GE Energy

milk and power

using biogas in Jenbacher gas engines

GE imagination at work

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, CO_2-neutral 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.

generation 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°C (psychrophile), 35°C (mesophile) or 55°C (thermophile). The fermentation period is approximately 10 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.

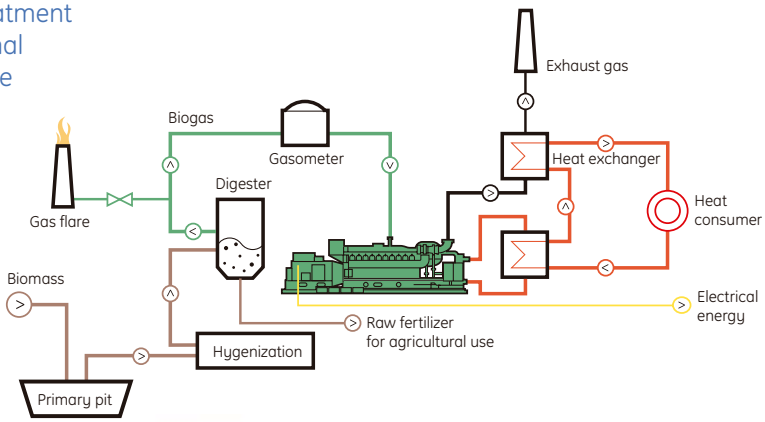
the Jenbacher concept

The process of biogas generation is divided into three steps:

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

At the start, the organic material is collected in a primary pit, sterilized to remove harmful germs 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 60 – 70% methane (CH_4) and 30 – 40% carbon dioxide (CO_2). This composition makes biogas well suited for combustion in gas engines.

The generated electrical energy can be utilized for the treatment plant as well as to supply the public power grid. The thermal energy can be used for heating the digester or to offset the heat requirements of the treatment plant.



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 Nm^3 per ton of moist material:

- Liquid manure, solid dung (20 – 70)
- Separately collected biowaste from households (10 – 200)
- Secondary-growth raw materials, e.g., corn silage, non-food grains (180 – 300)
- Sewage sludge and grease sludge (80 – 150)
- Old grease (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), dairies (25), the cellulose industry or sugar production (40 – 60)

The dung of approximately 2,500 cows, 15,000 hogs or 300,000 laying hens is required to operate a cogeneration plant with an electrical output of 500 kW – corresponding roughly to the demand of 200 households. 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.

advantages

- Alternative disposal of dung, liquid manure and biowaste while simultaneously harnessing them as an energy source
- High potential for reduction of greenhouse effects (biomass is a CO_2-neutral, renewable energy source)
- Biogas is a substitute for conventional fuels
- Highly efficient for on-site power and heat generation
- The remaining substrate from the digester can be used as high-quality, agricultural fertilizer:
    - The corrosive effect (e.g., of liquid manure) is neutralized by the higher pH value
    - The fermentation waste is nearly odorless
    - Plant nutrients are retained, resulting in good fertilizing properties

our competence

Jenbacher cogeneration technology fueled with biogas enables maximum economic and ecological benefits to be realized. Currently more than 290 Jenbacher biogas systems with a total electrical output of over 180 MW are in operation worldwide. Continued development of anaerobic fermentation applications are leading to greater opportunities for the utilization of biogas for energy production.

GE Energy

BASCHNEGGER AMMANN PARTNER

GE Energy's gas engine business is one of the world's leading manufacturers of gas-fueled reciprocating engines, packaged generator sets and cogeneration units for power generation. It is one of the only companies in the world focusing exclusively on gas engine technology.

Jenbacher engines range in power from 0.25 to 3 MW and run on either natural gas or a variety of other gases (e.g., biogas, landfill gas, coal mine gas, sewage gas, combustible industrial waste gases).

A broad range of commercial, industrial, and municipal customers use Jenbacher products for on-site generation of power, heat, and cooling. Patented combustion systems, engine controls, and monitoring enable its power generation plants to meet the strictest international emission standards, while offering high levels of efficiency, durability, and reliability.

GE Energy's Jenbacher product team has its headquarters, production facilities, and 1,000 of its more than 1,250 worldwide employees in Jenbach, Austria.

GEA-13719A

for more information on Jenbacher products

Austria (Headquarters)
Achenseestraße 1-3
A-6200 Jenbach
T +43 5244 600-0
F +43 5244 600-527
E info@gejenbacher.com
www.gejenbacher.com

Denmark
Industrivej 19
DK-8881 Thorsø
T +45 86966788
F +45 86967072

Germany
Amselstraße 28
D-68307 Mannheim
T +49 621 77094-0
F +49 621 77094-70

Hong Kong
15 Floor, The Lee Gardens
33 Hysan Avenue Causeway Bay
T +852 2100 6976
F +852 2100 6630

Italy
Via Crocioni, 46/H, Casella Postale n. 41 Aperta
I-37012 Bussolengo (VR)
T +39 045 6760211
F +39 045 6766322

Spain and Portugal
Avda. del Camino de lo Cortao, 34 – Nave 8
E-28700 San Sebastián de los Reyes (Madrid)
T +34 916586800
F +34 916522616

The Netherlands
Stationspark 750
NL-3364 DA Sliedrecht
T +31 184 495222
F +31 184 415440

United Arab Emirates
Dubai Airport Free Zone, W 1, Suite 220
PO Box 54338, Dubai
T +971 4 2996678
F +971 4 2996679

USA
15855 Jacinto Port Blvd
Houston, TX 77015
T +1 281 8642765
F +1 281 8642506

GE imagination at work