COMBINED HEAT AND POWER USING BIOGAS

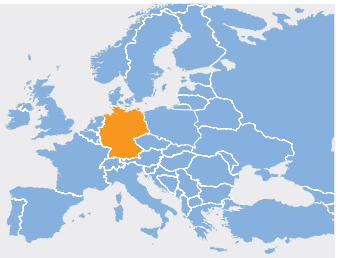
BIOGAS PLANT IN LÖNINGEN WITH MTU ENGINES IN LONG-TERM TRIAL

GUARANTEED PRICES FOR OPERATORS OF A COMBINED HEAT AND POWER SYSTEM

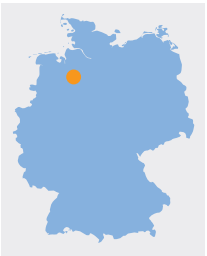
// **Who:** GF-Bio-Energie Hasetal GmbH

// **What:** Combined heat and power module GC 1166 B5 to generate electricity and heat

// **Where:** Löningen in Oldenburger Münsterland, Germany



Europe



Germany

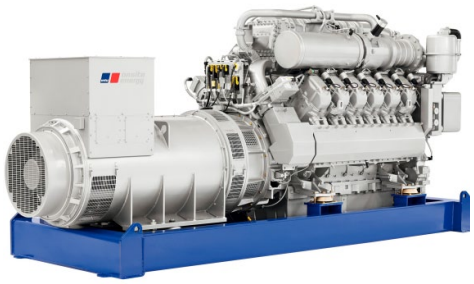
In 2008, GF-Bio-Energie Hasetal GmbH in Löningen, Germany, replaced their dual-fuel engines with Biogas-powered Otto cycle en-gines from MTU Onsite Energy. To maximise cost effectiveness, the company aims for high performance from each combined heat and power system. In light of the experience gathered with the 350-kilowatt engines, the company was thus very interested to try the new mega-watt engine in the 4000 Series. Since 2009, this machine has been the "best horse in the paddock" at Löningen.

As the profit margins for corn, grain and potatoes shrank towards the end of the 1990s, many farmers started looking for alternative sources of income, and interest grew in com-bined heat and power systems powered with biogas. Brothers Reinhard and Hermann Groß, who operated a liquid manure exchange at the time, recognised a great opportunity in the exploitation of biogas. Converting agricultural waste, crops grown for fuel, liquid manure or even chicken manure into electricity and heat promised higher profits than selling crops on the food market because electricity generated from biogas is sold at fixed rates in Germany. The heat produced in the combined heat and power systems can be used in the fermentation process or can be used for community heating in the immediate vicinity. In 2001, the brothers went ahead with their plans and set up a biogas plant with ten 80-kilowatt dual-fuel engines in the machinery hall of the specially founded company called GF-Bio-Energie Hasetal GmbH.

New CHP system from MTU Onsite Energy

Seven years later, stricter values for emissions and the need for reliable, powerful units and higher efficiency led to the operators of the plant rethinking their approach. They reshuffled their cards and chose Otto cycle engines. Three combined heat and power modules from MTU Onsite Energy using 400-Series engines, each producing 350 kilowatts (kW) replaced the dual-fuel engines. The reliability of these modules from the 400 Series was the deciding factor. Thus, when the opportunity arose to try a pre-production model of the large 4000-Series biogas engines, the team in Löningen did not hesitate long. Twelve cylinders, 1,166 kW of electrical output and more than 1,300 kW of thermal output were attractive characteristics, and the compact dimensions in relation to the power produced were also very practical to make best use of the available biogas.

The low maintenance costs are also one of the major benefits of these large engines. For a large machine it is only necessary to do one oil change or replace one set of spark plugs, for example. Three of the machines from the 400 Series are required to produce the same power, and the time required for maintenance and inspection is correspondingly higher.



Combined heat and power module from MTU Onsite Energy with a type 12V 4000 biogas engine

The company GF-Bio-Energie Hasetal GmbH in Löningen. 60 tonnes of renewable energy crops, 60 tonnes of slurry and 10 tonnes of manure are fermented every day in the biogas plant.

Biogas version of Series 4000 engine impresses

Although the biogas variant of the engine from the 4000 Series was a pre-production model, the decision-makers did not doubt its quality. After all, the unit is based on a diesel engine that has proven itself over many years, from which MTU has already derived a reliable natural-gas engine. Some design changes were necessary, however, for use with biogas. The biogas engine differs from its natural-gas cousin with tough new steel pistons and a different combustion geometry, along with a plumper cam shape in favour of a larger valve opening, to name but a few alterations.

The trial users also benefited from the engine management that modifies the combustion for the amount of methane contained in the fuel and avoids knocking, which can result in excessive wear. Above all else, the developers at MTU concentrated on maximising the reliability of the new engine. Despite its conservative design, the engine shows an excellent electrical efficiency of 42.5 percent.

Permanently placed after trial period

The 4000-Series engine has proven itself at GF-Bio-Energie Hasetal and has also shown its quality in the laboratory. After six months of operation, the engine was dismantled at MTU's Friedrichshafen facility and measurements were taken. The result was that even the newly designed components performed well, showing extremely low wear. Now reassembled, this engine is once again operating in Münsterland. In its twelve months of trial operation, it has already run for over 7,500 hours, and it is still humming powerfully away in the machine shed in Löningen.

The Groß brothers have already planned on the 4000-Series engine for their base load. The smaller 400-Series modules are to be distributed as satellite combined heat and power modules. These satellites will produce electricity and heat close to the consumers and will be supplied with biogas via pipelines. In this way, the operators hope to optimise the use of heat. Satellite operation increases their profit as it prevents loss of heat during transport, and it protects our climate. After all, bioenergy replaces heating energy, which would otherwise be produced using fossil fuels.

The environment also benefits from the latest investment made by GF-Bio-Energie Hasetal. They have now added on a catalytic convertor to their 4000-Series engine. This reduces the formaldehyde emissions, and alongside the profits from electricity, the brothers are now also paid an additional formaldehyde bonus.

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