GE Energy

About Jenbacher gas engines

- Independent power supply
- Reduced energy costs, and greater predictability and stability
- Efficient and economic combined heat and electrical supply
- High electrical efficiency compared to other power generation technologies (e.g., steam or gas turbines)
- Best suited for on-site electrical output range of 200,000 kW to 30 MW
- Considerably low gas pressure required
- Alternative disposal of syngas and gas while simultaneously harnessing it as an energy source
- Substitute to conventional fuels
- Considerably low gas pressure required
- Independent power supply
- Considerable reduction in CO₂ emissions

Advantages

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Key figures

- Per ton of produced coke approximately 200 m³ coke gas are produced; 60% of this volume is typically needed for internal processes, the remaining part can be used for power generation. About 40 Jenbacher gas engines now run on either coke gas, LD converter gas or blast furnace gas. Underscoring GE’s technological expertise, these units recently reached a combined total of more than 5.5 million operating hours. In addition, all these “waste gases” are used to generate electricity with zero environmental impact.

Steelmaking

In steel production processes, the coke used for the blast furnaces is released and can be burned in Jenbacher gas engines. About 50 m³ of LD converter gas are released, which can be burned in Jenbacher gas engines leading to about 50 kWh electrical power. About 60% of this volume is typically needed for internal processes, the remaining part can be used for power generation. GE Energy has achieved CO₂ emission savings of about 2 million tons since commissioning.

Advantages

- High electrical efficiency compared to other power generation technologies (e.g., steam or gas turbines)
- Reduced energy costs, and greater predictability and stability
- Independent power supply
- Considerable reduction in CO₂ emissions

Substantial research has been completed on this application. GE installed its first commercial Jenbacher gas engine applications for coke gas in 1995, for LD converter gas in 2004 and for blast furnace gas in 2008.

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A focal range of commercial, industrial and municipal customers use Jenbacher products for on-site generation of power, heat, and cooling. Additionally, all range from a diverse portfolio of combustion systems, engine controls, and monitoring and analycs and engine power generation plants to need stringent emission standards while offering high levels of efficiency, durability, and reliability. GE Jenbacher product teams have its headquarters, key production facilities, and research and development centers in Newton, Illinois, and its world-class assembly facilities in Hangzhou, China, and run on either a variety of gases. For more information on Jenbacher gas engines visit www.gejenbacher.com.
Gases from steel production processes can provide an energy source.

High levels of power requirement and rising energy costs represent a major challenge for the steel industry. Gases created as "free" by-products during steel production processes serve as an attractive energy source option for efficient power generation. In addition to the economic benefit, using these gases as engine fuel reduces industrial CO₂ emissions and saves natural energy sources.

Different gases from steel production processes

Steel production processes typically dispose large volumes of specialty gases. Three different process stages—from coal to steel—provide three different gas types: coke gas, blast furnace gas, and converter gas. These gases, with different compositions and lower heating values (LHV), are shown in the following figure.

- **Coke gas**: A by-product of industrial coke production from pit coal, coke gas is created by high-temperature dry distillation of coking coals in the absence of oxygen. The gas mainly consists of hydrogen (50 to 60%), methane (15 to 30%) and a small percentage (10 to 20%) of carbon monoxide, carbon dioxide, and nitrogen. With a calorific value of 5 kWh/m³N, coke gas constitutes a high-value fuel for effective power generation with Jenbacher gas engines.

- **Blast furnace gas**: Created from pig iron during the steel production process. Steel-making technology can be categorized into two different processes: blow moulding or open hearth. Within the blow moulding process, the pig iron is refined with oxygen or air, lowering the carbon proportion and providing enough process heat to maintain the steel liquid. With 60% of the worldwide raw steel production, the Linz-Donawitz (LD) process, classified as a blow-moulding process, is the most common production method to generate raw steel.

- **Converter gas**: Converter gas is created from pig iron during the steel production process. Steel-making technology can be categorized into two different processes: blow moulding or open hearth. Within the blow moulding process, the pig iron is refined with oxygen or air, lowering the carbon proportion and providing enough process heat to maintain the steel liquid. With 60% of the worldwide raw steel production, the Linz-Donawitz (LD) process, classified as a blow-moulding process, is the most common production method to generate raw steel.

The Jenbacher concept

Varying compositions, as well as calorific values and the combustion behavior of gases from steel production processes, put greater demands on engine design. GE offers specialized Jenbacher gas engines that make efficient use of these gases for combined generation of heat and electricity.

- **Coke gas**: With its high carbon monoxide content, has low combustion speed and is very harmful. GE has developed the specific Jenbacher engine combustion system that allows burning the gas efficiently and reliably. Additionally, GE offers a safety technology package that allows firm handling of harmful gases such as carbon monoxide.

- **Converter gas**: With high carbon monoxide content, has low combustion speed and is very harmful. GE has developed the specific Jenbacher engine combustion system that allows burning the gas efficiently and reliably. Additionally, GE offers a safety technology package that allows firm handling of harmful gases such as carbon monoxide.

Both gases can be used to create hot water, steam, and electricity. The hot water and exhaust gases from the gas engines are fed into boilers. The resulting steam can be used within the steel production processes. Electricity generated by the Jenbacher engines can either be used on-site or sold to the public grid. Converter gas electrical efficiencies of up to 37% can be achieved, and coke gas efficiencies are even higher.