

Cossato Spolina Wastewater Treatment Plant

Until spring 2009, the carbon footprint of a wastewater treatment center outside Cossato, Italy, was measured partly by the flare that burned continuously above the plant that was fed by biogas that had been considered a nuisance by-product of the treatment process.

But the flame went out when managers of the Cossato Spolina plant saw an opportunity to harness the energy stored in the waste biogas. They turned to Capstone Turbine for technology solutions to make their vision real.

Today, a single Capstone CR200 turbine provides all the electrical power needed at the treatment plant, along with heat to make the plant's digesters work at optimum efficiency. The simple, elegant system likely will serve as a model for similar projects at wastewater treatment plants worldwide.

Numbers tell the story of the Capstone installation's success: First, the CR200 will produce 1.7 million kW-hours (kWh) yearly to supply the plant's electrical power needs by using 2,600-cubic-meters of biogas from the plant as fuel – the same biogas that previously was burned away as waste. Second, an external heat exchanger installed with the microturbine delivers another 2.3 million kWh of thermal energy to warm the digesters. Together, the heat and power produced will cut carbon dioxide emissions at the plant by 1.8 tons per year.

Cossato Spolina's managers first tested traditional technology to meet their energy needs. They ordered a piston-driven gas engine that fell short of providing the combined heat and power (CHP) they needed to achieve their ecological and financial goals. After this pitfall, they had faith that microturbine technology would deliver, and it did.

The plant's Chief Technology Officer, civil engineer Fabio Dalla Villa, said Capstone's CHP package fit the bill perfectly.



At a glance

Location

Cossato, Italy

Commissioned

April 2009

Fuel

Biogas derived from the treatment of wastewater.

Technologies

- A Capstone CR200 MicroTurbine® installed with an external heat exchanger. The CHP system can operate efficiently with methane concentrations that range between 50% and 80%.

Results

- The system's start-up operation supports projections that it will supply 1.7 million kWh of electrical power and 2.3 million kWh of thermal energy annually.
- Reduction of greenhouse-gas emissions will amount to 1.8 tons of CO₂ annually.
- The Cossato Spolina project has attracted attention as a model for wastewater treatment facilities worldwide.

Looking Forward

- The efficiency of thermal generation to supply hot water to heat the plant's digesters will result in the production of even more biogas that can be converted to energy generation.



"I discovered that turbine systems have much lower maintenance costs, and that they have much better performance in hot water production," Dalla Villa said. "You must know that we need hot water in the waste treatment process. And, I must admit, I am very interested in new, original systems. Capstone was very convincing."

The Cossato plant serves a cluster of small cities with a combined population of 75,000, nestled in the foothills of the Italian Alps in northwest Italy, a mere 60 kilometers from the Swiss resort town of Zermatt with the Matterhorn as its trademark.

Cossato might soon become a destination in its own right for operators of wastewater treatment plants who seek the same financial and environmental benefits that the Cossato Spolina plant has discovered.

"We have already organized a visit there for other potential customers," said Ilario Vigani, a senior sales executive with Integrated Building Technologies SRL, the Capstone Turbine distributor based in Treviso, Italy. "Cossato Spolina is an important reference installation in Italy and also in the rest of Europe."

Vigani said European biogas applications for Capstone's technology were still in their infancy, with natural gas-burning turbine installations far more common. But, he predicted the efficiencies offered by the CR200 and other Capstone turbines would revolutionize the way wastewater treatment centers approach CHP generation.

The secret is in the way the microturbines efficiently use biogas fuel that can vary widely in the concentration of methane, the purest energy source. Dalla Villa said his experience with the Capstone product shows it can operate effectively with biogas containing methane concentrations within a range of 50–80 percent.

So-called "green certificates" for energy savings and carbon reduction – almost equivalent to currency as a measure of cost savings – would also lead to greater market opportunities in Europe, Vigani said.

"Germany and Spain already have good incentives in place for (CHP) cogeneration," he said.

Vigani's next Capstone customer might well be Cossato Spolina itself. Dalla Villa and other managers are completing an evaluation of the first CR200 installation that he said likely would lead to another.



A single Capstone CR200 microturbine fueled by biogas provides all the electrical power needed at the Cossato Spolina Wastewater plant in Italy.

"I prepared the system for expansion," he said. "I plan to demonstrate with indisputable numbers that a second CR200 will be economically useful. In the meantime, I can already show the economic evidence of our investment so far."

Because the CR200 operated at 100 percent capacity for 330 days annually, plant operators recovered their investment in 18 months.

"With the micro-cogeneration plant, we will save a lot of money with electricity self-production and the green certificates incentives," Dalla Villa said. ■