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INNOVATIVE WOOD CHP PLANT

using Jenbacher technology

Background

Bioenergie Frauenfeld, which is co-owned by sugar manufacturer Schweizer Zucker and Energie 360°, has built a new wood cogeneration plant in Frauenfeld in the Canton of Thurgau. The aim: efficiently exploit green energy and—at the same time—reduce CO_2 emissions. The latest generation of INNIO Group's Jenbacher combined heat and power (CHP) technology makes this possible, using residual wood waste as renewable energy. The region's plentiful supply of wood waste can be found in the form of unused timber from forest and landscape management work, blown-down trees, or pest-infected wood.

Solution

To meet its ecological objectives, Bioenergie Frauenfeld opted for an innovative SYNCRAFT wood CHP plant that is powered by four Jenbacher engines. The installation, which has benefited from joint optimization efforts, recovers energy from 25,000 metric tons of locally sourced residual wood every year. With an electrical output of 4 MW, the plant is one of the largest of its kind in the world. The carbon-negative facility provides power to 8,000 households as well as heat to the resident sugar factory and the town of Frauenfeld.

In the first stage of the process, the wood is dried to a water content of under 10% using the low-temperature heat recovered from cooling the product gas. In the following two-step gas extraction phase, the biomass is initially broken down through pyrolysis into its constituent parts to produce solids and gas and then gasified in the downstream reduction zone. The gas, cooled to around 750°C, exits the top of the reactor and is separated from the biochar. It then is cooled to about 100°C, and the extracted heat is fed into a heating network. Once the gas has been cooled again to between 25°C and 30°C, it has reached the required operating temperature for generating electricity in the four high-efficiency Jenbacher J420 engines, which have been optimized specifically for this application, with each engine capable of producing 1 MW of power.

»The wood CHP plant in Frauenfeld is helping us set new standards for the use of bioenergy, which is becoming increasingly important as the energy transition progresses. At the heart of this flagship project are four high-efficiency Jenbacher wood gas engines that are perfectly adapted to meet the demands of SYNCRAFT gasification technology.«

Stefan Ellenbroek, project leader at Bioenergie Frauenfeld

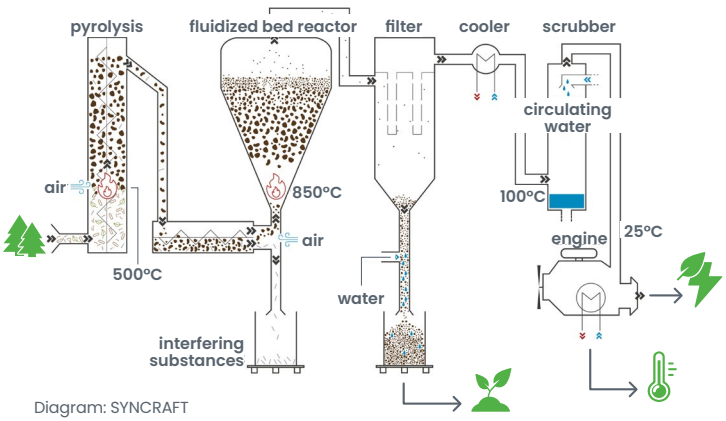

Diagram: SYNCRAFT

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Results

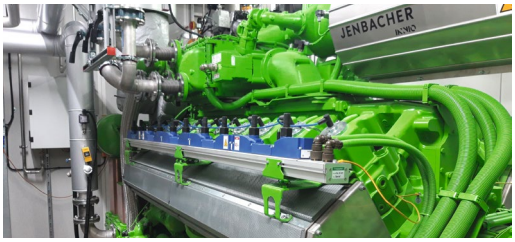
The Frauenfeld wood CHP plant is a flagship project that uses biomass in a highly efficient way and provides a clear demonstration of wood's potential as a regenerative raw material. The electricity generated in the Jenbacher CHP plant is fed into the local grid and is subsidized via the Swiss system of feed-in payments. On the one hand, the heat is used in subprocesses at Schweizer Zucker AG and, on the other hand, it is used to supply homes and businesses in the Frauenfeld West area in the form of district heating. The biochar obtained as a valuable by-product is used primarily to improve the soil as an animal feed additive and in industry. Overall, the carbon-negative plant removes 9,000 metric tons of CO_2 annually from the atmosphere.

The facility was created in collaboration with Swiss distributor IWK Integrierte Wärme Kraft AG and the wood CHP plant specialist SYNCRAFT. INNIO Group has been working closely with SYNCRAFT for many years. SYNCRAFT wood cogeneration plants equipped with Jenbacher engines have been operating successfully in Austria, Germany, Italy, Croatia, Switzerland, and Japan. For more than 30 years, INNIO has been acquiring knowledge and experience working with specialty gases such as wood gas, which contains about 40% hydrogen in energy terms. More than 100 Jenbacher engines have been used in wood gas applications. Wood gas-fired systems achieve an overall utilization of up to 92%, showcasing again how these installations based on a regenerative raw material have great potential in the energy transition.

Customer benefits

Wood cogeneration plants with Jenbacher CHP technology have a number of advantages:

- Optimized overall efficiency thanks to many years of close cooperation with wood CHP plant specialist SYNCRAFT
- Highly efficient recovery of energy from local residual wood waste
- Production of premium biochar as a third product, in addition to heat and power
- Zero-waste technology
- Significant CO_2 savings



Key technical data for the gas engines

Installed engines	4 x J420
Electrical power	1,000 kW (per engine)
Energy source	wood gas
Year of commissioning	2022

Key technical data for the wood CHP plant

SYNCRAFT—Gasification Fuel heat output	~14 MW
Fuel requirement	~2,800 kg/h (dry)
Specific fuel requirement	~0.71 kg/kWhe
Fuel quality	wood chips, G50, W50(4) with fine fraction and bark
Premium biochar	~36 m³/day
Thermal output (for district heating)	~5.6 MW (90°C)
Thermal output (for drying)	~2 MW (50°C)

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About INNIO Group

INNIO Group is a leading energy solution and service provider that empowers industries and communities to make sustainable energy work today. With its product brands Jenbacher and Waukesha and its digital platform myPlant, INNIO offers innovative solutions for the power generation and compression segments that help industries and communities generate and manage energy sustainably while navigating the fast-changing landscape of traditional and green energy sources. INNIO is individual in scope, but global in scale. With its flexible, scalable, and resilient energy solutions and services, INNIO enables its customers to manage the energy transition along the energy value chain wherever they are in their transition journey.

INNIO is headquartered in Jenbach (Austria), with other primary operations in Waukesha (Wisconsin, U.S.) and Welland (Ontario, Canada). A team of more than 4,000 experts provides life-cycle support to INNIO's more than 55,000 delivered engines globally through a service network in more than 100 countries.

In March 2023, INNIO's ESG rating ranked first out of more than 500 companies worldwide in the machinery industry assessed by Sustainalytics.

For more information, visit the INNIO website at **www.innio.com.**

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