

GE
Energy



Making coal mining cleaner.

Generate power and heat from coal mine gas
with Jenbacher gas engines.

ecomaginationSM
a GE commitment



GE imagination at work

coal mine gas as energy source

Coal mine gas develops during the geochemical conversion of organic substances to coal (carbonization). It is present in fissures, faults and pores of coal seams and as adsorbed gas on the inner surface of coal and neighboring rock. Worldwide, many underground mines with a certain rank, permeability and location of coal strata can be considered gassy.

mine degasification

Coal mine gas is a problematic phenomenon associated with pit coal mining since the gas and air can form explosive mixtures. If the ventilation system is not able to prevent such risk, mines need to be degasified further to keep up worker safety. This can be achieved through the installation of various types of gas suction systems prior, during and also after cooling. In addition to increasing safety standards, capturing coal mine gas provides a modern energy source and also helps to mitigate greenhouse emissions, especially in countries with large coal production. If not captured, the methane-laden mine air is vented to the atmosphere by exhaust fans.

different types of coal mine gas

Dependent on the capturing time and method, three different types of coal mine gas can be identified:

- Coal Bed Methane (CBM)

So-called Coal Bed Methane or Coal Seam Gas (CSG) from un-mined coal beds consists of more than 90% methane and can be harvested independently of coal mining in some locations. The gas composition is very stable, meaning that the gas can be fed either directly into the natural gas network or a gas engine.

- Coal Mine Methane (CMM)

Coal Mine Methane, a methane/air mixture released during active coal mining, must be vented and captured for safety reasons. CMM typically has an oxygen content from 5% to 15%. The methane content ranges from 25% to 60%. However, the methane/air proportion can change suddenly, thus complicating its use in gas engines.

- Abandoned Mine Methane (AMM)

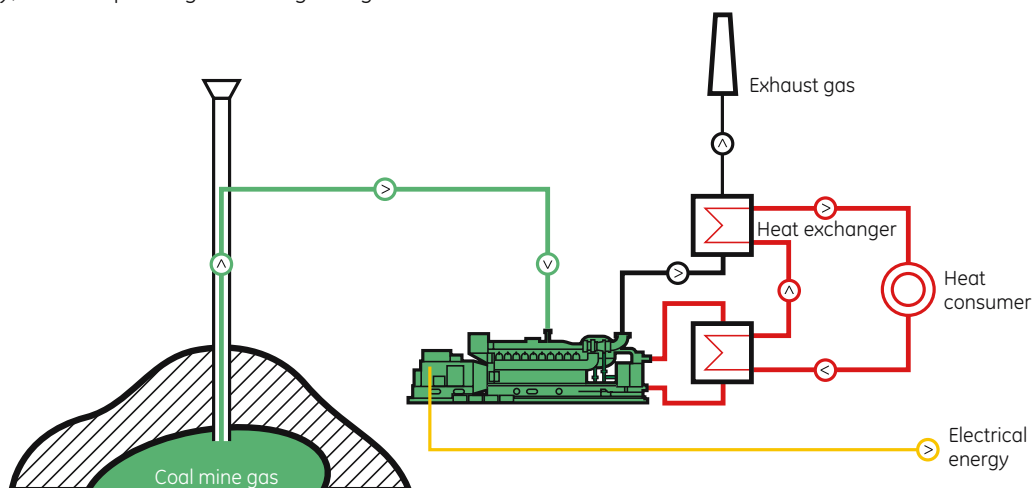
Even after coal mines are shut down, coal mine gas continues to be released. Coal mine gas from abandoned mines typically contains no oxygen, but a considerable amount of carbon dioxide (3-20%), and its composition changes slowly compared to CMM. The methane content ranges from 40% to 80%.

the Jenbacher concept

Most of the larger underground hard coal mines provide a potential for Coal Mine Methane and Abandoned Mine Methane and can be effectively used for power and heat generation with gas engines.

The sudden changes in the composition of coal mine gas from active mining (CMM) put greater demands on the engine design. GE has developed a special gas mixing and engine control system that allows the efficient use of this gas down to a methane content of only 25%. Additionally, Jenbacher gas engines are designed to operate on full load despite low gas pressure, high humidity, dust load and altitude.

The electrical energy generated can be used in the coal mine to meet electricity requirements or fed into the public power grid. The thermal energy can be used for heating purposes on site or fed into a district heating system.



advantages

- Smooth operation despite fluctuations in gas pressure and methane content
- Overall efficiency of up to 90%, in the case of combined heat and power, and 43.4% in the case of power generation alone
- Compact units with lowest footprint requirement and dynamic weight per kW
- Basic design and support for gas conditioning if required
- Integrated methane measuring unit complying to UNFCCC specifications
- Enlarged engine control panel and extensive remote services
- Contractual Service Agreements including specific preventive maintenance
- Alternative disposal of a problem gas while simultaneously harnessing it as an energy source
- Increased worker safety due to installation or refurbishing of gas suction system
- Additional revenues from feed-in tariffs or through carbon credit projects

Investments in the gas suction system or gas supply to reach a certain coal mine gas quality and stable gas flow do pay off. In combination with a highly efficient and specialized cogeneration unit, this setup will optimize the profitability of coal mine gas power generation projects. For coal mine gas projects that include a carbon credit trading scheme, not only does GE ensure the highest availability of its Jenbacher gas engines, but it also provides support for gas supply and conditioning, mitigation monitoring, carbon monetization, financing and more.

our competence

The first Jenbacher systems using coal mine gas were installed in Germany and Great Britain in the early 1990s. Today, nearly 170 units, with a total electrical output of more than 360 MW, run on coal mine gas worldwide. Also in remote areas with critical frame conditions, the Jenbacher engines achieve maximum availability of 8,000+ operating hours per year.

These plants generate about 2.8 million MW-hours of electricity a year – enough to supply about 800,000 EU homes. Generating this amount of electrical power with coal mine gas could save approximately 700 million cubic meters of natural gas a year. In addition, using coal mine gas in Jenbacher engines can reduce the release of methane into the atmosphere by about 85% compared to venting the gas, which corresponds to CO₂ savings of 30,000 to 40,000 tons per year and MWeI.

Due to their cost-effectiveness, high output and measurable benefits to the environment, Jenbacher coal mine gas engines have been certified as GE “ecomagination” product by an independent agency. 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



GE's Jenbacher gas engine division 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.

GE's Jenbacher gas engines range in power from 0.25 to 4 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 stringent emission standards, while offering high levels of efficiency, durability, and reliability.

GE's Jenbacher product team has its headquarters, production facilities, and 1,300 of its more than 1,700 worldwide employees in Jenbach, Austria.



GEA-13718A

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

Bulgaria

36, Dragan Tsankov Blvd.
1040 Sofia
T +359 2 971 4390
F +359 2 971 4384
jenbacher.bulgaria@ge.com

China

8 Floor, The Lee Gardens
33 Hysan Avenue Causeway Bay
Hong Kong
T +852 2100 6976
F +852 2100 6630
jenbacher.asiapacific@ge.com

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

Denmark

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

Egypt

54 Lebanon Street
El Mohandessin, Floor 13
Cairo
T + 20 2 33018000
jenbacher.egypt@ge.com

Germany

Amselstraße 28
68307 Mannheim
T +49 621 77094-0
F +49 621 77094-70
jenbacher.germany@ge.com

Hungary

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

Taganskaya Street, 17-23
Business Center Mosenka 4
109147 Moscow
T +7 495 7755885 1015
F +7 495 77558 84
jenbacher.russia@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

The Netherlands

Kelvinring 58
2952 BG Alblasterdam
T +31 88 0019700
F +31 88 0019701
jenbacher.netherlands@ge.com



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