Cogeneration

> Case History
De Breuck Greenhouses, Belgium

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Cummins Power Generation

Where:
At the tomato greenhouses of Geert De Breuck in Sint-Gillis-Waas, Belgium

What:
A lean-burn gas generator set producing heat and electric power to reduce energy costs and accelerate growth of tomatoes

Purpose:
Generate electricity for on-site use and for sale to the power grid, while simultaneously producing heat and carbon dioxide for plant growth

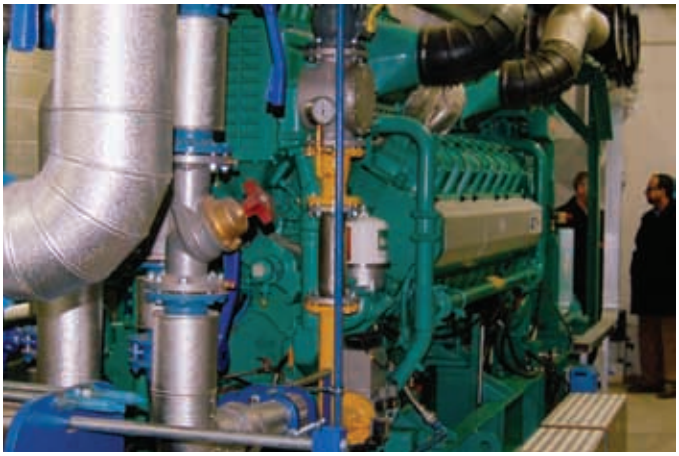
Primary choice factors:
High fuel efficiency, reliability, high specific heat output and expert help from Cummins Power Generation to optimize system operating parameters

Belgian tomato grower slices energy costs with Cummins Power Generation CHP system

SINT-GILLIS-WAAS, BELGIUM — The renovated and expanded tomato-growing business belonging to Geert De Breuck includes a covered area of more than 27,000 square meters (6.6 acres), making it a large business for the region of Sint-Gillis-Waas, Belgium. The facility produces about 1,650 metric tons (3.64 million pounds) of tomatoes annually with the help of an innovative combined heat and power (CHP) system designed and manufactured by Cummins Power Generation. The system uses natural gas to generate electricity, heat and carbon dioxide, which are all used to accelerate the growth of the tomatoes.

The CHP system is the result of a direct partnership between the grower and Cummins Power Generation, which provided the equipment and technical expertise for the CHP system, plus a significant portion of the financial investment. With a power system that operates above 90 percent overall energy efficiency, as well as government regulations that grant CHP certificates and CO_2 emission permits, the project is proving to be very economical.

Buffer tanks near the power building store hot water that is released at night to warm the greenhouses.



A 1.5 MW lean-burn gas generator set from Cummins Power Generation provides heat, power and CO_2 to accelerate the growth of tomatoes.

Power system components

The centerpiece of the CHP system is a Cummins Power Generation 1.5 MW lean-burn gas generator set. The generator is powered by a Cummins natural gas engine known for high thermal efficiency, low exhaust emissions and high reliability. The generator produces electricity that is mainly directed to the grid; less than five percent is used on site.

Waste heat from the water jacket and exhaust are recovered through a heat exchanger and used to provide heat for the covered plant-growing areas year-round. A large buffer water tank stores heat produced during daylight hours. The heat can be released during the night to keep the plants warm. The generator's treated exhaust gases are also a source of carbon dioxide the plants need for photosynthesis.

Optimizing operation is the key

Optimizing the operation of the CHP system was critical to its economic success, but this was often complicated by the needs of the growing plants and the realities of operating a generator set. During daylight hours in summer, for example, tomatoes need ample carbon dioxide but little additional heat.

While a CHP installation supplies only half the amount of heat per cubic meter of gas compared with a gas boiler, it produces an equivalent amount of carbon dioxide — plus electricity that can be used on site or sold to the local utility. By running the CHP system only during daylight hours, Geert De Breuck is able to produce carbon dioxide when the plants need it, and generate electricity when its value is the highest.

To make the system economically feasible, the design team calculated, it had to operate between 4,000 and 5,000 hours annually — a little more than half of all the available hours. This required the generating system to have an extremely high availability factor.

Compared with separate heat and electricity production, the CHP system realizes an energy savings of about 25 percent.

Another key to the success of the system was the exceptionally high overall efficiency of the generator and heat exchangers.

Projected payback period of 3.5 years

While the financial performance of the CHP system depends on a number of factors — the price of tomatoes, the price of natural gas, the value of the electricity sold, the value of the government CHP certificates and maintenance costs — the optimized system was designed to pay for itself in about three and a half years. Given fluctuating gas prices, the selling price of electricity can be negotiated for up to three years. With today's higher gas prices, the sales of electricity alone pay back a major part of the cost of the consumed natural gas.

For more information about cogeneration power systems or other energy solutions, contact your local Cummins Power Generation distributor or visit www.cumminspower.com/energysolutions.

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