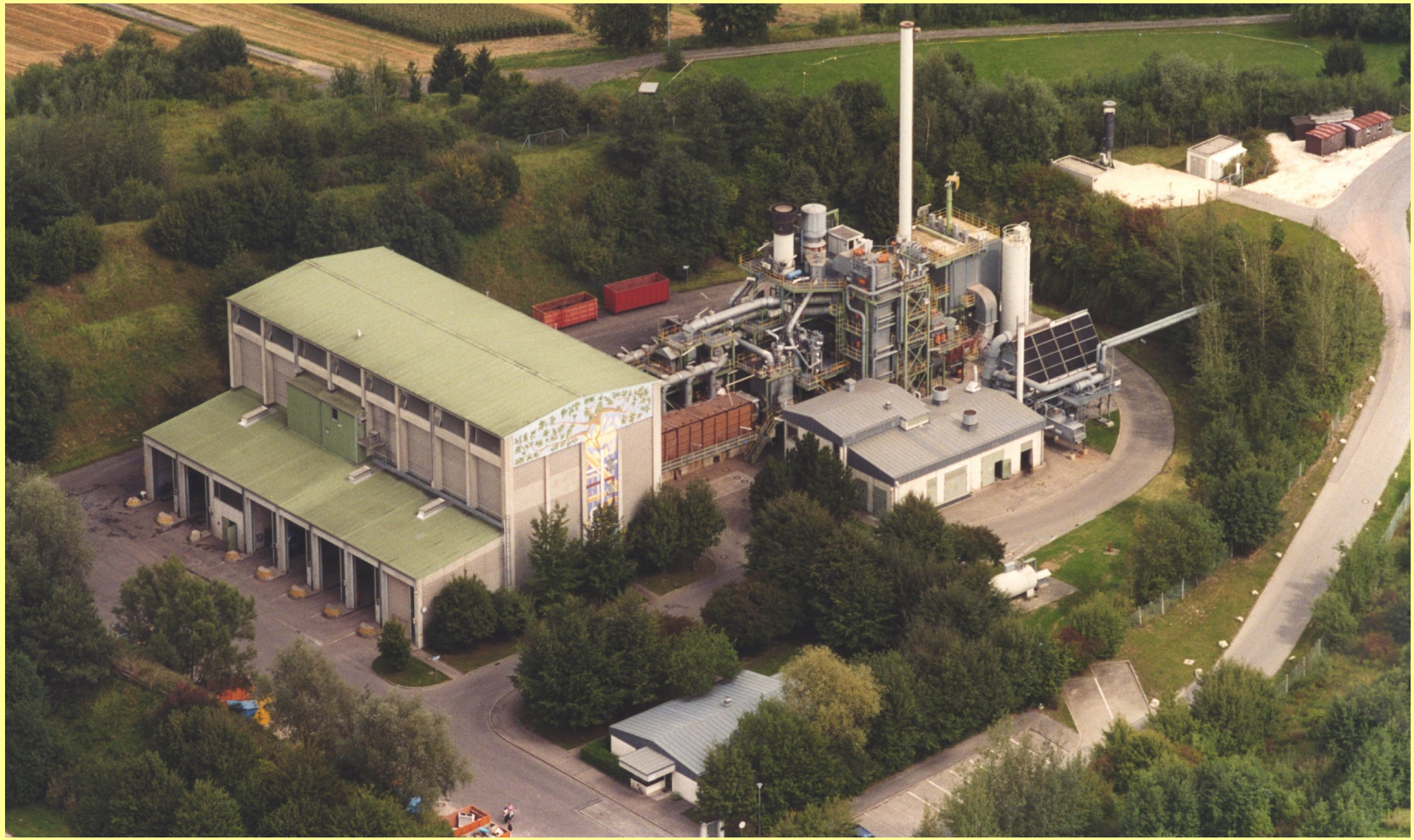
Burgau MW Pyrolysis Plant

Waste Pyrolysis Plant „Burgau“

Plant capacity 35,000 t/a



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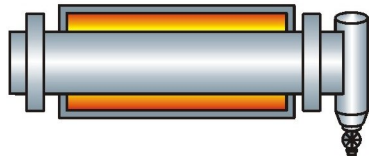


Waste Pyrolysis Plant „Burgau“

The waste pyrolysis plant was built in 1985. Since that time the plant processes the whole municipal and industrial waste, bulky waste and sewage sludge of the county of „Günzburg“ (approx. 100,000 inhabitants).

Until 2001 the waste pyrolysis plant „Burgau“ has been the worldwide only commercial plant for domestic waste that assures the complete waste disposal of a county in continuous operation.

More then 20 years experience in operation with this commercial plant reflects a fully developed and approved process with a safe operation and a high availability.

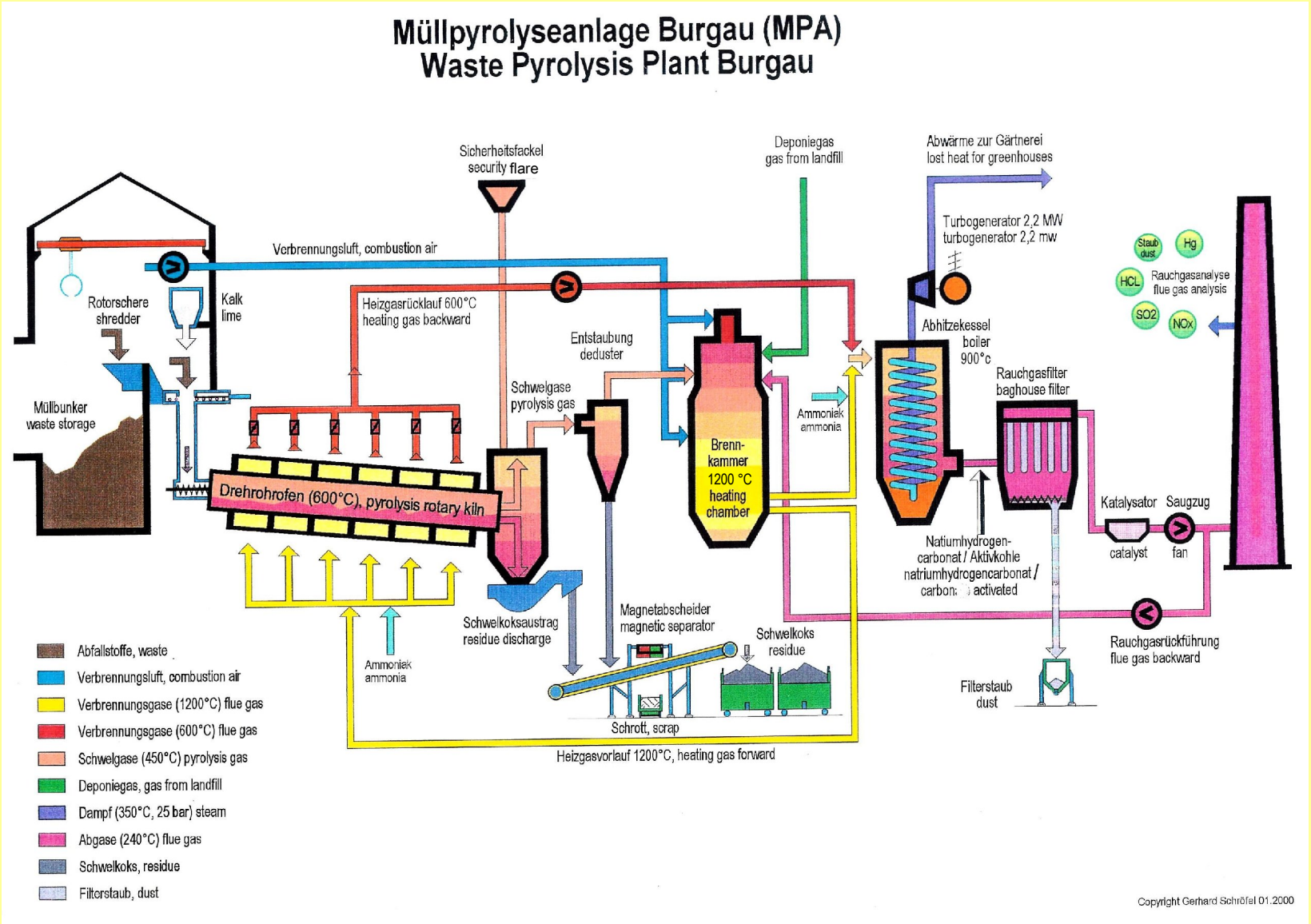
Up to the time of erection the plant emissions were approved in accordance with „TA-Luft“. With the 17. Federal Immission Control Ordinance (17. BImSchV) coming into force, a retrofitting of the plant was done to be in compliance with the more strict limit values for pollutants in the flue gas.
Because of the special characteristic of the pyrolysis process the process requirements for the retrofitting were extremely low and therefore cost-saving.
The gain in experiences since the installation of the supplementary equipment shows that the safe compliance of the limit values are achieved and particularly fall below clearly.

Today the waste pyrolysis plant „Burgau“ still is a municipal plant and belongs to the most economically waste management plants for municipal waste materials.

The following figure shows a schematic configuration of the waste pyrolysis plant „Burgau“.

Burgau MW Pyrolysis Plant

Schematic Flow Sheet



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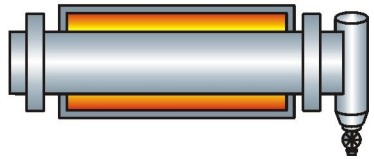


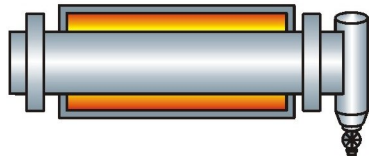
Process description

Pre-treatment of waste materials

The waste pyrolysis plant „Burgau“ processes municipal and industrial waste, bulky waste and sewage sludge in two rotary kiln, each with a capacity of 3 t/hr. This waste materials are delivered and thermal treated at the ratio of 20,000 t/a municipal waste, 3,000 t/a industrial waste and 5,000 t/a sewage sludge.

Municipal, industrial and bulky waste is delivered by waste collecting vehicles and discharged into the coarse waste storage bin. From the waste storage bin, the waste mixture is picked up by a crane, discharged onto two alternatively operated rotor cutters and cut to pieces with edge lengths of approx. 30 cm. From the rotor cutters, the material is delivered via appropriately arranged chutes into the fine waste storage bin.

The sewage sludge is delivered directly into the fine waste storage bin. A crane mixes waste and sewage sludge in order to obtain a highly homogeneous mixture.



Process description

Feeding of waste materials

The mixture is charged by the crane out of the fine waste storage bin into the feeding hoppers of the charging devices of the two rotary kiln incinerators.

From the feeding hoppers, a speed regulated plate conveyor and a belt conveyor transport the waste to the feeding chute. The feeding chute consists of a gas-tight slide gate valve and a chute.

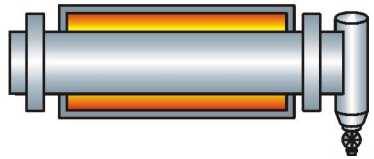
As soon as the maximum filling level is reached – monitored by a radiometric level indicator – belt and plate conveyors are switched off and the gas-tight gate above the feeding chute is closed.

A feeding screw arranged downstream the feeding chute conveys the waste mixture into the pyrolysis kiln.

At the same time, about 12-20 kg of quicklime per ton of waste are fed into the kiln.

As soon as the filling level reaches a minimum, the feeding chute gate opens and feeding via belt and plate conveyors starts again.

Burgau MW Pyrolysis Plant



Process description

Pyrolysis of waste materials

The pyrolysis process of the waste materials takes place in two indirect heated rotary kilns. The kilns have a heated lengths of about 20 meters and an inner diameter of about 2.2 meters. Both rotary kilns are operated at slight negative pressure of about 100 Pascal (10 mm WC).

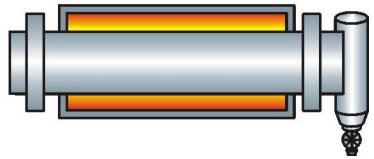
The two rotary kilns are heated indirectly with flue gas from the pyrolysis gas incineration having a temperature of approx. 1,200 °C.

The flue gas is led around the kiln shells via a stationary muffle and cools down to about 600 – 650 °C at the muffle outlet. The sealing between the stationary muffle and the kiln shell is executed as a slide ring sealing.

The outer surface of the rotary kilns is heated to a temperature of about 650 °C. In the first third of the kiln shell the waste materials are mainly dried. But afterwards in the following two thirds it is heated up to the actual process temperature of about 500 °C.

This is where degasification and decomposition of organic matter takes place and where a pyrolysis gas and a solid residue are generated.

Burgau MW Pyrolysis Plant



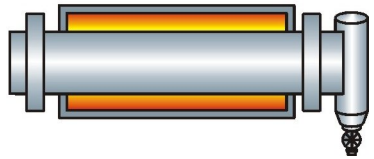
In the front part of the kiln, lifting blades arranged in reverse order provide greatest possible surface contact between waste and kiln wall surface without increasing dust formation by agitating the waste.

A shutter blade arranged at the rear part of the kiln makes sure that it is filled with waste material to about 15 %. Heavy residues are discharged by a device arranged in front of this shutter blade.

The speed of the rotary kiln and the residence time of the material within the kiln can be set to 30 minutes up to 2 hours (average 1 hour). This residence time and the pyrolysis-temperature guarantee an inert residue free of organic compounds only with a small amount of pure carbon.

Approx. half of the gaseous pollutants formed during the pyrolysis process, such as hydrogen chloride, hydrofluoric acid and sulphur compounds react already within the rotary kiln with the quicklime added during feeding. Thus, the flue gas resulting from pyrolysis gas incineration needs only a minimum of cleaning.

The resulting reactant of the quicklime added is discharged with the solid residues.



Process description

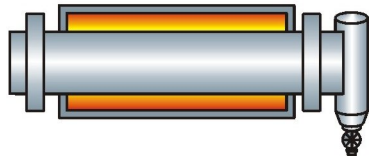
Discharge of solid pyrolysis residues

Solid residues of the pyrolysis process are removed via a wet discharger. The pyrolysis gas is sealed from the atmosphere by the water level in the discharger.

The solid residues, having a residual humidity of 30 to 50 % and a temperature of 40 to 50 °C are transported to the residue silo by a conveyor belt that is connected to each of the two kilns

Directly in front of the low temperature coke silo, coarse ferrous components are extracted by an overhead magnetic separator, discharged into a container for recycling. These components make up 5 to 10 % of the total pyrolysis residues.

The containers filled with pyrolysis coke and cyclone dust are then transported to the county's pyrolysis coke dump, near by the pyrolysis plant.



Process description

Pyrolysis gas dedusting

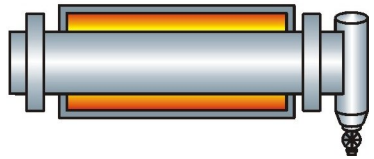
The process gas generated during the degasification (pyrolysis gas) is led from the top end of the discharge housing to hot gas cyclones where the dedusting takes place.

The cyclones efficiency is about 70 %, that equals to a removal of about 80 to 100 kg of dust per hour and kiln.

The separated dust, having a temperature of about 450 °C, is discharged through double pendulum flaps and added to the pyrolysis coke via cooling screw-type conveyors.

The cyclones are cleaned from fine dust fouling at intervals of about four hours.

To avoid condensation of pyrolysis gas components all gas containing components, including the cyclones, are electrically heated.



Process description

Incineration of pyrolysis gas and energy usage

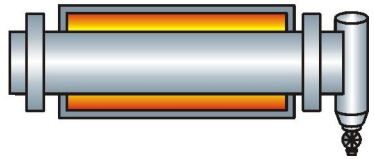
The pre-dedusted pyrolysis gas of the two rotary kilns is extracted and charged to the common combustion chamber where it is incinerated with an excess air of approx. 5 to 8 %, at a temperature of approx. 1,200 °C.

Optimum combustion conditions are created by the homogeneous fuel pyrolysis gas generated in the rotary kiln during pyrolysis of the waste mixture, and combustion chamber temperatures considerably higher (1,200°C) than in conventional grate incinerators. Therefore, the flue gas contains only small quantities of carbon monoxide, dioxins, furans and hydrocarbons, and only simple treatment for reduction of these pollutants is required.

A part of the flue gas from the combustion chamber is first used for heating the rotary kiln. The remaining flue gas as well as the recirculated heating gas – cooled down to approx. 600 to 650 °C – are fed into a waste heat boiler.

In this boiler, steam at 25 bar and 350° C is generated from the feasible heat of the flue gas and sub-sequent drive so a turbine-generator for power generation.

Burgau MW Pyrolysis Plant



Process description

Flue gas treatment

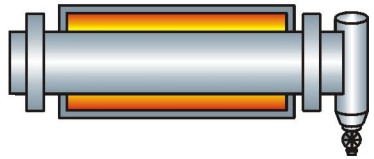
To reduce the NOx content in the flue-gas a SNCR-Denitrification is used. Therefore an urea solution is added via water cooled nozzles to the hot flue gas between combustion chamber and boiler. At that temperature urea degenerates to ammonia. Ammonia and NOx from the flue gas generate molecular nitrogen and water, thus the values fall below the required limits clearly .

For reducing the quantity of combustion air and thus NOx emission, approx. 5,000 m³ of treated flue gas are returned to the combustion chamber by a fan.

The flue gas, cooled down to approx. 200 ° C in the boiler, is dedusted in a fabric filter.

By adding a mixture of sodium bicarbonate and activated carbon upstream the fabric filter the remaining gaseous pollutants and mercury are absorbed and adsorbed. This simple technique warrants the compliance with the emission limits.

Burgau MW Pyrolysis Plant



Because of adding quicklime into the rotary kiln and the resulting partial bonding of gaseous pollutants the flue gas values for pollutants are clearly below that one of conventional incineration systems.

As a result of the higher basic reactivity of sodium bicarbonate compared to other reagents a small quantity is sufficient to fall below the required limit values.

The bags of the fabric house filter are cleaned by compressed air activated by a pressure difference measurement. The removed dust is collected and charged into a silo. After conditioning, this is taken to an underground deposit.

After treatment, the flue gas is led to the stack by an induced draught. This induced draught fan controls the pressure profile of the plant, activated by pressure measurements within the kiln unit.

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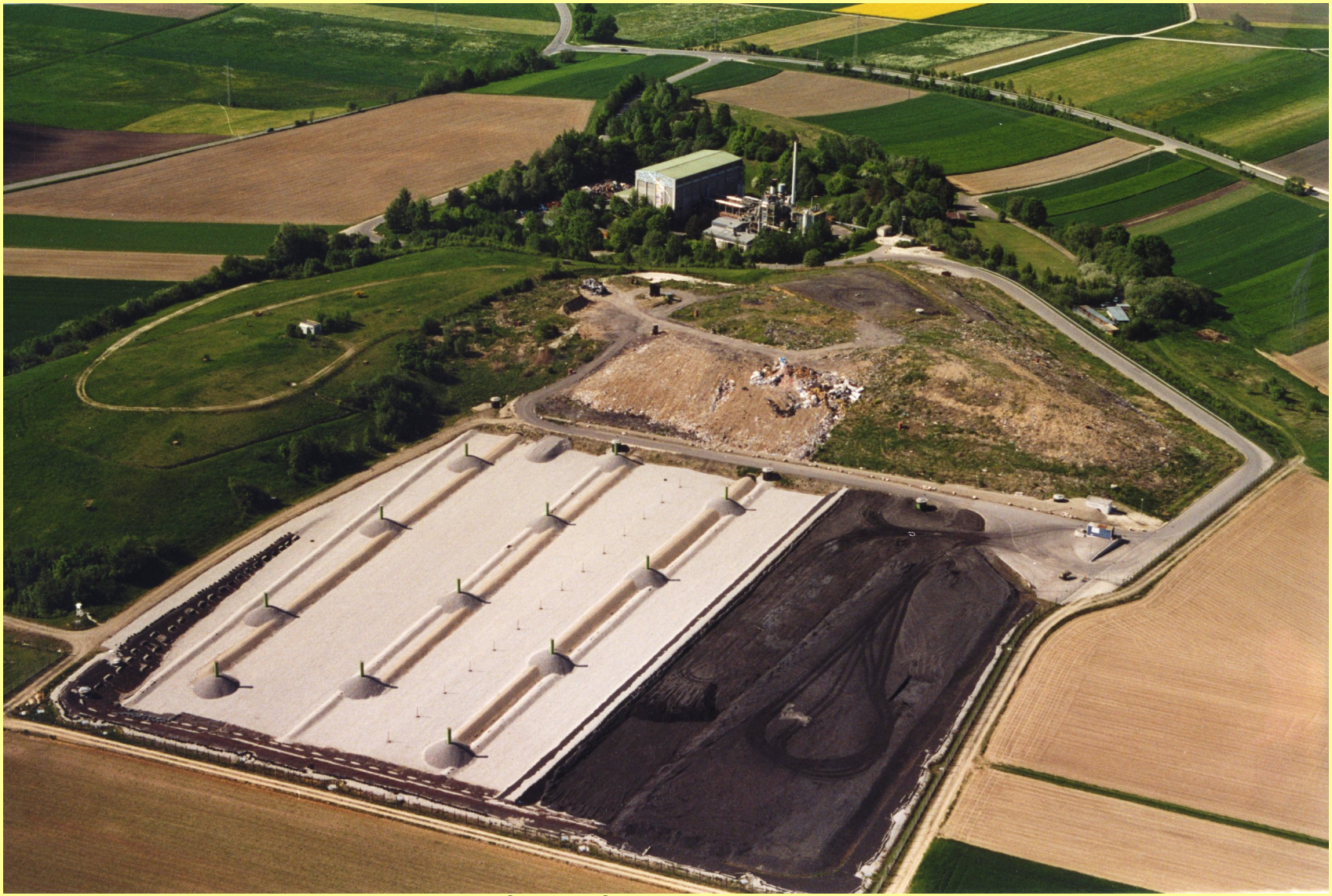
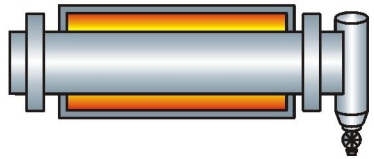
Burgau MW Pyrolysis Plant



Waste pyrolysis plant „Burgau“ and landfill area for solid residues



Characteristics of the waste pyrolysis plant „Burgau“

Waste materials

Area of refuse collection	County Günzburg, 762 m²
Number of inhabitants	120,000
Waste quantity	35,000 t/a
Types of waste	Residual domestic waste Commercial waste Bulky waste Sewage sludge
Caloric value of waste	Average 9,000 kJ/kg maximum 11,000 kJ/kg minimum 6,000 kJ/kg
Waste analysis (average)	Moisture 25 % Inorganic fraction 30 % Organic fraction 45 %

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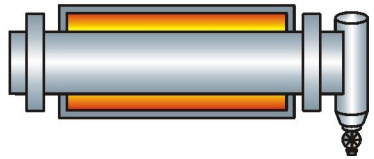

Characteristics of the waste pyrolysis plant „Burgau“

Rotary kiln, Combustion chamber, Power generation

Number of rotary kilns	2
Dimensions of rotary kiln - Shell diameter (inner) - Heated shell length	 2.2 m 21 m
Flue gas temperature in combustion chamber	1,200 °C
Flue gas temperature upstream the boiler	900 °C
Flue gas temperature downstream the boiler	200 °C
Steam parameters - Temperature - Pressure	 350 °C 25 barg
Power generation	max. 2.2 MW
Turbine type	Condensation
Heat recovery	Recovery by condensation and hot water supply for greenhouses in the neighbourhood

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Müllpyrolyseanlage (MPA) Burgau

Waste Pyrolysis Plant Burgau