gives you a very quick assessment of the plant condition and operation and tells us what generators are operational, which ones are idle, what the campus load is. It makes it easy for an operator to walk in and at a quick glance have a good overview of what’s happening with the electrical plant.”

Slaughter says the dedicated support it receives from its Cat dealer meets the standard of excellence that PCC strives for in all of its operations and academic programs.

“Caterpillar plays right into that with their long-standing tradition,” he says. “We strive to be energy efficient, and our Cat dealer understands that. They have the necessary ‘boots on the ground’ and have been very responsive—they’ve worked really well with us to meet our needs.” 📱



“The plant is fairly complex, and our Cat dealer has really worked hand-in-hand with us as far as programming the switchgear and tailoring the plant to our usage.”

LOUIS SLAUGHTER

Standby Power Facility Manager
Pensacola Christian College

Pensacola Christian College

Arlin and Beka Horton founded Pensacola Christian Grade School in 1954 that was later renamed Pensacola Christian Academy. Today, the K-12 school has an enrollment of over 2,000 students.

In 1974, on an adjacent campus, the Hortons opened Pensacola Christian College (PCC) to further their vision of education from a Christian perspective. The college had 100 students its first year and was based in a single building. Encompassed within a 149-acre campus, the college today has 4,700 students from all over the world, along with 1,500 faculty and staff.

PCC’s mission and purpose is to train young men and women for a life of service to Jesus Christ. The college offers a mix of liberal arts and ministry majors, as well as a recognized nursing program.

Other affiliate ministries located on the Pensacola Christian College campus include:



Pensacola Theological Seminary: An extension of PCC’s graduate school, founded in 1998.

Campus Church: An independent Baptist church, meets in the Crowne Centre on PCC’s campus and has Sunday morning, evening and Wednesday evening services. These services are recorded for the weekly television broadcast of *Rejoice in the Lord*.

Radio station WPCS 89.5 FM: Known on-air as Rejoice Radio, is the main station of the Rejoice Broadcasting Network. The content heard on Rejoice Radio consists primarily of inspirational music and syndicated Christian radio programming.

Abeka: The world’s largest Christian textbook publisher, provides Christian schools and homeschools with Christian educational resources built on a foundation of academic excellence and Christian character training. Christian schools and homeschools benefit from Abeka’s academically rigorous textbooks and teaching materials that reflect a mix of traditional education, comprehensive curriculum, and a biblical worldview.

CG170B GENERATOR SET

New series offers increased efficiency, reliability and improved \$/kW performance

With increased power output from 1.3 to 2.3 MW, the new Cat® CG170B 50 Hz series of generator sets boasts higher reliability and improved return on investment.

Increased electrical efficiency—up to 45 percent natural gas, and 43.6 percent biogas—makes the generator set more economical for customers as it burns less gas to produce even more energy.

“The B series offers high power density enabled through a compact design, delivering greater return on investment,” said Mark Jenzer, product manager with Cat Energy Solutions.

Advanced engineering improvements with the B series of the CG170 gas generator series include switching from aluminum to steel pistons, enabling higher efficiency. Additionally, the air filters have been redesigned to support the compactness of the generator set.

With upgraded state-of-the-art technology, the B series of CG170 can

provide up to 80,000 hours of operation until major overhaul. This results in higher reliability and lower total owning and operating cost for customers.

The CG170B series offers different engine variants tailor-made for a variety of applications—running on natural gas, biogas, wellhead and propane gas.


“This offers greater flexibility to our customers, allowing them to choose the type of fuel they want to use,” Jenzer said.

If a customer is interested in producing electrical energy but also needs heat for internal efficiency by utilizing Combined Heat and Power (CHP), a high-response version of the CG170B is optimized for total efficiency. The series also offers a biogas version with the engine optimized for total efficiency with a variety of biogases.

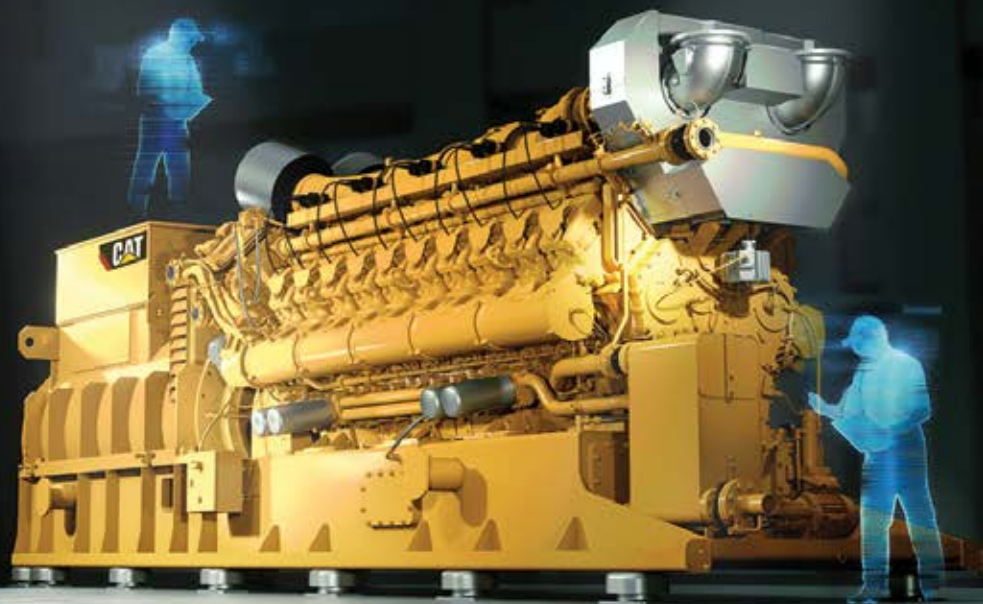
In the future, the CG170B will offer a variant for high altitude and ambient temperatures for regions of the world where climates are rough.

The CG170B series features Caterpillar’s fully digitized Total Plant and Energy Management (TPEM) system. Responsible for controlling all power plant data within an advanced hardware and software solution, this new system eliminates the need for multiple controls. It also features a user-friendly 15-inch touchscreen, which provides a wide range of data concerning the status of the power plant.

The CG170B also comes standard with Cat® Connect capabilities. Cat Connect is a suite of services that collects and analyzes data to help customers reduce owning and operating costs and increase profits.

The 20-cylinder version is available now with 12- and 16-cylinder versions coming out later this year. 

To learn more about the new CG170B series, contact the power systems experts at our dealership.





Hamilton, Ontario

MONEY in the BANK

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

Based 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 have been produced at Glanbrook Landfill

Total net benefit to the city of Hamilton averages about

C\$1.3 MILLION PER YEAR

“We’re very pleased with the reliability of the Cat engines and the output at the site...and of course that translates into revenue for Hamilton Renewable Power, which returns a dividend to the City of Hamilton.”



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



NET ZERO

CHP helps Oregon wastewater plant self-generate to meet its entire energy demand

Taking in an average of 13 million gallons of sewage per day, the wastewater treatment plant in Gresham, Ore. is one of the city's largest users of energy.

Located near the Columbia River northeast of Portland, the Gresham Wastewater Treatment Plant (WWTP) is a basic secondary activated sludge facility with 20 million gallons/day (mgd) of capacity.

Dating back almost 30 years, efforts were made to curb the plant's big appetite for power. Anaerobic digesters were installed in 1990 to make the plant more efficient by deriving biogas from the solid waste matter that settles out during the treatment process. Raw, untreated biogas

derived from the digesters fed a 250 kW generator that helped power about one quarter of the plant.

"We wound up turning it off in 2002 when it burned out," recalls Alan Johnston, senior engineer with the City of Gresham Wastewater Treatment Plant.

In 2005, after receiving grants from the Energy Trust of Oregon and the Oregon Department of Energy, the City installed a Cat® G3508 gas generator set that produces 400 kW in a combined heat and power (CHP) application.

The cogeneration system includes a modern biogas scrubbing system that removes moisture, hydrogen sulfide and siloxanes. The Cat genset produces power and heats the buildings with

jacket water heat. It has been supplying 50 percent of the treatment plant's power needs since 2005, saving about \$250,000 in annual avoided electrical costs.

But even with the addition of the Cat 400 kW cogeneration unit, excess biogas had to be flared, Johnston says. In 2007, Gresham's mayor, Shane Bemis, signed a climate action agreement with the U.S. Conference of Mayors, which ultimately led Johnston to examine ways to make the WWTP even more energy efficient.

The journey to net zero

After further analysis, Gresham decided to shift its focus in 2008-09 to reduce power consumption while increasing biogas production.



The journey to energy independence began in 2009 when the Gresham WWTP received a grant from the Oregon Economic Development Commission to study ways to increase the environmental and operational efficiency of the treatment plant. One outcome was a study on the benefits of accepting fats, oils and grease (FOG) from restaurants to remove them from the waste stream and instead use them to boost electrical generation.

Based on revenues generated by a FOG tipping fee at the facility and avoided electrical utility fees, the conclusion was that it would be cost-effective with an ROI of seven years. Gresham acted on the recommendation,

and currently takes in about 13,000 gallons per day of FOG. The product is slowly injected into the digesters, and according to Johnston, the organic matter has nearly doubled biogas production.

“FOG has a lot of energy stored in it, or about 12 cubic feet of biogas produced for every gallon injected into the digesters,” Johnston says. “The study concluded that adding FOG receiving facilities is economically viable, and it turns out that there is a market for this service in our area.”

The increase in biogas production made possible the installation of a second Cat G3508 gas generator set in

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CUSTOMER PROFILE

Gresham Wastewater Treatment Plant

Location: Gresham, Ore.

Application: Anaerobic digester/
Cogeneration

Cat® Equipment: G3508 gas generator set (2), C9 diesel genset, paralleling Switchgear (480V) Transfer Switch

CITY OF
GRESHAM
OREGON

2015, thereby increasing power output and allowing the facility to produce more electrical power than it consumes.

Energy net zero means producing the same amount of energy that a facility uses to operate.

For Gresham, net zero became a real goal in 2010 when investments were made as part of the capital improvement cycle. A formal energy management team was created, and Gresham established a goal of achieving energy net zero at the WWTP by 2015.

With support from management and staff, five major capital upgrades were phased in over a five-year span.

- **Phase 1 (2010):** Installation of a 420 kW solar array
- **Phase 2 (2011):** Power conservation project that reduced plant-wide power consumption by 17 percent
- **Phase 3 (2012):** Installation of a 10,000-gallon FOG receiving station
- **Phase 4 (2014):** Expansion of the FOG receiving station to 30,000 gallons
- **Phase 5 (2015):** Expansion of the cogeneration system from 400 kW to 800 kW with the addition of a second Cat G3508 generator set.

In February 2015, on schedule and on budget, the first energy net zero month occurred. The WWTP generated more electrical energy on site from renewable biogas cogeneration and solar power than it consumed. Today, the Gresham WWTP generates about 10 percent more electricity than it needs via a combination of energy efficiency, codigestion, cogeneration and a solar array.

“We didn’t do it just because it was fun and exciting, we did it because it made financial sense,” Johnston says. “That’s how the City of Gresham operates, and we showed over a 10-year period that we’d have a seven-year payback on all of these projects, and that’s really what sold it to the mayor.

“We’ve had a ton of support—all the way from my bosses to managers to the city council and mayor through all of these projects—and I’m glad it

was so successful because I pushed it for years saying it would work, and it has.”

Over the 10-year journey to energy net zero, the Energy Trust of Oregon supported the City of Gresham with technical assistance, project development support, and cash incentives that lowered the costs of the energy efficiency measures—as well as the two CHP generator sets and the solar electric system. Business Energy Tax credits and biomass incentive funds from the State of Oregon also were essential to making net zero a reality.

“This was a really smart financial move for Gresham,” observes Betsy Kauffman, program manager for Energy Trust of Oregon. “Gresham had a champion who was willing to go to bat for this. They had a supportive mayor and city council, and they brought in partners who were able to help them move this forward.”



“In over four years we’re at 95 percent (uptime) and that includes all the overhauls, top end work, oil changes, and unrelated construction issues that take those engines down.”

ALLAN JOHNSTON

Senior Engineer

City of Gresham Wastewater Treatment Plant



G3508 Genset

green in terms of green energy, it's green in terms of money.”

Adds Kauffman: “What’s really great about this project is they are using something that is truly a waste product—they’re taking methane and using it as a resource to generate their own electricity. And they don’t have an electrical bill to cover because of the efficiency work that they did.”

High uptime

Achieving net zero status is made possible by the high uptime of the Cat gensets, Johnston says. To ensure continuous operation, Gresham relies on its Cat dealer, Peterson Power Systems, which provides service through a Customer Support Agreement.

“One of the big reasons why we have a successful program here is because of the relationship we have with our local Cat dealer,” he says. “Anytime we have issues with the engines, we call them, and we have a guaranteed 24-hour interval for their technicians to come out here to fix the problem.”

Over four years, Gresham’s cogeneration plant has averaged about 95 percent uptime.

“And we couldn’t have done that without the support of Peterson Power Systems,” Johnston says. “If the Cat engines aren’t running, we’re in trouble. So, we try to average over 90 percent run time, and in over four years we’re at 95 percent and that includes all the overhauls, top end work, oil changes, and unrelated construction issues that take those engines down.

“So really, it’s a pretty impressive thing when you think about it—if the engines run 80 percent of the time, we’re not net zero,” Johnston adds. “It’s always easy in the honeymoon phase of big projects to have engines running good and everybody’s happy, but to have done it now for four years with all the issues you run into with older equipment, it’s pretty impressive.”

Gresham sole-sourced the second Cat generator through the National Joint Partnership Alliance (now known as Sourcewell). Peterson Power sales rep Marty Hopkins helped negotiate the cost,



FOG collection tanks



which also included Cat Switchgear, heat exchangers and PLC controls.

Gresham also has a Cat C9 standby diesel generator in the event of a grid outage. (Because the WWTP operates in parallel with the grid, the gas gensets automatically shut off during an outage and can’t serve as an emergency power source.)

Gresham also utilizes Cat S•O•SSM Services, a routine checkup for oil, coolant and fuel that delivers valuable insights which can be used to prevent unexpected failures and unplanned downtime.

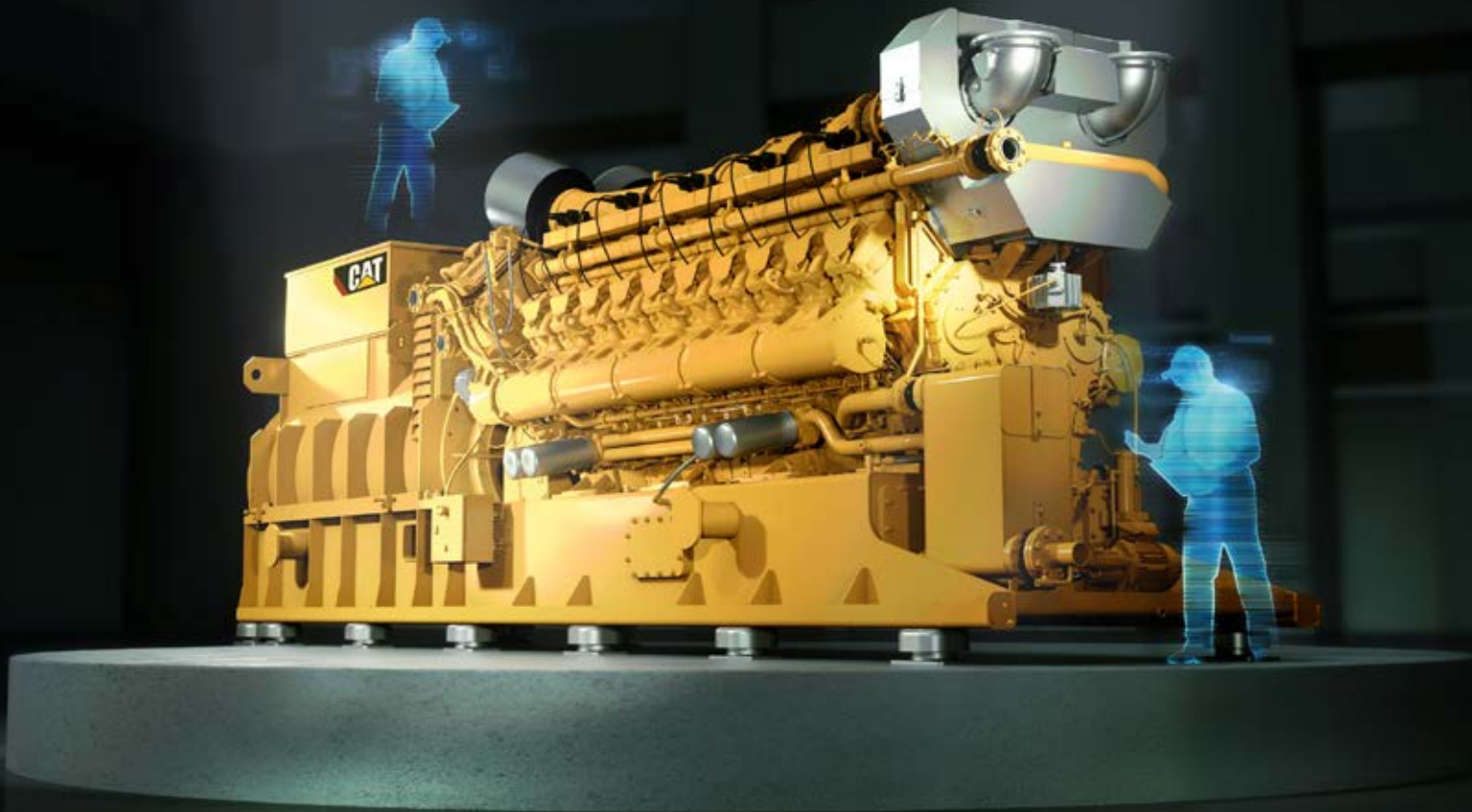
“Just the other day one of the coolant samples showed a potential problem,” Johnston said. “And that’s why Peterson was here to change the coolant.”

Peterson technicians handle all preventive maintenance, including changing oil, spark plugs and coolant, as well as engine overhauls.

“And even for just general troubleshooting if it sounds like something’s not running right, we will call Peterson,” Johnston says. “They are always quick to respond, and it has been a pretty successful arrangement for us.”

Meanwhile, Johnston continues to look for ways to improve efficiency of the cogen plant. The WWTP still flares about 20 percent of the biogas from the digesters, and currently uses just 40 percent of the heat from the gensets. The WWTP is currently under construction to expand its hot water heating system to its equipment maintenance building to utilize even more of the heat produced by the engines, Johnston says.

“We’re always searching for ways to improve, and with the help of our energy partners, we will find the means to utilize that excess energy.”



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