

GE
Energy

Energy. It's in our nature.

Cogeneration for your greenhouse
with the option of CO₂ fertilization.



GE imagination at work

greenhouse solutions with gas engines make plants grow faster

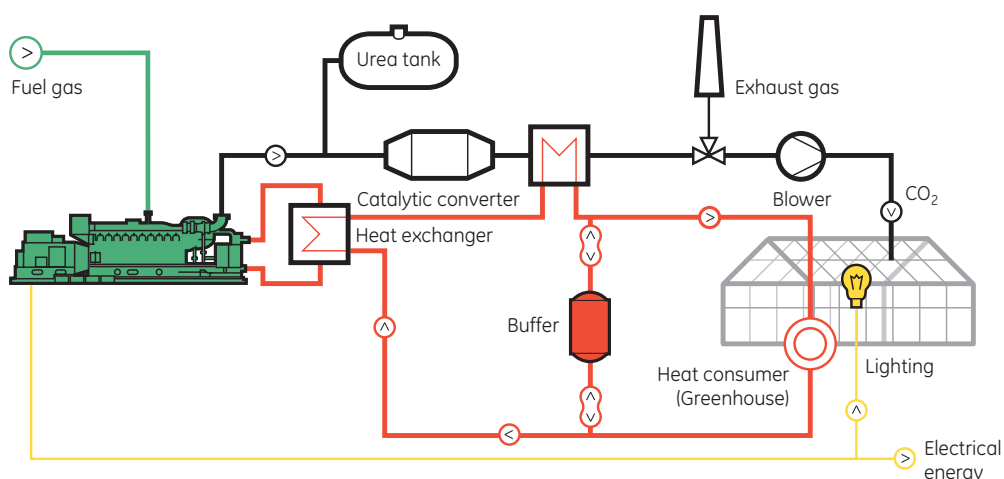
Heat, light and carbon dioxide (CO₂) promote plant growth. Plants grow by converting CO₂ to carbon through photosynthesis. Air generally contains approximately 350 ppm CO₂. Optimal CO₂ levels depend on the type of plant and generally lie above 700 ppm. With increased artificial lighting, as present in greenhouses, plants absorb even more CO₂. If the greenhouse atmosphere is enriched with CO₂, the temperature kept on a constant level and sufficient lighting provided, plant growth and consequently the harvest yield can be increased significantly.

the Jenbacher concept

The energy created by gas engine cogeneration systems in greenhouses can be used in various ways. The electricity can provide the power for the artificial lighting and/or be fed into the public grid. The heat efficiently meets the greenhouse's requirements. In addition, the climate-relevant CO₂ of the engine exhaust gas serves as a fertilizer for the plants.

When burning natural gas in gas engines, approximately 0.2 kg of CO₂ is produced per kWh of energy input. This CO₂ is present in the exhaust of gas engines in a concentration of approximately 5 to 6% by volume.

After the purification of the exhaust gas with special catalytic converters (SCR and oxidation catalytic converters), the exhaust gas is cooled down by a heat exchanger to approximately 55°C and supplied to the greenhouse for CO₂ enrichment. A measurement device that constantly measures the exhaust gas levels ensures maximum safety for the vegetation.



advantages of Jenbacher CHP systems in greenhouses

- Excellent overall efficiency levels of up to 95%, therefore high contribution to resource conservation
- Time-independent supply of CO₂ and heat through heat storage
- Additional flexibility through the option of supplying electricity into the public grid
- Minimum emissions through the patented LEANOX® lean mixture combustion
- Improved reliability through the additionally integratable light controls using DIA.NE® XT
- Maximum operational safety and availability through the control of the whole system via the patented engine management system, DIA.NE® XT
- Small footprint due to compact design
- Excellent CO₂ quality

key figures

- Efficient operation is possible with approximately 1 hectare (ha = 2.47 acres) or larger greenhouse areas
- CO₂ fertilization is suitable for nearly all plant types
- CO₂ fertilization with simultaneous heat supply: dimensioning for 0.5 MWel/ha
- CO₂ fertilization with simultaneous heat supply and illumination: dimensioning for 0.35 MWel/ha
- Illumination suitable for vegetables (e.g., tomatoes or peppers) and for flowers (e.g., chrysanthemums or roses)
- The decisive factors for economical plant operation are the high electrical efficiency, combined with the usage of heat and CO₂ fertilization

our competence

We have been working with the Dutch horticulturalists who pioneered CO₂ fertilization in greenhouses. Because of the experience gathered there, we have based our worldwide Center of Excellence for the application in greenhouses in our Dutch office. This new application for cogeneration plants continues to gain worldwide acceptance. Currently more than 280 Jenbacher cogeneration units with CO₂ fertilization have been supplied. Their total electrical output is more than 530 MW.



