

# Clarke Energy

Engineer - Install - Maintain



Distributor & Service Provider  
Gas Engines

# Syngas

Synthetic Gas  
Synthesis Gas  
Wood Gas  
Pyrolysis Gas  
Producer Gas

# Syngas

Clarke Energy is the authorised distributor and service partner for GE Energy's gas engine division in a growing number of countries across the world. In addition to providing high-efficiency, reliable gas engines we combine this with the expertise and resources to deliver unbeatable product support.

Whether your requirement is for the supply of a single gas engine generator or a complete turnkey power generation facility, we can meet that need. Our ability to add value by offering an end-to-end service, from initial proposal to reliable long-term maintenance, has led to us becoming a multi-national company with operations in ten countries across the globe. Our company prides itself on integrity, delivering only the highest quality products whilst providing a reliable accountable localised service.

## Benefits of working with Clarke Energy

Clarke Energy provides flexible solutions for your gas generation projects. Our services range from the supply of a gas engine generator, through to the complete turnkey installation of a gas powered generation facility. Clarke Energy has a dedicated, top-quality team of sales, engineering, project management, commissioning and maintenance staff to meet your needs. We also offer long-term maintenance contracts backed up by a strong balance sheet, giving peace of mind with respect to the long-term performance of your GE gas generation equipment.

## Power from Syngas

Syngas, also known as synthesis gas, synthetic gas or producer gas, can be produced from a variety of different materials that contain carbon. These can include biomass, plastics, coal, municipal waste or similar materials. Historically town gas was used to provide a gas supply to many residences in Europe and other industrialised countries in the early 20th Century.

Syngas is created by the gasification or pyrolysis of carbonaceous materials. Gasification involves subjecting these materials to high temperatures, in the controlled presence of oxygen with only limited combustion to provide thermal energy to sustain the reaction.

Gasification can occur in man-made vessels, or alternatively could be conducted *in-situ* as in the gas of underground coal gasification.

Where the fuel to the gasifier is of recent biological origin, such as wood or organic waste, the gas produced by the gasifier is considered to be renewable and so is the power produced by its combustion. When the fuel to the gasifier is a waste stream, its conversion to power in this manner has the combined benefit of the conversion of this waste into useful products.

## Benefits of Synthetic Gas

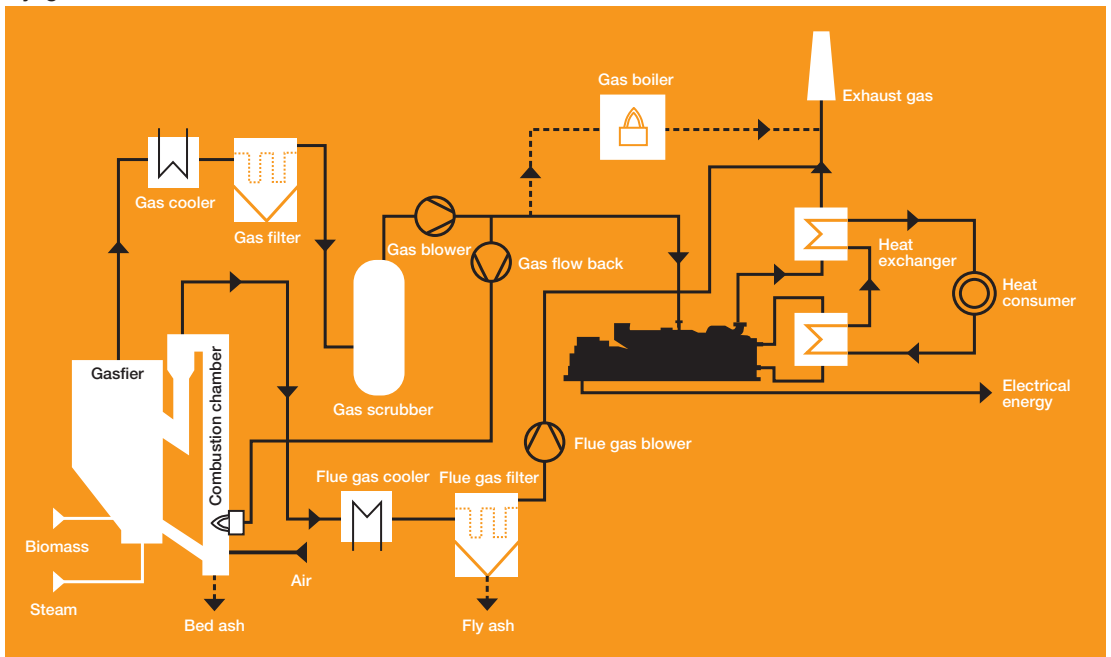
- Generation of renewable power
- Conversion of problematic wastes to useful fuels
- Economical onsite power production and reduced transmission losses
- Reduction in carbon emissions

## Syngas Challenges

The composition of syngas is highly dependent upon the inputs to the gasifier. A number of the components of syngas cause challenges which must be addressed at the outset, including tars, hydrogen levels and moisture.

Hydrogen gas is much quicker to burn than methane, which is the normal energy source for gas engines. Under normal circumstances, faster combustion in the engine cylinders would lead to the potential of pre-ignition, knocking and engine backfiring. In order to counter this challenge the engine has a number of technical modifications and the output of the engine is reduced to between 50-70% of its typically natural gas output. (I.e. a 1,063kW engine running on natural gas is comparable to a maximum 730kW engine on synthetic gas).

Syngas Schematic



## Syngas Composition

Substance	Composition (%)
H <sub>2</sub>	20-40
CO	35-40
CO <sub>2</sub>	25-35
CH <sub>4</sub>	0-15
N <sub>2</sub>	2-5

## Fuel Gas Quality

A wide range of hydrogen gases can be used in gas engines. However as with all engine fuels, there are specific limits to different components the input fuel gas. Gas contaminants in syngas, most notably tar and humidity, are a key technical challenge to the utilisation of synthetic gases. Please request the special gas technical instruction for fuel gas quality for more information.

## Concept

Varying compositions, as well as calorific values and the combustion behaviour of the gases from synthetic gases processes, put greater demands on engine design. Clarke Energy offers specially modified GE Jenbacher gas engines that make efficient use of these gases for combined generation of heat and electricity. Special features of these engines may include flame arrestors for the prevention of backfiring, special gas mixers to improve gas mixing and to be more robust to dirt.

In general, the stable composition of wood gas makes it advantageous as an engine fuel. The high hydrogen content of some syngases however, means the combustion process is very fast, which increases the danger of engine pre-ignition, knocking or engine backfiring. To avoid this risk, GE has created an engine control system that is able to fuel the GE Jenbacher engine with a very lean mixture and, at the same time, react very quickly to variations in the engine load.

Some synthetic gases have a high carbon monoxide content, which has a low combustion speed and is very harmful. GE has developed the specific gas engine combustion system that enables burning of the gas efficiently and reliably. Additionally, Clarke Energy & GE offer a safety technology package that allows firm handling of harmful gases such as carbon monoxide.

Syngas can be used to create hot water, steam and electricity. The hot water and exhaust gases from the engines are fed into boilers. The resulting steam can be used within other localised industrial processes. Electricity generated by the GE gas engines can either be used on-site or sold to the public grid. Syngas electrical efficiencies of 37% and over can be achieved with Jenbacher gas engines

## Advantages

- Independent power supply
- Reduced energy costs, and greater predictability and stability
- Efficient and economic combined heat and electricity supply
- High electrical efficiency compared to other power generation technology (i.e. steam or gas turbines)
- Best suited for an electrical output range from a few hundred kW up to 20-30MW
- Low gas pressure required
- Alternative disposal of a problem gas while simultaneously harnessing it as an energy source
- Substitute to conventional fuels
- Environmental benefits by greenhouse gas reduction

## Our Competence

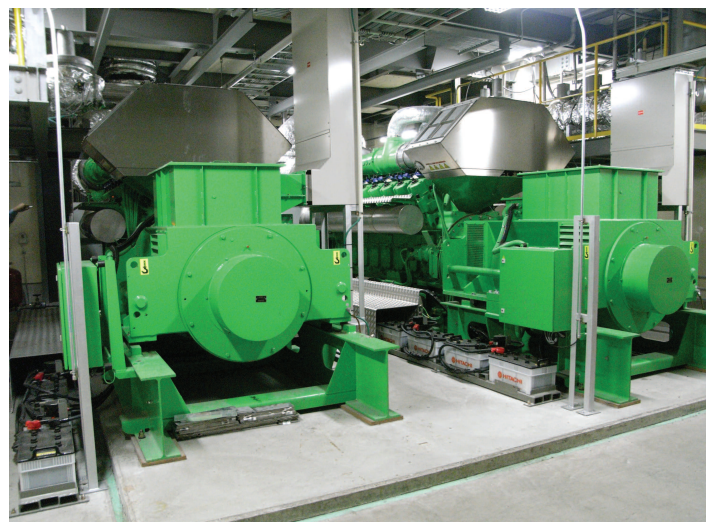
Clarke Energy has comprehensive experience with gas engine technology and has a large reservoir of knowledge with respect to handling tricky gases such as syngas.

The GE Jenbacher gas engine is known for its flexibility and robustness when utilising difficult gases. Coupling this with a maintenance agreement with Clarke Energy will enable you to get the highest performance from your generator.

Güssing, Austria, wood gas project, 1x JMS 620



Yamagata, Japan, wood gas project 1x JMS612, 1x JMS 616



If you would like to find out more about how Clarke Energy can help you develop your syngas project, please contact your local office for more details.

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