



Advancing Energy Transition in Sugar Production in Poland

Successful Start-Up of the Newest Biogas Plant for the Sugar Industry by Krieg & Fischer Ingenieure GmbH

Krieg & Fischer Ingenieure GmbH has successfully completed another biogas plant for the sugar industry. The company started engineering biogas plants for the sugar beet industry 15 years ago. Each year, approximately 500,000 metric tons of organics from the sugar industry are converted into more than 40 Mio m³ of biomethane in biogas plants designed by Krieg & Fischer Ingenieure GmbH.

Over the years, the team has gained a deep understanding of what sugar engineers and biogas plant operators need. Today, Krieg & Fischer is recognised as one of the global leaders in the engineering of biogas plants for the sugar sector. Dedication to delivering tailored, high-performance solutions continues, with three new biogas projects currently underway for sugar producers in Germany and Poland.

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The biogas plant in Poland has successfully commenced operations during the juice campaign and is now producing biogas as planned. This development marks an important step in the sugar company's energy transformation strategy, significantly increasing the share of renewable energy in its production processes. A key milestone for the client was the shift away from coal and coke toward lower-emission natural gas and biogas from sugar beet pulp. As part of this transition, a coal-fired boiler was replaced with a gas-fired boiler, and a new gas-fueled lime kiln was installed. However, the existing "small" biogas plant could supply only a portion of the biogas required for the heat demand of sugar production.

In 2023, Krieg & Fischer Ingenieure GmbH was contracted to expand this vision further with a large-scale biogas plant. This new facility is designed to process 300,000 tonnes per year of fresh and ensilaged sugar beet pulp, juice and other organic by-products from sugar production. Solutions developed by the engineering team at Krieg & Fischer are designed for maximum availability and gas production and flexibility in gas utilisation. However, this particular project was a challenging task from different aspects. Biogas-producing bacteria thrive in stable conditions, and most biogas plants are engineered for a consistent, daily supply of feedstock, making the design process relatively straightforward. In contrast, this plant operates on a seasonal basis, significantly increasing the complexity of its engineering.

During the beet campaign, which lasts approximately 133 days, the biogas plant processes fresh sugar beet pulp, delivered hot at 55° C. Outside the campaign, biogas is produced from ensilaged sugar beet pulp, with a large number of different processes between; such as for the brown sugar campaign period, the thick juice campaign period and the high/down periods—all of which introduce variability to the process. Another important requirement is heat supply for the sugar plant, thus both a flexible and efficient system was needed.

The newly developed biogas plant for a sugar factory in Poland is a comprehensive, large-scale system designed for seasonal flexibility and high operational efficiency. The

facility includes: four digesters (high steel tanks with a volume of 10,400 m³ each), two secondary digesters with gas holder, external gas storage, biogas pre-treatment unit which encompasses biological biogas desulphurisation with compression, biogas cooling and active carbon filter. To minimise heating and cooling requirements, operation is thermophilic. In biogas utilisation, the system is equipped with two cogeneration units, a biogas upgrading system, and two boilers (steam, hot water), as well as biogas burnt lime kiln.

Finally, there is also a digestate treatment plant for both digestate flows, from existing and new plant. This treatment plant produces fertilisers, purifying the liquid and solid digestate fraction for environmentally compliant discharge. Biogas production is planned at more than 8,500 Nm³/h during the sugar beet campaign and about 430 Nm³/h outside the campaign. Gas utilisation is tailored to fit seasonal energy demand, balancing on-site consumption and biomethane injection into the national gas grid.

During the campaign, biogas is mostly utilised for heat production in boilers. Additionally, 800 Nm³/h is directed to the upgrading unit, while flow to CHPs (800kW and 1200kW) is up to 630 Nm³/h. Outside the campaign, biomethane is supplied to the natural gas grid. The new plant is connected with the existing biogas infrastructure, specifically in areas of biogas processing and digestate treatment.

According to Jose Herrera, the project's lead engineer at Krieg & Fischer Ingenieure GmbH, "this plant has it all."

With the expertise and dedication of the Krieg & Fischer team and good cooperation with the client and selected suppliers, the entire project, from initial concept to commissioning, was delivered in just two years. As our team looks ahead to future complex projects, hopefully with a less compressed timeline, the sugar plant in Poland can now rely on a stable supply of renewable energy for its production.



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