

At a glance

Location

Cavenago di Brianza, Italy

Commissioned

March 2010

Fuel

Methane gas

Technologies

- Five C65 Capstone Microturbines
- Five Heat Recovery Modules
- Two Adicomp Gas Compressors

Results

- Overall efficiency of the CHP system exceeds 80%.
- Produces 325kW of electricity (7,800kW hours) each day.
- Reduces CO₂ emissions by 3,900 metric tons (8.6 million pounds) annually.
- Microturbines easily operate using biogas with methane content of 30% or less. Former reciprocating engine unable to run at this methane content level.
- First landfill in Italy to showcase Capstone microturbines.

CEM Ambiente SpA

After 24 years, the debris-laden landfill in Cavenago di Brianza, Italy – about 30 miles from Milan – closed in 1994 and was transformed into a lush, picturesque natural area that today is home to grazing animals, abundant wildlife, magnificent meadows, and tranquil fields. Far underground, however, sits decomposing garbage that continues to produce methane biogas, a waste product of the aging landfill site.

Instead of flaring the methane gas into the atmosphere like a majority of landfills worldwide, CEM Ambiente SpA, a solid-waste management company that serves 450,000 residents in the region, decided in 1994 to use a portion of the methane gas to fuel a reciprocating engine at its nearby headquarters. The company's goal: use the two megawatts of electricity produced by the engine to help power CEM Ambiente's headquarters.

But in 2010, problems arose when the methane content of the biogas dropped to 30 percent, which is common among aging landfills. The 30 percent methane content was too low for the antiquated reciprocating engine to use as fuel. CEM Ambiente officials began searching for a more reliable, efficient, and environmentally friendly power source.

That year they found the answer with five highly efficient, quiet, and low-emission Capstone C65 microturbines installed in a combined heat and power (CHP) application.



“Emissions generated from the Capstone microturbines are basically zero.”

*— Ilario Vigani, CEO and President,
IBT Group*

Clean-and-green Capstone microturbines are extremely flexible to variations in methane content, and also are designed to tolerate high levels of often damaging hydrogen sulfide and siloxanes from landfill biogas when compared to traditional reciprocating engine technology.

“We chose the microturbines because the production of methane became so low,” said Raffaello Di Martino, Technical Director, CEM Ambiente. “Classic engines can’t run on biogas that contain less than 30 percent methane.”

The methane-fueled microturbines produce 325 kilowatts of electricity (7,800 kilowatt hours) each day that heats the building and a nearby greenhouse, and for landfill leaching treatments. “In the summer, the heat energy is transformed to cooling to provide air conditioning,” Di Martino added.

Overall efficiency of the highly reliable CHP system exceeds 80 percent.

In addition to the five C65 microturbines, the power system features a gas-compression system that compresses the biogas fed to the microturbines along with a heat-recovery system that captures waste heat from each microturbine.

“The microturbines replaced a noisy, pollution-generating reciprocating engine installed in 1970,” said Ilario Vigani, CEO and President, IBT Group, the Capstone distributor that secured the installation. “CEM is an environmentally focused company. The ultra low-emission microturbines reduce carbon dioxide emissions by 3,900-metric-tons (8.6-million-pounds) each year and can operate on the smaller concentrations of methane in the closed landfill.”

Because the old landfill and the CEM Ambiente building are located in a business area, emissions played a large role in the decision to install microturbines. “CEM chose the Capstone microturbines because the area has extremely strict emission regulations,” explained Vigani. “Emissions generated from the Capstone microturbines are basically zero.”

In addition, Vigani noted the microturbines are extremely reliable and low maintenance since they have only one moving part and do not require any oil, other lubricants, coolants, or hazardous materials to operate.

“We are very happy with the Capstone microturbines because of their low cost, low maintenance, and the benefit to this beautiful area,” Di Martino added.

“This first-ever installation of Capstone microturbines at an Italian landfill serves as a model for Italy,” Vigani said. “The site showcases innovative ways landfills can use waste biogas in an environmentally conscientious way to produce electricity and thermal energy.” ■



This conference room at CEM Ambiente SpA headquarters in Cavenago Brianza, Italy, is one of the many places within the revitalized landfill site powered by the five methane-gas fueled Capstone C65 microturbines.