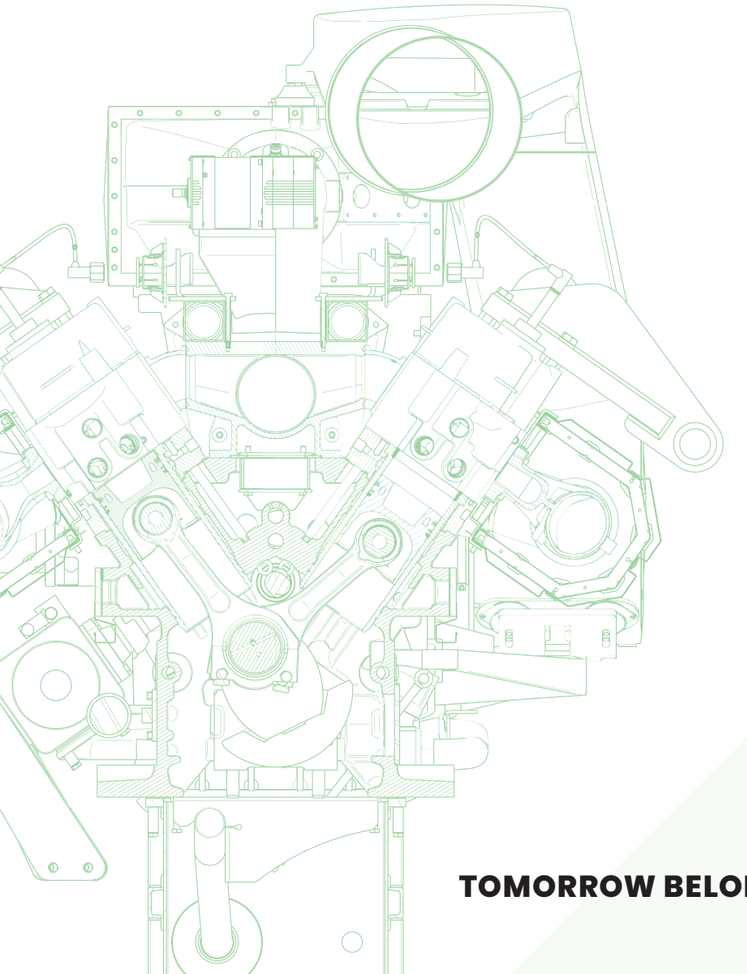
INNIO* is a leading solutions provider of gas engines, power equipment, a digital platform and related services for power generation and gas compression at or near the point of use. With our Jenbacher* and Waukesha* product brands, INNIO pushes beyond the possible and looks boldly toward tomorrow. Our diverse portfolio of reliable, economical and sustainable industrial gas engines generates 200 kW to 10 MW of power for numerous industries globally. We can provide life cycle support to the more than 50,000 delivered gas engines worldwide. And, backed by our service network in more than 100 countries, INNIO connects with you locally for rapid response to your service needs. Headquartered in Jenbach, Austria, the business also has primary operations in Welland, Ontario, Canada, and Waukesha, Wisconsin, US.

For more information, visit: innio.com

*Indicates a trademark



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JENBACHER

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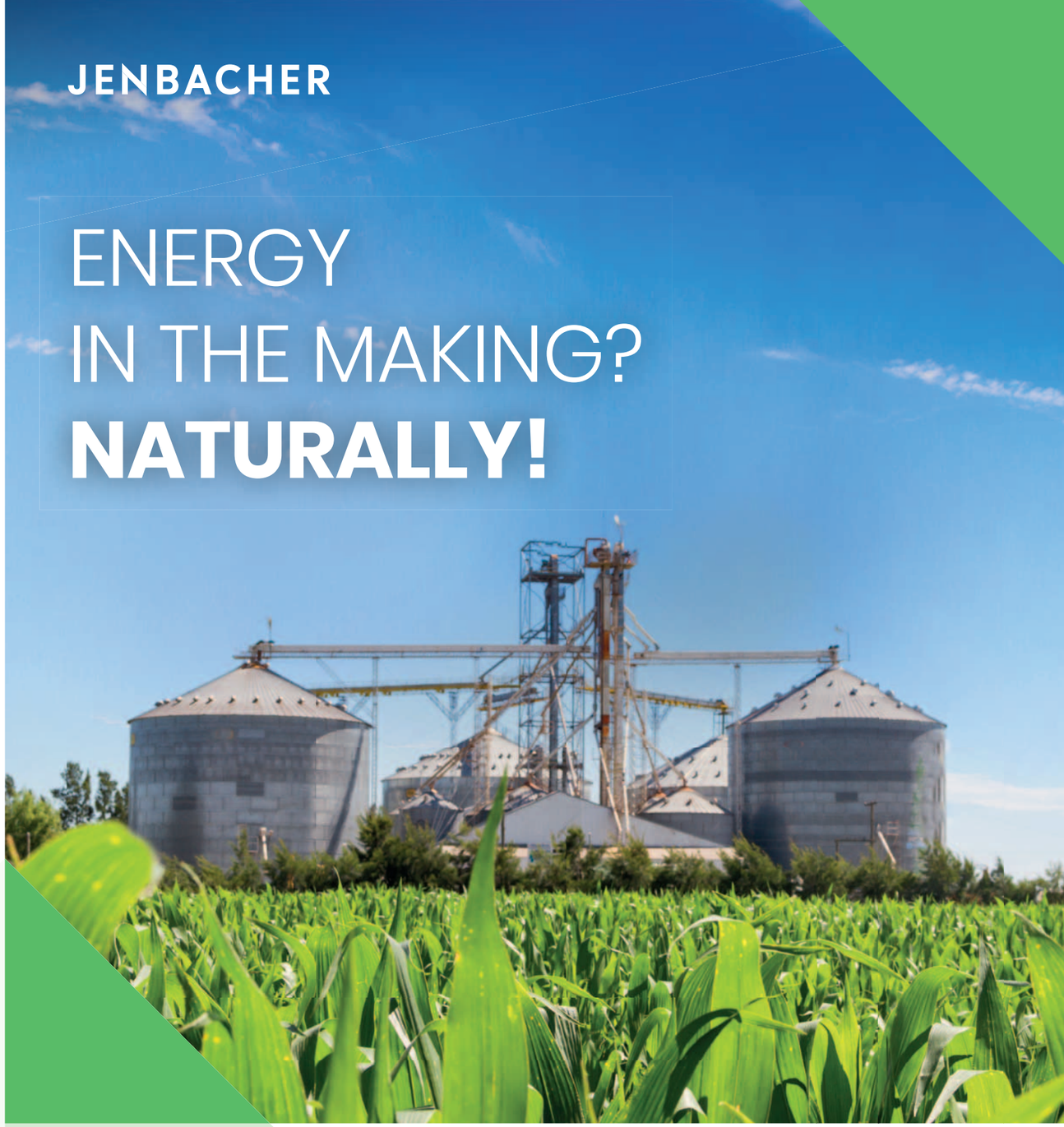
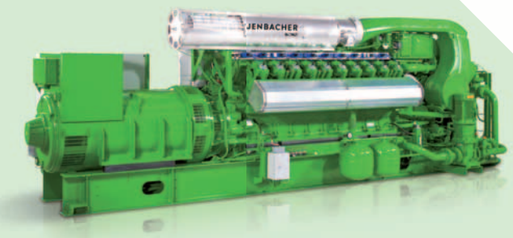


Jenbacher J420



Jenbacher biogas solutions
from INNIO – your gas engine expert

INNIO

BIOGAS AS **ENERGY SOURCE**

Disposal and treatment of biological waste represent a major challenge for the waste industry. For a wide range of organic substances from agriculture, foodstuff or feed industries, anaerobic fermentation is a superior alternative to composting. Biogas – a mixture of methane and carbon dioxide – is created during anaerobic fermentation and serves as a high-energy, renewable fuel that can be used as a substitute for fossil fuels. Biogas-fueled gas engines improve waste management while maximizing the use of an economical energy supply.

CREATION OF BIOGAS

Biogas results from anaerobic fermentation of organic materials. As a metabolic product of the participating methane bacteria, the prerequisites for its production are a lack of oxygen, a pH-value from 6.5 to 7.5 and a constant temperature of 15 to 25°C (psychrophile), 25 to 45°C (mesophile) or 45 to 55°C (thermophile). The fermentation period is approximately ten days for thermophiles, 25 to 30 days for mesophiles and 90 to 120 days for psychrophile bacteria. The fermentation systems of today operate largely within the mesophile temperature range.

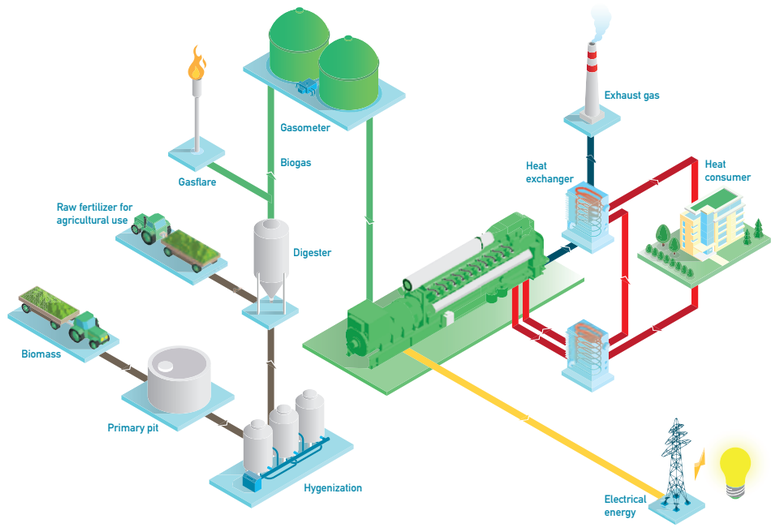
THE JENBACHER CONCEPT

The process of biogas generation is divided into three steps:

- Preparation of the bio-input
- Fermentation
- Post-treatment of the residual material

At the start, the organic material is collected in a primary pit, sterilized to remove harmful germs in case of food waste and moved to the digester. The biogas produced in the digester is collected in a gas storage tank to ensure a continuous supply of gas, independent of fluctuations in the gas production. Finally, the biogas is fed into a gas engine. For safety reasons, the installation of a gas flare is recommended so that excess gas can be burned off in the event of excessive gas production. The end product from the fermentation of the biomass can be utilized as fertilizer. The gas mixture produced in the digester consists of 50 to 70% methane (CH_4) and 30 to 50% carbon dioxide (CO_2). This composition makes biogas well suited for combustion in gas engines.

The generated electrical energy can be utilized for the plant and/or be fed to the power grid. The thermal energy can be used for heating the digester or to offset the heat requirements of the treatment plant.



ADVANTAGES

- Alternative disposal of dung, liquid manure and biowaste while simultaneously harnessing them as an energy source, a substitute for conventional fuels
- High potential for reduction of greenhouse gases
- Highly efficient for combined on-site power and heat generation
- The remaining substrate from the digester can be used as high-quality, agricultural fertilizer, characterized by neutralizing the acid effect with a higher ph-value, keeping nutrients retained and being nearly odorless

SUITABLE ORGANIC MATERIALS

Among others, the following organic materials are suitable for the generation of biogas. The figures in brackets show the biogas yield in m^3 per ton of moist material:

- Liquid manure, solid dung (20–70)
- Biomass from municipal solid waste (MSW) stream (100–120)
- Corn silage, non-food grains (180–300)
- Grease trap content (150–300)
- Used cooking fat (1,000)
- Grass, e.g., from EU set-aside areas (150–200)
- Biowastes from slaughter houses (100), breweries and distilleries (20), fruit and wine press houses (30), palm oil mill effluent, dairies (25), the cellulose industry or sugar production (40–60)

Wood is not suitable for biogas production because the lignin it contains is indigestible to methane bacteria. Pesticides, disinfectants and antibiotics also have a negative effect on the bacteria and on biogas formation.

OUR COMPETENCE

INNIO*'s Jenbacher* cogeneration technology enables customers to realize the maximum economic and ecological benefits available from utilizing biogas for power generation. About 5,100 Jenbacher biogas systems with a total electrical output of about 4,400 MW have been delivered worldwide.

These plants have the potential to generate about 35 million MW-hours of electricity a year – enough to supply more than 9,7 million EU homes[1]. Generating this amount of electrical power with biogas could save about 8 billion cubic meters of natural gas a year. To operate a Jenbacher cogeneration plant with an electrical output of 500 kW, the dung of about 5,000 cows, 40,000 hogs or 1,500,000 laying hens is required. Additionally, compared to fossil fuels – utilizing biogas in the engines avoids any additional greenhouse gas emissions; due to the organic nature of the components of biogas, burning it in a gas engine for power generation emits the same amount of CO_2 into the atmosphere as was originally absorbed during the process of photosynthesis in the natural CO_2 cycle.

[1] Based on average electricity consumption of households in EU, 2014, World Energy Council https://wec-indicators.enerdata.net/