GE Energy
Gas Engines

GE Energy's Gas Engines division is a manufacturer of gas-fueled engines, generator sets, Combined Heat and Power (CHP) modules, Organic Rankine Cycle (ORC) systems and auxiliaries. With a legacy of technological innovation across three product lines, including Jenbacher engines, Waukesha engines and Heat Recovery Solutions, GE's gas engines set the industry standard for flexible fuel capability, low emissions and efficiency. Engines can operate not only on natural gas, but on a broad range of alternative gases such as biogas, landfill gas, coal mine gas, flare gas and sewage gas featuring impressive fuel flexibility.

Solutions include combined heat and power, gas compression, and waste heat to electricity generation in industries ranging from Oil & Gas and agriculture and are deployed in over 80 countries.

With this ability to provide diverse power output, ranging from 0.12 – 9,5 MW, and eight products and solutions approved through the GE ecomagination program, GE's Gas Engines business offer specialized local power solutions to deliver cleaner, more efficient, affordable energy around the world.

GE's Gas Engines business has its headquarters, main production facilities, and more than 1,400 of its 2,600 worldwide employees located in Jenbach, Austria. GE's Jenbacher gas engines also operate two regional gas engine assembly facilities in Hangzhou, China, and in Veresegyház, Hungary. The Waukesha gas engines facilities are located in Waukesha, Wisconsin and the Heat Recovery Solutions facility in Stuart, Florida.

for more information on Jenbacher gas engines

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

Brazil
Av das Nacoes Unidas, 12901
04578-910 São Paulo-SP
Tel.: +55-19 2116-8339
jenbacher.brazil@ge.com

China
288 Hongxing Rd., South Bridge
Xiaoshan Economic & Tech. Development Zone
Hangzhou, 311231, P.R. China
T +86 571 8369 9888
F +86 571 8286 9107
jenbacher.china@ge.com

18/F., Kerry Center
1 Guanghua Road, Chaoyang District
Beijing 100020
T +8610 5822 3821
F +8610 8529 6283

Denmark
Samsøvej 10
8382 Hinnerup
T +45 86966788
F +45 86967072
jenbacher.scandinavia@ge.com

Germany
Carl-Benz-Str. 25
67227 Frankenthal
T +49 6233 5110-0
F +49 6233 5110-170
jenbacher.germany@ge.com

Hungary
Kisret út 1
2112 Veresegyház
T +36 2858 7376
F +36 2858 7491
jenbacher.hungary@ge.com

India
A-1, 2nd Floor, Golden Enclave,
Corporate Towers, Airport Road
560017 Bangalore
T +91 80 4150 1406
F +91 99452 01125
jenbacher.india@ge.com

Italy
Via Crocioni, 46/H
37012 Bussolengo (VR)
T +39 045 6760211
F +39 045 6766322
jenbacher.italy@ge.com

North America
5244 North Sam Houston Pkwy E.
Houston, TX 77032
T +1 832 2955600
F +1 281 4429994
jenbacher.us@ge.com

Russia
27, Electrozavodskaya Street, bld. 8, floor 5
107023 Moscow
T +7 495 937 1111, +7 495 981 1313
F +7 495 937 1112
jenbacher.russia@ge.com

Singapore
240 Tanjong Pagar Road, GE Tower
88540 Singapore
T +65 6326 3659
F +65 6326 3623
jenbacher.singapore@ge.com

Spain and Portugal
Avda. del Camino de lo Cortao, 34 – Nave 8
28703 San Sebastián de los Reyes (Madrid)
T +34 916586800
F +34 916522616
jenbacher.iberica@ge.com

South Africa
Unit 5 Corporate Park, 130 Gazelle Avenue
1685 Midrand
T +27 11 237 0125
F +27 86 532 5987
jenbacher.southafrica@ge.com

The Netherlands
Kelvinring 58
2952 BG Alblasserdam
T +31 (0)88 0019700
F +31 (0)88 0019701
jenbacher.netherlands@ge.com

GE imagination at work

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GE Energy
Gas Engines

Your organic waste is our power.

Power generation from biogas with Jenbacher gas engines.

a product of
ecomagination

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, 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 60 to 80°F (psychrophile), 80 to 115°F (mesophile) or 115 to 130°F (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.

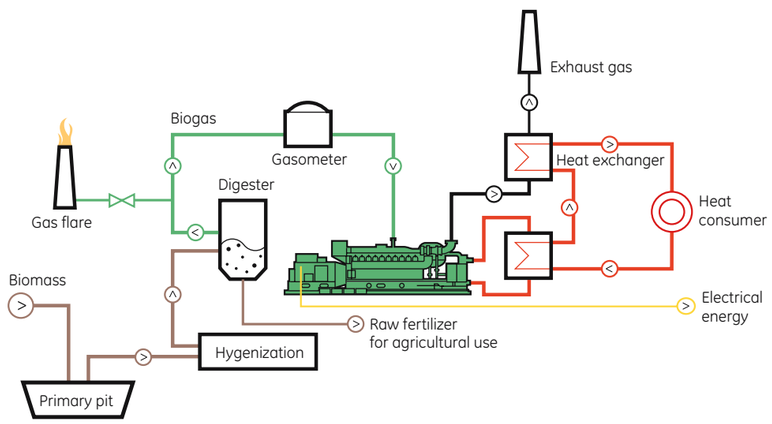
the Jenbacher concept

The process of biogas generation is divided into three steps:

- Preparation of the bio-input
- Fermentation, and
- 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 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.



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 scft per ton of moist material:

- Liquid manure, solid dung (700 – 2,500)
- Biomass from municipal solid waste (MSW) stream (3,500 – 4,200)
- Corn silage, non-food grains (6,400 – 10,500)
- Grease trap content (5,300 – 10,000)
- Used cooking fat (35,000)
- Grass, e.g., from EU set-aside areas (5,300 – 7,000)
- Biowastes from slaughter houses (3,500), breweries and distilleries (700), fruit and wine press houses (1,100), palm oil mill effluent, dairies (900), the cellulose industry or sugar production (1,400 – 2,100)

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

Jenbacher cogeneration technology enables customers to realize the maximum economic and ecological benefits available from utilizing biogas for power generation. More than 2,500 Jenbacher biogas systems with a total electrical output of over 1,900 MW have been delivered worldwide.

These plants generate about 15 million MW-hours of electricity a year – enough to supply more than 1.4 million US homes. Generating this amount of electrical power with biogas could ave about 141 billion scft of natural gas a year. To operate a Jenbacher cogeneration plant with an electrical output of 500 kW, the dung of about 3,500 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.

Jenbacher biogas engines have been approved as „ecomagination" products by an independent agency as they provide our customers with a cost-effective, high output means of generating power while substantially and measurably reducing emissions from their operations. Ecomagination is a GE commitment (www.ge.com/ecomagination) to use and develop new technologies to help customers around the world meet escalating environmental challenges.