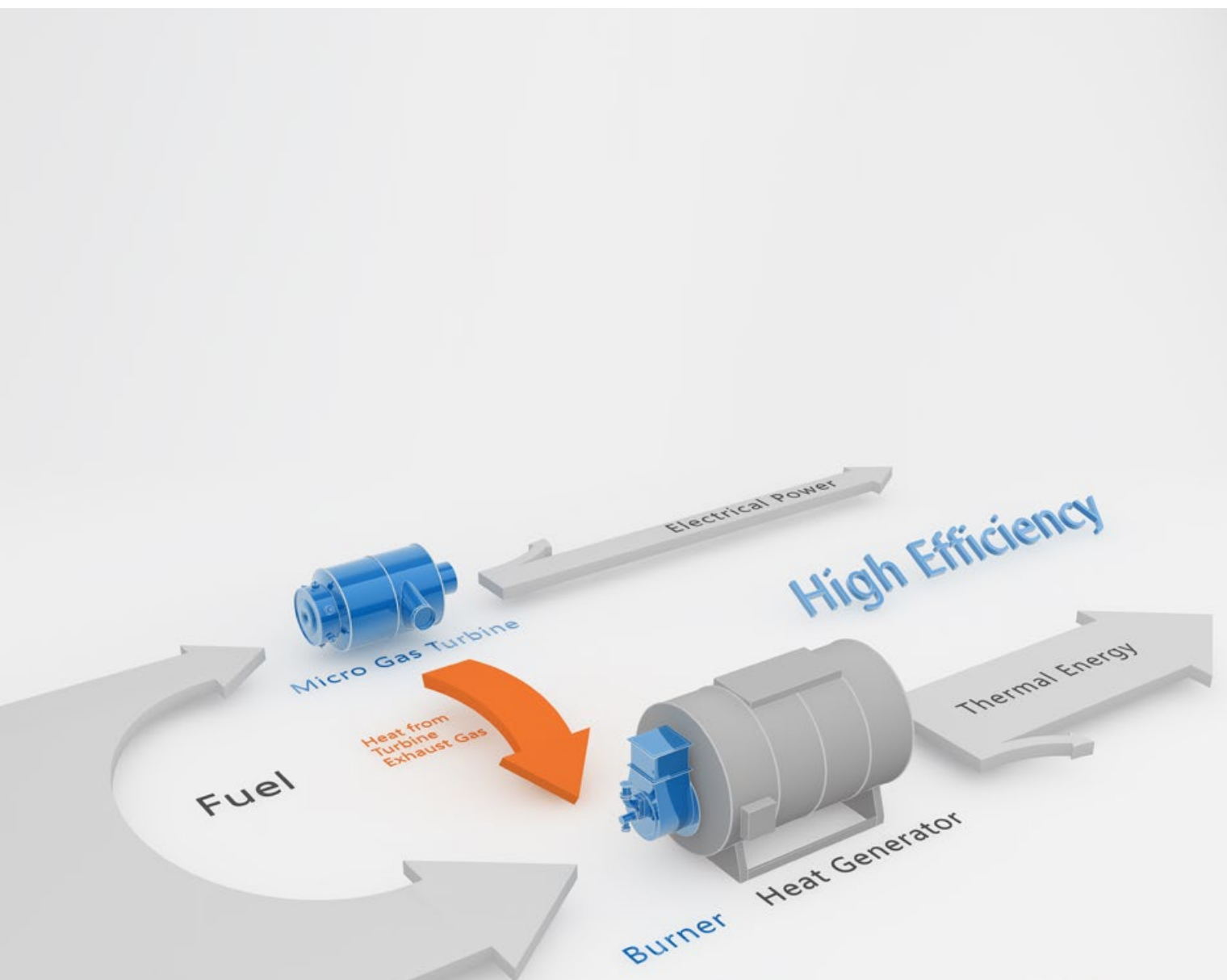


New ways with SAACKE micro-CHP system

The energy efficient solution



New ways with SAACKE micro-CHP system

Optimal energy utilization

The idea of using waste heat from power generation for process steam or hot water is not new. Rather, it is a logical step, because exhaust gases from a combined heat and power plant or a gas turbine contain large quantities of valuable energy. While exhaust gas in a traditional combined heat and power (CHP) plant is conveyed directly over a heat exchanger or through a waste heat boiler, in this newly developed SAACKE solution for medium-sized industrial enterprises, the exhaust gas is conveyed to the heat generator via a turbine exhaust gas burner from the DDZG-GTM series. This allows SAACKE to not only utilize high-temperature exhaust gases for small to medium-sized combined heat and power generation plants, it also makes

energy generation more flexible and profitable overall. CHP plants achieve extremely high efficiency, they are both very economical as well as environmentally friendly. The set-up and configuration of the SAACKE micro-CHP system provides heat for conventional heat generators and produces valuable electricity. The existing heat generator and peripherals often continue to be used. This not only saves money as part of the investment, it also gives the operator assurance that they are making use of tried and tested equipment.

Even without government subsidies, the amortization times of SAACKE micro-CHP systems are often surprisingly short, while heat generation and production is no longer dependent on the price fluctuations on the electricity market. SAACKE offers customers decades of experience in plant engineering, including CHP systems in combination with large turbine plants. Our engineers develop the optimal combined heat and power generation solutions, regardless of the area of application or power range.

This also applies for consulting services on the retrofitting of existing plants.

Why use CHP generation?

- Save energy costs by reducing of flue gas losses
- Protect the environment
- More flexible production
- Increased independence from price fluctuations through in-house power supply
- Statutory CHP remuneration possible depending on the plant

Why the SAACKE system?

- SAACKE is the provider on the market that provides an optimal solution with decades of experience in CHP systems
- Designed for all standard and a range of special fuels, such as biogas
- Suitable for heat generators, such as steam and hot water boilers, combustion chambers and thermal oil heaters
- Straightforward retrofitting on existing heat generators
- Long maintenance intervals for turbines and burners as well as the lowest possible downtimes for installation and commissioning
- High system availability
- Basic modules of the micro gas turbines can be installed in parallel
- Extremely low emission values in accordance with statutory requirements as well as outstanding energy efficiency

An overview of our services

Service



With 70 SAACKE customer support centers in over 20 countries, we guarantee close customer support everywhere in the world. Our service is focused on a single goal: ensuring the operation of your combustion plants for many years beyond assembly and commissioning – efficient, environmentally friendly and reliable.

You can expect rapid availability for repairs and replacement for all SAACKE plants worldwide. The service partnership with SAACKE also includes maintenance and operational optimizations if this has been agreed. SAACKE provides flexible maintenance contracts tailored to the customer's needs. The high quality of our service offer is guaranteed by our service personnel, who are also available at any time via our 24-hour hotline.

Installation & commissioning



Our assembly team provides expert support with extensive experience in energy technology. Our services don't just include the assembly of combustion plants and systems, they also extend over the entire process in the energy control center.

After constructing, upgrading or retrofitting a plant, our technicians and engineers naturally also commission and fine-tune the plant on-site. The functional and procedural integration of all protective devices is also checked and documented. The aspect of safety is given the highest priority. Our quality management system in accordance with DIN ISO and the SCC management system make a significant contribution to ensuring optimal and safe processes.

Modernization



The responsible use of fossil fuels is now more important than ever. This means that modern combustion plants have to extract as much heat output from existing fuels as possible. This requires a high level of efficiency, which can be achieved by targeted plant optimization using the SAACKE modernization modules.

The SAACKE portfolio includes:

- Speed-controlled motors
- O₂/CO controls
- Economizers and heat exchangers
- Calculation of cost and emission reduction potentials using the SAACKE Energy Efficiency Calculator
- Optimization of the mode of operation and the control parameters

Engineering



Whether turn-key solutions, modules or individual components, SAACKE provides services for all thermal processes under one roof – from conventional firing through to complex plants for the combustion of special fuels.

The experienced SAACKE engineering team ensures smooth processing within the frequently required short-term implementation phase and provides extensive know-how from the initial concept through to the detailed engineering for maximum efficiency, availability and service life of the plant.

Besides feasibility studies and the basic engineering to ensure the process technology, set-up and pipework planning, including CFD simulations, is also part of our engineering portfolio.

Spare parts



SAACKE original spare parts are selected especially for your combustion plant and manufactured in accordance with the highest quality standards. That's how we ensure functionality over many years and make a valuable contribution to the flawless operation of your plant – worldwide.

In addition to the guaranteed product quality, you also benefit from optimal cost effectiveness. Short delivery times, optimal material durability and strict compliance with safety inspections and approvals guarantee that the high requirements placed on components in combustion technology always ensure flawless operation.

Training/Instruction



The SAACKE training concept with continuous, internal training courses is a key instrument in ensuring the quality of our service.

You can participate in this expert knowledge, because SAACKE also offers its customers tailored training sessions, which can be held directly at the plant as well as at SAACKE in Bremen.

In addition to multimedia presentations, our motivated and competent trainers also have access to various burner exhibits. This allows us to make sure that you gain practical experience during our training sessions.



*Use energy
more efficiently.*

Uncover potential savings, optimize efficiency!

Combustion plant losses or unused waste heat are a drain on the budget as well as the environment. But, optimization does not necessarily have to result in higher expense or long downtimes. SAACKE supports you with a comprehensive selection of modernization tools and energy efficiency measures, through to a complete SAACKE micro-CHP system. In view of constantly rising operating costs, we develop individual solutions that focus on the smooth interaction of all plant components. Our team develops concepts together with you and provides support during implementation (e.g. coordination with authorities) in order to comply with all the new environmental regulations and the latest state-of-the-art equipment. You thus benefit from our decades of experience in combustion technology and the provision of all relevant services under one roof.

- 1** Establish contact
- 2** Data recording & process analysis
- 3** Basic engineering & proposal preparation
- 4** Detailed engineering & production "Made in Germany"
- 5** Documentation
- 6** Installation & commissioning
- 7** Training & instruction
- 8** Plant hand-over
- 9** Service support

*From the idea
to its realization*

The SAACKE solution in detail

The SAACKE micro combined heat and power principle is a highly profitable instrument for energy generation for conventional heat generators. The system consists of the specially developed SAACKE DDZG-GTM turbine exhaust gas burner, one or more micro gas turbines and the exhaust gas system, including all shut-off and control elements between the turbine and the burner, as well as the associated SAACKE se@vis Pro process control system.

The SAACKE DDZG-GTM burner series, which was developed in five sizes for 2-20 MW maximum burner capacity, is installed directly on the new or existing downstream heat generator. The burner has been specially developed for the exhaust gases of micro turbines and has a low burner pressure loss in turbine exhaust gas (TEG) operation. The use of residual oxygen and the temperature of the TEG enable an overall efficiency of up to 97%. In principle, these durable burners operate with almost all liquid (not heavy fuel oil) and gaseous fuels and can even be used for the thermal utilization of special fuels e.g. biogas. When planning a SAACKE micro-CHP system, the burner is designed such that the DDZG-GTM is able to fully utilize the available turbine exhaust gas quantity up to full load and recover this for energy savings. The old modes of operation, such as fresh air operation, remain available for operators of SAACKE micro-CHP systems even after a new construction or retrofit. This means that turbine(s) and burner can also operate independently. This proven combination of burner and turbine always guarantees the lowest emission values which are reliably below requirements across the entire range of EU regulations.

Technical data turbine*

Electrical power	200 kW
Electrical efficiency	33% ± 2%
Fuel requirement	606 kW
Exhaust gas temperature	280°C
Exhaust gas heating capacity	395 kW

Example calculation: amortization of a turbine**

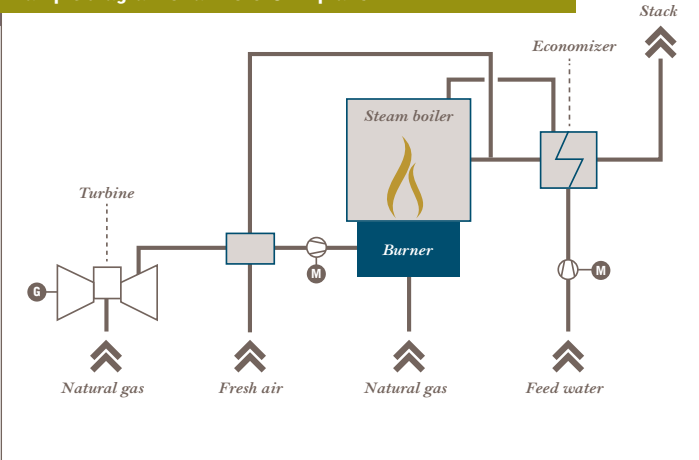
Investment	EUR 600,000
Cost saving (max.)	EUR 150,000 per year

Process data for a micro gas turbine with additional firing on the steam boiler

Turbine exhaust gas	1.33 kg/s
Q _{th} turbine	395 kW
Natural gas additional firing***	324 Nm³/h
Primary air	311 Nm³/h
Heat flow	3,638 kW
Boiler capacity	3,435 kW
Steam capacity	5.0 t/h

* No compressor under ISO conditions ** For 8,000 hours of operation/annum, electricity price: 0.145 euro/kWh, gas price: 0.03 euro/kWh *** Max. possible additional firing in order to fully utilize the oxygen content in the turbine exhaust gas. Additional fresh air intake required for higher firing rate.

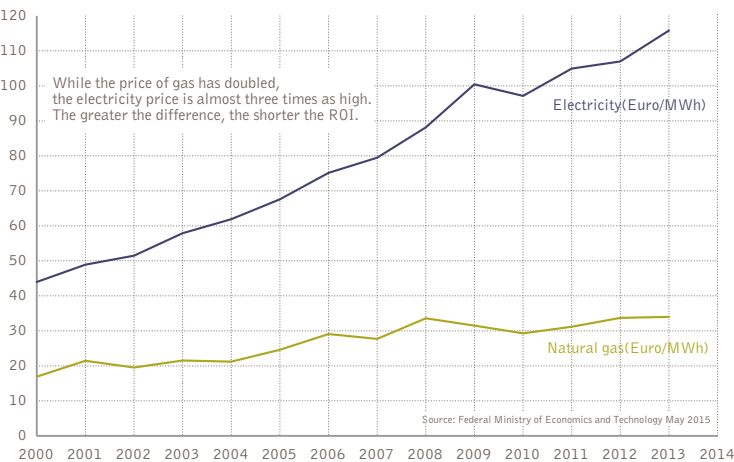
Example diagram of a micro-CHP plant



Gas turbine flue gas burner (DDZG-GTM series)



Consumer prices of industry in Germany (nominal prices / without VAT)



Reference projects with shell boilers

Bruno Bock Chemische Fabrik GmbH, Marschacht (Lower Saxony)



A SAACKE DDG-GTM 13 burner was installed on the existing saturated steam boiler with two upstream micro gas turbines. The turbines produce 400 kW of electricity for site, which also roughly corresponds to the hourly energy requirements. SAACKE's scope of delivery included the steel construction and civil works, as well as the combined heat and power generation processes into which the turbines provided by the customer were successfully integrated. All of the expectations identified in the run-up to the project, e.g. relating to emissions and energy efficiency, were exceeded. The plant has been in operation since November 2012.

Technical data

Burner capacity (max.)	13.5 MW (fresh air operation)
NO _x emissions	ca. 80 mg/m ³ (TEG mode, natural gas)
Electrical power turbine	400 kW
Thermal output turbine	790 kW
Steam generation	19.5 t/h at 13 bar (g)

Interquell GmbH, Großaitingen (Bavaria)

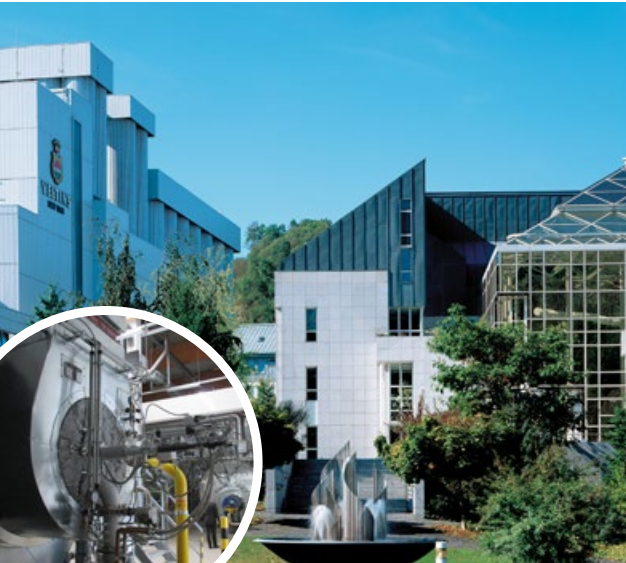


The SAACKE DDZG-GTM 8 burner was installed on the new saturated steam boiler, which produces 1,460 MW of electricity per year for the Großaitingen site, together with an upstream micro gas turbine. The use of turbine exhaust gas as combustion air in the burner and the addition of a exhaust gas condensing economizer increases overall efficiency to 97%. The challenges for this highly efficient solution included effective time management and comprehensive service. Downtimes had to be kept to a minimum to ensure that continuous operation was not interrupted.

Technical data

Burner capacity (max.)	7 MW (fresh air operation)
NO _x emissions	ca. 80 mg/m ³ (TEG, natural gas), ca. 150 mg/m ³ (light fuel oil, fresh air)
Electrical power turbine	200 kW
Thermal output turbine	395 kW
Steam generation	10 t/h bei 12 bar (g)

Veltins Brauerei, Meschede-Grevenstein (North Rhine-Westphalia)



The heat generation of the SAACKE DDZG-GTM 20 burner is assisted by three upstream micro gas turbines, which produce 600 kW of electricity for the site. As the general contractor, SAACKE delivered a turn-key plant together with steel, construction and civil works. The turbines provided by SAACKE were installed in a new auxiliary building. Both the structural demands as well as the energy challenges were mastered, especially to ensure the efficiency of the turbine. The perfectly implemented time management and outstanding teamwork by all parties involved in the project kept the downtimes to a minimum, which made a significant contribution to the reliability of production at site.

Technical data

Burner capacity (max.)	15 MW (fresh air operation)
NO _x emissions	ca. 80 mg/m ³ (TEG, natural gas)
Electrical power turbine	600 kW
Thermal output turbine	1,185 kW
Steam generation	22 t/h at 13.5 bar (g)

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