

POWER PROFILE

Customer: Stadtwerke Lemgo

Location:

Lemgo, Germany

Customer Business Issue:

The need for decarbonization of power generation and district heating capabilities driven by local regulations and community initiatives

Solution:

Innovative combined heat and power (CHP) technologies customized through local engineering expertise

Cat® Dealer:

Zeppelin Power Systems



Stadtwerke Lemgo, a local municipal utility, is reducing the impact of its operations by using combined heat and power (CHP) system powered by Cat natural-gas generator sets, a solar thermal system, and a heat pump using water from the Bega River.

POWER NEED

Located in the Lippe district of Germany's North Rhine-Westphalia, the town of Lemgo has a rich history dating back nearly 850 years. It is the home of Technische Hochschule Ostwestfalen-Lippe, a research university that specializes in the applied sciences, focusing on mechanical engineering and industrial electronics. Lemgo is also renowned for its half-timbered architecture dating back to the Renaissance, including the Hexenbürgermeisterhaus finished in 1571.

Stadtwerke Lemgo, the local municipal utility, provides electric power and district heating for the town, currently supplying approximately 160 million kilowatt-hours of heat annually.

Stadtwerke Lemgo is committed to reducing its environmental impact by supporting the goals of the 3rd Lemgoer Klimaschutzkonzept, a climate protection initiative aiming to reduce carbon emissions in the town by 90% from 1990 to 2050.

Over its extended relationship with Stadtwerke Lemgo, Zeppelin Power Systems, the local Cat® dealer, has served a major role in helping the utility meet its goals by supplying engineering, installation, and service expertise for nine Cat natural gas-fueled combined heat and power (CHP) systems that currently supply a total electrical output of 18 MW.

Most notably, Zeppelin supplied Stadtwerke Lemgo's CHP units in 2021 as part of an integrated system that was named "CHP of the Year 2022" by Germany's Federal Association of Combined Heat and Power and *Energie & Management* magazine.

SOLUTION

The solution combines a 7.5 MW CHP system powered by three Cat G3520 natural-gas generator sets, a 5.2 MW solar thermal system with vacuum tube collectors, and a heat pump that generates up to 1 MW of thermal output using water from the Bega River. With the addition of these new thermal capabilities of solar thermal and a heat pump, up to 20% of district heating produced by Stadtwerke Lemgo is currently generated carbon-free.

This award-winning system is the latest in a series of innovations supported by the team at Zeppelin. A previous milestone was achieved in 2019, when engineers from Zeppelin updated a CHP system powered by an existing Cat G3516H generator set with a state-of-the-art ammonia heat pump that recovers heat from the second-stage intercooler and exhaust heat condenser. Zeppelin also installed a second heat pump configured to recover heat from treated sewage plant discharge water. Combined, the two new heat pumps deliver over 3.3 MW of hot water for district heating which represents two-thirds of the historic city center heat needs.

Zeppelin designed and managed the modification of the CHP system, which included the delivery of the heat pumps and required control systems, switchgear, and ventilation. Additionally, Zeppelin provides ongoing support through long-term service agreements, which include regular maintenance at scheduled intervals as well as around-the-clock, on-demand technical assistance.

RESULTS

Facilities can reduce operating costs by implementing a Cat CHP system or a combined cooling, heat, and power (CCHP) system. Most Cat natural gas-fueled engines can be configured with a CHP or CCHP system to simultaneously generate power for electrical loads while capturing waste heat that can be repurposed as thermal energy for facility processes or heating, ventilation, and air conditioning (HVAC) requirements.

While the combination of grid power and traditional boilers for thermal energy offers less than 50% energy efficiency, CHP and CCHP systems from Caterpillar can provide total energy efficiencies of up to 90%. This allows customers to save on energy spending, provide autonomy of supply, and reduce emissions.

Cat CHP and CCHP systems can deliver a rapid return on investment for a wide range of industrial and commercial facilities, such as manufacturing plants, refineries, regional district heating plants, resorts, shopping malls, high-rise office buildings, universities, data centers, and hospitals.

