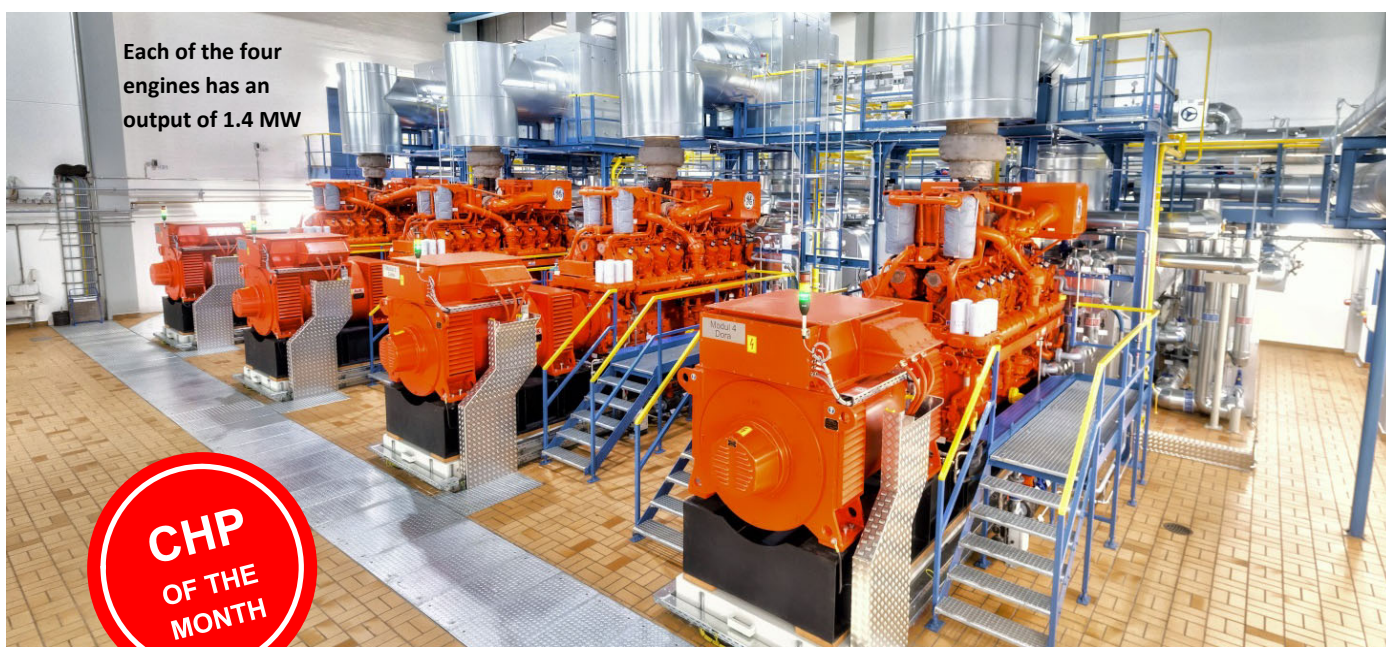


Each of the four engines has an output of 1.4 MW



Extra clean engines

June 15, 2019

Stadtwerke Wittenberg have modernized a CHP plant and paid attention to achieving particularly low emission values.

BY ARMIN MÜLLER

Since the 1960s, Wittenberg has had a district heating location in Berliner Straße. Initially, lignite was burned in the power plant, but between 1993 and 1995 the municipal utilities converted the plant to natural gas and fuel oil, and after 1995 to four Jenbacher CHP units using natural gas as fuel.

Since 2013, Stadtwerke Wittenberg have been considering the renewal of the CHP system and have also carried out their own exhaust gas measurements. Because citizens and politicians in Wittenberg had been discussing the environmental aspects of energy supply for some time, the municipal utilities placed great emphasis on the environmental aspects when planning the new plant.

In April 2018, the four Jenbacher engines of the CHP plant had reached about 125 000 operating

hours per engine and had to be replaced. Between May and October 2018, almost the entire CHP system periphery was also replaced. The contract for the project was awarded to S&L Energie-Projekte GmbH, Spelle.

With a view to the emission limits planned for the future, the planner and the municipal utilities discovered that these are easier to meet with a Lambda-1 engine than with lean burn or turbocharged engines.

Exhaust gas cleaning with 3-way catalytic converter

In a Lambda-1 engine, the fuel burns stoichiometrically, i.e. theoretically in such a way that all fuel molecules can react completely with the atmospheric oxygen. Turbo engines, on the other hand, burn the fuel with excess air. This gives them a better electrical efficiency, which

is, however, bought at the expense of higher methane emissions. The lower electrical efficiency is no problem for Stadtwerke Wittenberg at all, explains their technical director Thomas Grabe. After all, as heat suppliers they want a high overall efficiency.

This is achieved in Lambda-1 engines by a lower exhaust gas loss as a result of the smaller exhaust gas flow. In Wittenberg, the planner had promised 95% total efficiency; in practice, the value was even slightly exceeded.

Four Waukesha VHP P9394GSI chp units are installed in the cogeneration plant. Each unit has an output of 1.4 MW_e at 1 000 rpm. The electrical efficiency is 35.5%. The exhaust gases from the Lambda-1 combustion are cleaned with three-way catalytic converters.



The chp plant
Berliner Straße in
Wittenberg
got new
engines with
Lambda-1-
combustion



The plant at a glance

Owner/Operator: Stadtwerke
Lutherstadt Wittenberg GmbH

Planner: S&L Energie-Projekte
GmbH, Spelle

Plant: 4 Waukesha VHP
P9394GSI units with 1 440 kW_e
each and 3-way-catalysts

Special features: particularly
low emissions and low
methane slip

Environmental relief: by
reducing the methane slip,
savings of 3 212 t CO₂ equivalent
per year and 1.8 million kWh
primary energy savings

Information: Thomas Grabe,
thomas.grabe@
stadtwerke-wittenberg.de

➤ The catalyst, which has been state of the art for 30 years, consists of a coated honeycomb ceramic and does not require any other additives such as urea (Add Blue).

For a lean burn engine with an SCR cat. converter, Grabe estimates that the municipal utilities would need 130 t of urea per year for the same chp output.

The three-way catalytic converter reduces NO_x, carbon monoxide and formaldehyde, which is below the detection limit here. It also slightly reduces the already very low emission of unburned methane. The so-called "methane slip" had not been taken into account up to now, because the still valid 4th BImSchV does not specify a limit value for it.

In the draft of the TA-Luft, which is to come into force as the 44th BImSchV (but is still in the Bundesrat), limit values for unburned hydrocarbons were discussed for the first time.

Foreseen are 300 mg/m³, for lean-burn engines 1 300 mg/m³. In the combined heat and power plant Berliner Straße 100 mg/m³ are reached.

Methane slip pollutes the climate

Thanks to the Lambda-1 engine, the Wittenberg public utility company saves considerable amounts of methane. According to Grabe, lean-burn engines of the same power output, which comply with the future limit value of 1 300 mg/m³, would still release 180 000 m³ of unburned natural gas into the air every year. This not only causes additional costs. According to the Federal Environment Agency, methane is also 25 times more harmful to the climate than CO₂.

Electrical efficiency versus methane emission

For the other pollutants in the exhaust gas, the new plant in Wittenberg also allows the limit values of the planned 44th BImSchV to be significantly undercut.

According to the official measurements, the cogeneration plant in Berliner Straße achieves 30 mg/m³ at NO_x; in the future, 100 mg/m³ is planned as the limit value. For carbon monoxide (CO) the values are 40 mg/m³ compared to 250 mg/m³, for formaldehyde 0.5 mg/m³ compared to 5 mg/m³.

The plant realized in Wittenberg thus already clearly undercuts the future limit values. **E&M**