
HEAT AND POWER WITH WOOD PELLETS



MADE IN GERMANY

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From the idea to the production stage

Starting out as a classical company for heating and plumbing, we ventured into the area of renewable energies with CHPs fuelled by vegetable oil in 2004. At the same time, we researched ways to convert wood into electricity. We achieved that goal in 2010 with the Burkhardt wood gasifier, which is by now being produced modularly and in series thanks to the continuous optimization of the processes. In 2014, we received the Bavarian Energy Award for this development.

In the meantime, our wood gas CHP plants exist in various performance classes. Apart from the large machine with up to 180 kW electrical output, we also offer a 50 kW plant. All plants are

operated exclusively with wood pellets, whereby we also offer CHPs with natural gas as an alternative.

Thanks to our Research and Development department, we are able to adapt and further develop our products permanently. Furthermore, we are also working on further research projects in renewable energies. This means that you can continue to look forward to new interesting products from Burkhardt in the future, too.



Tradition and innovation

- 1978 Gerhard Burkhardt establishes the company for heating, ventilation and plumbing
- 2004 Research regarding the use of wood gas and vegetable oil as renewable energies
- 2010 Burkhardt Italia GmbH was founded in Bolzano
- 2013 Delivery of the 100th wood gasifier
- 2014 Bavarian Energy Award for the project: "Combined heat and power through gasification of wood pellets"
- 2015 Development of wood gasifier with 50 kW electrical output
- Mühlhausen location: Development and production of CHPs and wood gasifiers as well as service centre
- Currently around 340 employees at locations in Germany and Italy

PELLETS AS FUEL



Homogeneous fuel

In order to be able to ensure a uniform and stable gasification process, the fuel used at Burkhardt is homogeneous: wood pellets.

The Burkhardt wood gasification process is designed perfectly for the ideal properties of the standardised pressed pellets (EN Plus A1) with their flow and transport characteristics, thus achieving above-average efficiency. Since the fuel contains a maximum residual moisture of 10%, it does not need to be dried before use or stored in any special way, but can be used directly and efficiently in the plants.

With approx. 5 kWh of energy per kilogram, wood pellets are extremely rich in energy, which means that, firstly, they produce a higher energy yield and, secondly, the required pellets have a low storage volume. Thus, for example, about 3300 kWh of energy „lies dormant“ within 1 m³ of wood pellets, whereby in contrast with that, 1 m³ of wood chippings contains about 900 kWh.



Benefits of wood pellets

- Standardised fuel (mechanical stability, ash content, ash softening temperature)
- Simple logistics, transport and storage
- No investments required for raw-material preparation
- Higher energy density and efficiency levels
- Regional, renewable raw material
- CO₂ neutral

WOOD GASIFICATION WITH WOOD PELLETS

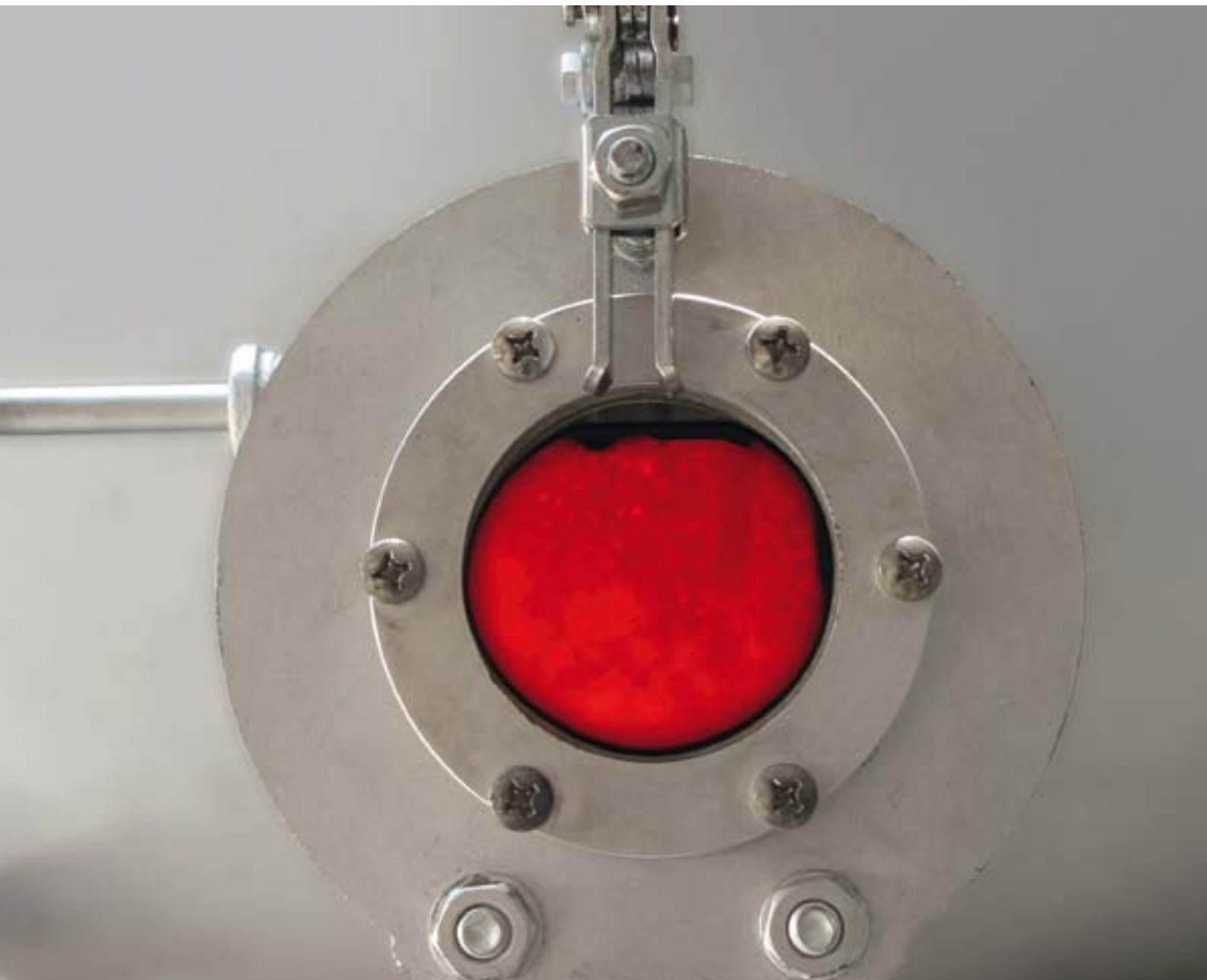


Process turned upside down

We have completely rethought and reinterpreted the conventional principle of wood gasification. Hence, our concept differs from the familiar wood gasifiers in the type of process control and in the fuel itself. A technical trick from our experts helped the system become successful:

The process was turned upside down. In this process, the wood pellets are fed into the reactor from below. An updraught co-current flow gasification takes place there, while forming a stationary fluidised bed. This is generated with an airflow over a side-channel compressor. A bed material is not necessary here, since the fuel stabilises by itself. Rising means that the stages of gasification (drying, pyrolysis, oxidation and reduc-

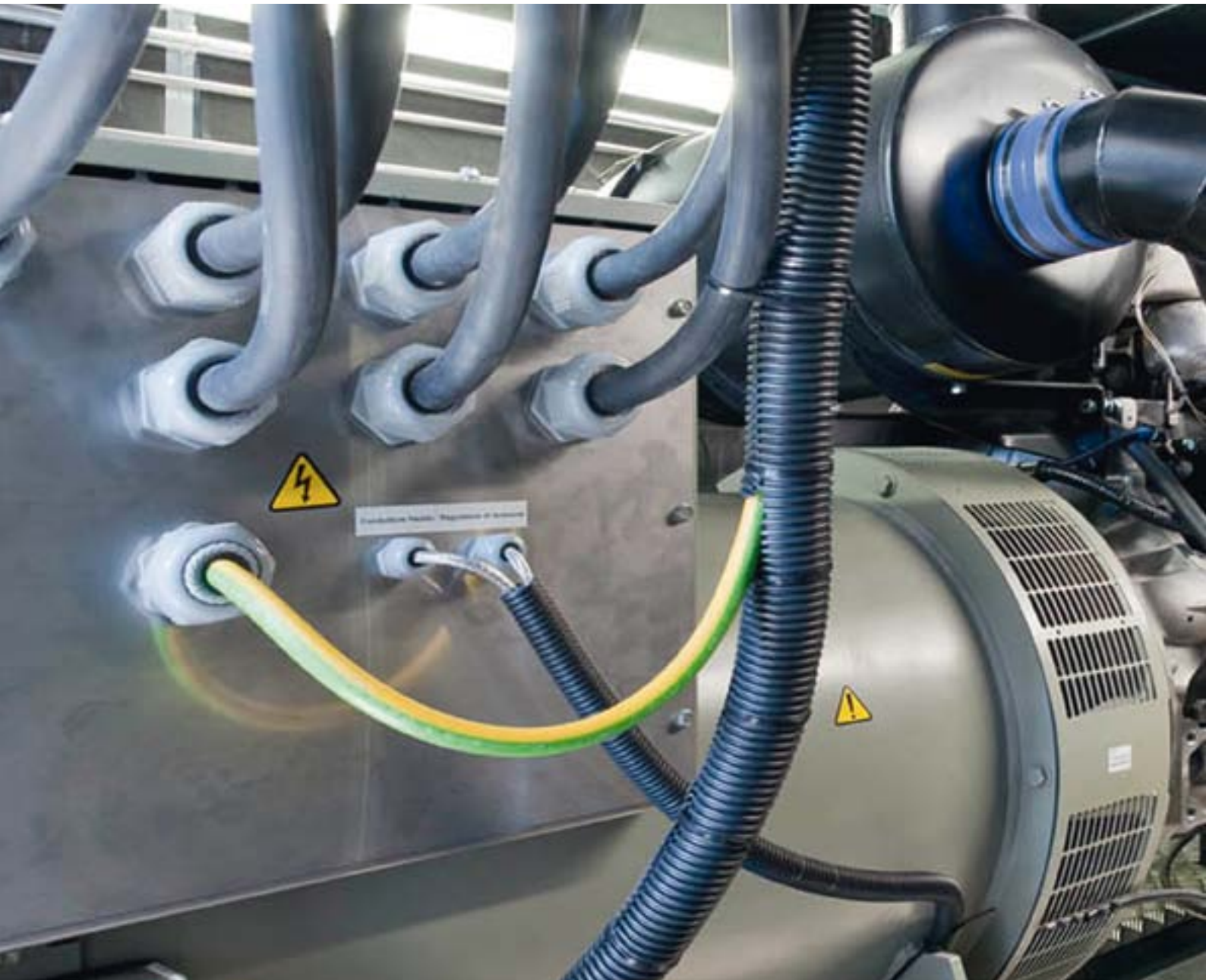
tion) are passed through from the bottom to the top. The aim is to transfer the highest possible proportion of energy inherent in the solid fuel to the combustible synthesis gas. With our patented process we achieve constant gasification and the resulting optimised, sequential operations with almost complete transfer to the utilisable wood gas. Only the non-decomposable minerals of the biomass remain as ash content.



Technical solution of Burkhardt

- Constant, updraught co-current flow gasification with a stationary fluidised bed
- Intelligent regulation through automatic air and fuel supply
- Permanent measurement and control of the gas quality
- Usable waste heat from gas cooling process
- Cleaning of the wood gas by means of bag filter, incl. automatic ash discharge
- Gas flare with automatic ignition for emergency operation as well as for start-up and shut-down procedure
- Elegant look and compact design even for confined spaces
- Mass-produced „Made in Germany“ module and quality management
- Operation and plant visualisation of the process values by means of a 15“ touch panel
- Additional remote access to the plant

COMBINED HEAT AND POWER WITH WOOD GAS



Innovation and efficiency

For our ECO 180 HG and ECO 165 HG CHPs, we rely on sturdy 6-cylinder engines by MAN. We continue to develop and optimise the units for our purposes, including numerous in-house developments, in order to achieve the most efficient result with wood gas. Directly driven synchronous generators supply three-phase current for grid-connected operation. With the product lines ECO 180 and ECO 165 we offer you the design as a pilot-injection engine as well as a spark-ignition engine. The CHP can be supplemented with the heating assembly, lubricating oil supply or with various housing concepts on request.

Ever since the time the product range was extended to include our 50 kW module, we have been collaborating with the experienced CHP manufacturer KW Energie from Freystadt. In close collaboration, a CHP resulted from the already successful smartblock range, which is ideally suited for use with wood gas. Just like our CHPs of the ECO series, the smartblock 50 T is also built on a solid base frame. The engine and generator are directly coupled and elastically mounted. A sound-absorbing cover encloses the entire unit.



CHP ECO 165 / 180 HG

- 6-cylinder spark-ignition/diesel engine with turbocharger
- Synchronous generator with steel housing and pre-lubricated life-sealed ball bearings
- Low own power consumption < 1%
- Two-stage water-air/water-water charge air cooling system
- Waste gas and plate heat exchangers already installed in the unit, incl. safety equipment
- Heat extraction from engine cooling circuit and lubricant circuit, waste-gas and charge air
- Temperature level for heating: max. 95°C / max. 70°C or alternative design with two circuits (circuit 1: max. 105°C, circuit 2: max. 85°C/max. 65°C)
- Temperature level for heating: max. 90°C/ max. 70°C
- Grid-connected operation at 400 V / 50 Hz or 60 Hz



CHP smartblock 50T

- 4-cylinder spark-ignition engine with turbocharger
- asynchronous generator or synchronous generator
- specially designed waste gas heat exchanger module with water-cooled waste-gas tube, cooling water expansion tank, 3-way catalytic converter and lambda sensor on the unit
- fully automatic oil circulation system
- highly effective sound-absorbing cover
- heat extraction from generator cooling, engine cooling circuit and lubricant circuit, waste-gas and charge air
- Temperature level for heating: max. 90°C/ max. 70°C
- Grid-connected operation at 400 V / 50 Hz or 60 HZ

50 KW WITH WOOD GASIFIER V 4.50



Technical data with CHP smartblock 50 T

- Electrical output 50 kW
- Thermal output 110 kW
- Efficiency el. approx. 25%
- Overall Efficiency approx. 80%
- Pellet consumption approx. 40 kg/h
- Self-energy consumption approx. 1,5 kW
- Space requirements min. 48 m²
- Residual material ash/coke

Wood gasifier V 4.50
LxWxH: 5400 x 1485 x 3742 mm
(without flare)

CHP smartblock 50 T
LxWxH: 2260 x 960 x 1780 mm



165 - 180 KW WITH WOOD GASIFIER V 3.90



Technical data with CHP ECO 165 HG

- Spark-ignition engine
- Electrical output 165 kW
- Thermal output 260 kW
- Efficiency el. approx. 30%
- Overall Efficiency approx. 77%
- Pellet consumption approx. 110 kg/h
- No pilot oil needed
- Self-energy consumption approx. 8 kW
- Space requirements min. 63 m²
- Residual material ash/coke

Technical data with CHP ECO 180 HG

- Pilot-injection engine
- Electrical output 180 kW
- Thermal output 270 kW
- Efficiency el. approx. 30%
- Overall Efficiency approx. 77%
- Pellet consumption approx. 110 kg/h
- Pilot oil consumption approx. 4-5 l/h
- Self-energy consumption approx. 8 kW
- Space requirements min. 63 m²
- Residual material ash/coke



Wood gasifier V 3.90
LxWxH: 5280 x 2470 x 4500 mm
(up to flare connection)



CHP ECO 180 HG
LxWxH: 3760 x 1730 x 2600 mm
(without concrete cell)

COMPLETE BUILDING SOLUTIONS



All-in-one: System unit

In our system unit, wood gasifiers V 3.90, a CHP of the Eco series with a noise-protection cabin and the pellet store can be accommodated in one unit in an efficient and space-saving manner. The fuel storage is designed as a rectangular bunker with a slanted floor. Feeding takes place via a bucket elevator. The pent roof hall in simple steel construction with sandwich panels is the ideal alternative to the existing building. The standardised construction allows it to be built quickly and cheaply on site. The interface to the customer constitutes a finished foundation with a concrete base. Dimensions: 19.00 x 6.40 x 6.30 m (L x W x H); height of bunker: 7.50 m.

Quiet outdoor use: Concrete cell

The sound-proof concrete modular unit for one CHP of the Eco series is installed and wired ready for use with air and exhaust gas routing, sound absorption, control technology as well as a complete electrical installation. The heating assembly and complete lubricating oil supply can be integrated on request. The customer only has to provide a foundation. The plant is delivered ready for connection and is operational within a short time. Dimensions: 8.38 x 2.98 x 3.29 m (L x W x H).



Space-saving: noise-protection cabin

Our specially developed, space-saving housing for the engine and generator unit of an ECO CHP, as well as heat exchanger reduces the noise emissions reliably by about 25 dB. The side doors of the cabin can be opened for maintenance work in just a few simple steps. The air circulation system with a fan integrated in the roof rack frame ensures an optimum supply of combustion and cooling air for reliable engine running. Dimensions: 5.00 x 2.05 x 2.77 m (L x W x H)

Solid enclosure: Drywall cell

For installing our CHPs in an existing building we offer a dry-wall construction enclosure in metal post and beam construction. The walls consist of a metal substructure as a single stud frame and double planking made of special plates. A mineral wool insulation is introduced in the wall cavity. As an F90 construction, the drywall cell meets the fire protection requirements according to DIN 4102. Example dimensions: 6.25 x 3.45 x 3.00 m (L x W x H)

SERVICE



Service

Our service specialists and a broad network of service offices and partners ensure the operational safety of your plant. Furthermore, our service department is able to analyse problems quickly via remote access and can sometimes even fix the problem directly. You too, of course, can access the parameters of your plant via the Internet and keep an eye on everything at anytime and anywhere.

Benefit from our maintenance and service contract tailored individually to you and your plant. We take care of the planning, implementation and documentation of the maintenance work for you. We ensure the long service life of your plant with high quality original spare parts and operating materials. Our

well-assorted material warehouses with a digital merchandise management system guarantee you quick availability of spare and wear parts as well as lubricants, for example. As a result, you minimise the failure risks to predictable, fixed costs and can therefore concentrate on your day-to-day operations. Furthermore, we hold training courses regularly, even for operators, in order to ensure the best possible supervision of the plants.



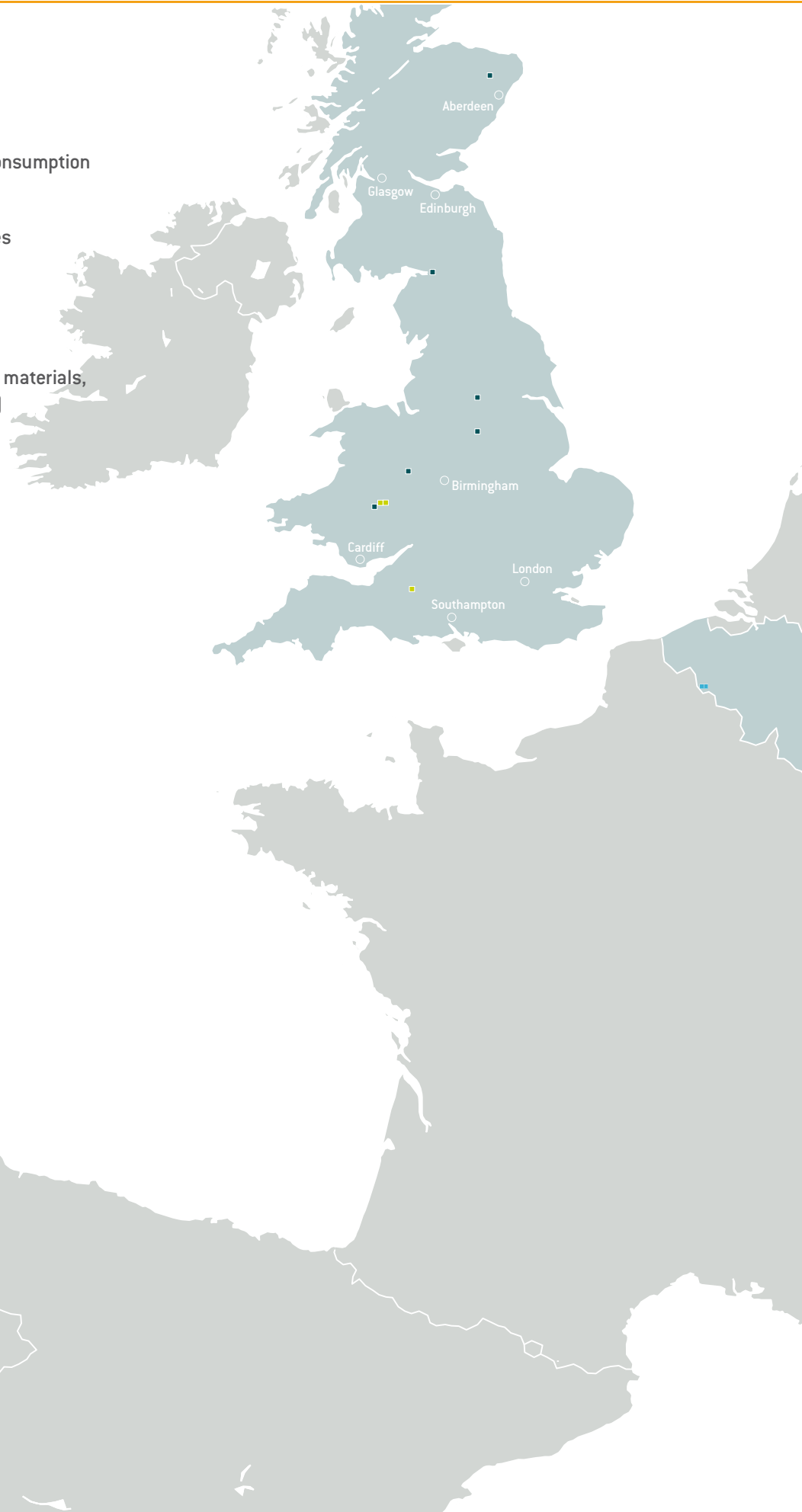
Maintenance work provided by the customer

- Daily: Check gas values, pressures and temperatures (can be done remotely). Visual inspection for possible leaks, contamination, defects and gasifier level once a day. Replace ash Big Bag as required (time needed approx. 1h)
- Weekly: Service wood gasifier (time needed approx. 30min)
- Every 4-6 weeks: Vacuum gas reactor and remove slag (time needed approx. 4h)
- Every 21 days: Minor CHP service (oil change, replace filters: time needed approx. 1h)

LOCATIONS

Areas of application

- Customers with high annual heat consumption
- Industrial businesses
- Forestry and agricultural businesses
- District heating networks
- Hospitals, hotels, swimming baths (open year-round)
- Drying facilities (wood and building materials, sewage sludge drying, paint shops)



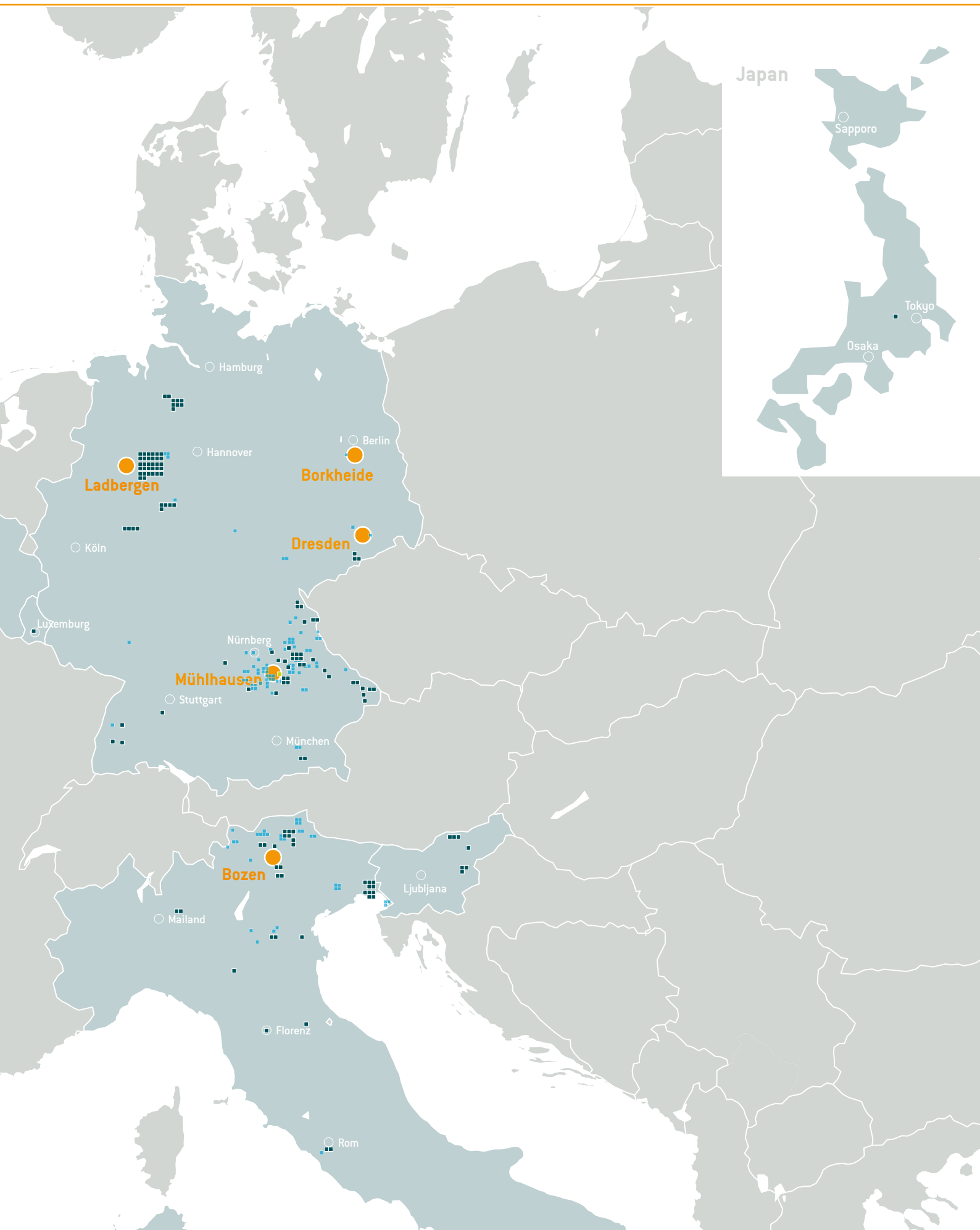
● Burkhardt office

○ City

■ Wood gasifier V 3.90 & CHP

■ Wood gasifier V 4.50 & CHP

■ Miscellaneous CHPs



REFERENCES



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1 | Josef Ziegler sawmill

At Josef Ziegler in Plößberg they rely entirely on wood. Apart from the approx. 250,000 cubic metres of round timber, which is further processed each year, we also use the renewable raw material there for energy generation. Apart from the wood gas CHP plants already installed in 2012, another two plants were added in 2014. Together with the two pilot-injection engines, the present spark-ignition engines achieve a total output of approx. 690 kWel and 1.06 MWth with availabilities of up to 95%!



2



3

2 | Rhyse poultry farm

Ninety kilometres south-west of Birmingham (England) is one of the first wood gasifiers V 4.50 with smartblock 50 T, which supplies Co2-neutral energy to a poultry farm with eight poultry houses. The 50 kW electrical energy is used completely for own needs and simultaneously relieves the existing heat generator of 110 kW by means of the generated heat.



4

3 | Bioenergie Schnellingen

Great emphasis is put on regional value creation in the Kinzig Valley (Black Forest). This is also the case in Haslach, where Burkhardt supplies a variety of customers with heating by means of wood gasifiers and natural gas CHPs via a district heating grid, including several industrial companies, various single and multiple family houses as well as a market garden and hotel with a wellness area. The routes of the fuel are also short: the wood pellets stem directly from the immediate vicinity.

4 | Wood gasification and ORC in Meran

Since 2012, two wood gasifiers V 3.90 together with CHPs have been performing their work there. Directly connected to the heating network of a construction market, it is thus supplied with sufficient heat. Furthermore, an ORC plant with an additional 40 KW of electrical output is connected to the existing 360 KW of the Burkhardt plants as well as an absorption chiller for the cooling system of a seminar room and the offices of two neighbouring companies.



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