HAFNER®

RENEWABLE ENERGIES

THERMAL TREATMENT PLANTS

BIOMASS AND WASTE

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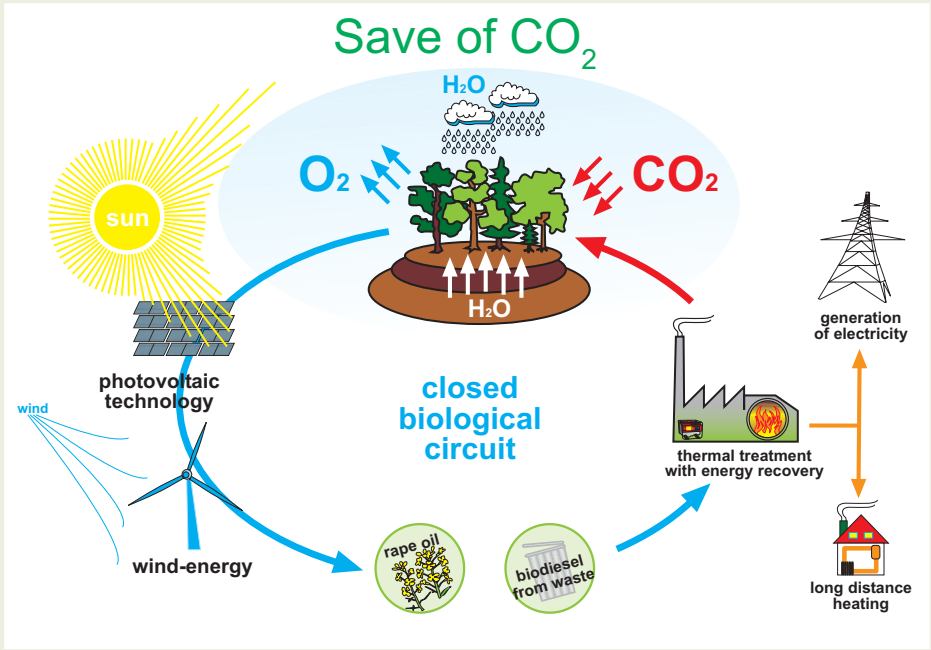
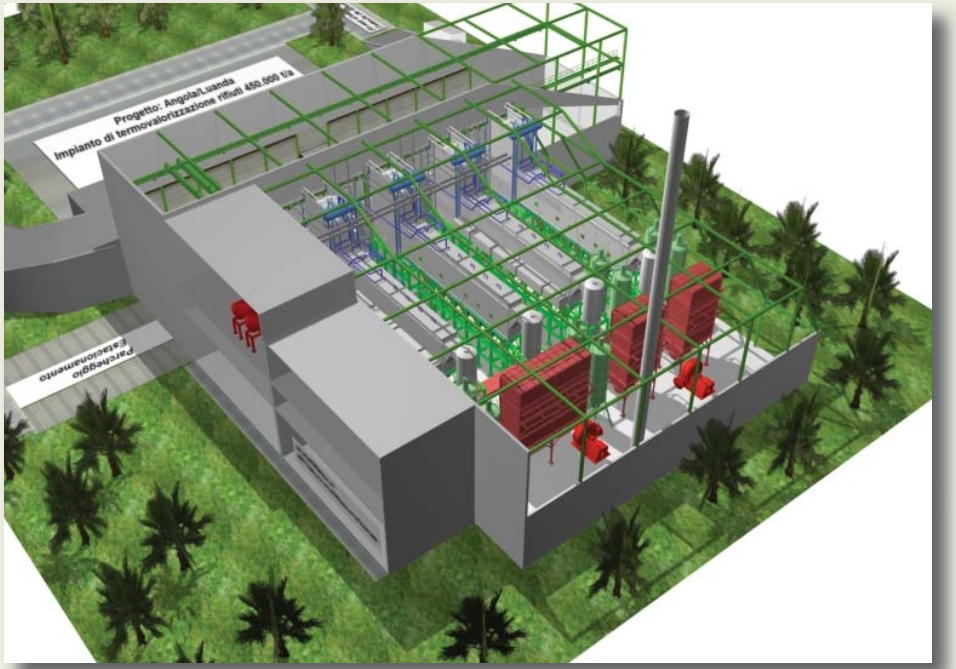
The waste management of the last few decades has left to us and to the following generations a hardly definable number of ecological time bombs.
In future depositing untreated waste will be stopped while the time has come for ecologically and economically sensible thermal waste treatment. So the way to sustainability starts right now.
The biogene parts in waste amount to more than 60%, thus contributing indirectly to the reduction of CO_2-emissions.

HAFNER realizes facilities for the energetic management of biomass and waste.
These plants are an important and valuable contribution to climate protection providing for safe waste management and accurately obeying the law.
For incineration they mainly use two systems, typical of the Hafner technology: grates and rotary kilns.
Hafner is a medium-sized company based in South Tyrol, with independent subsidiaries in Germany, Austria, Croatia, and Poland.



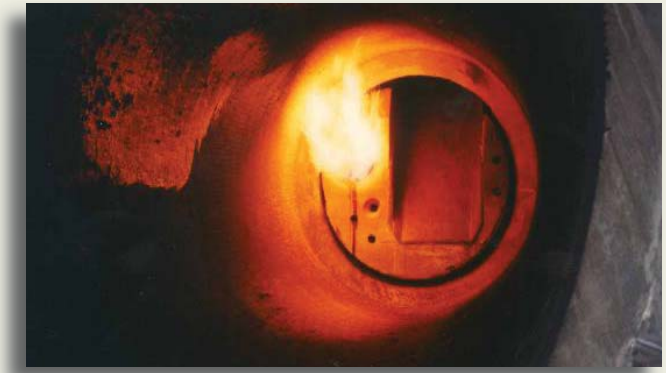


HAFNER collaborates directly with the independent subsidiary based in Winnweiler (Rheinland-Pfalz, Germany) and is mainly engaged in projects in Germany but also in the new accession countries and overseas.

HAFNER Group offers cost effective solutions which allow energy recovery from as waste, biomass, sludge etc.

Its biomass power stations put the HAFNER Group right in the middle of a growing field of interest: it keeps concentrating on the realization of facilities ready for putting into operation for the thermal treatment of municipal solid waste as well as industrial and medical waste, also sewage sludge and biomass, usually by means of water-cooled grates and rotary kilns.

Based on our experience and in cooperation with our partners we have developed a system for the thermal recovery of waste and biomass that complies with the situation new European directives.

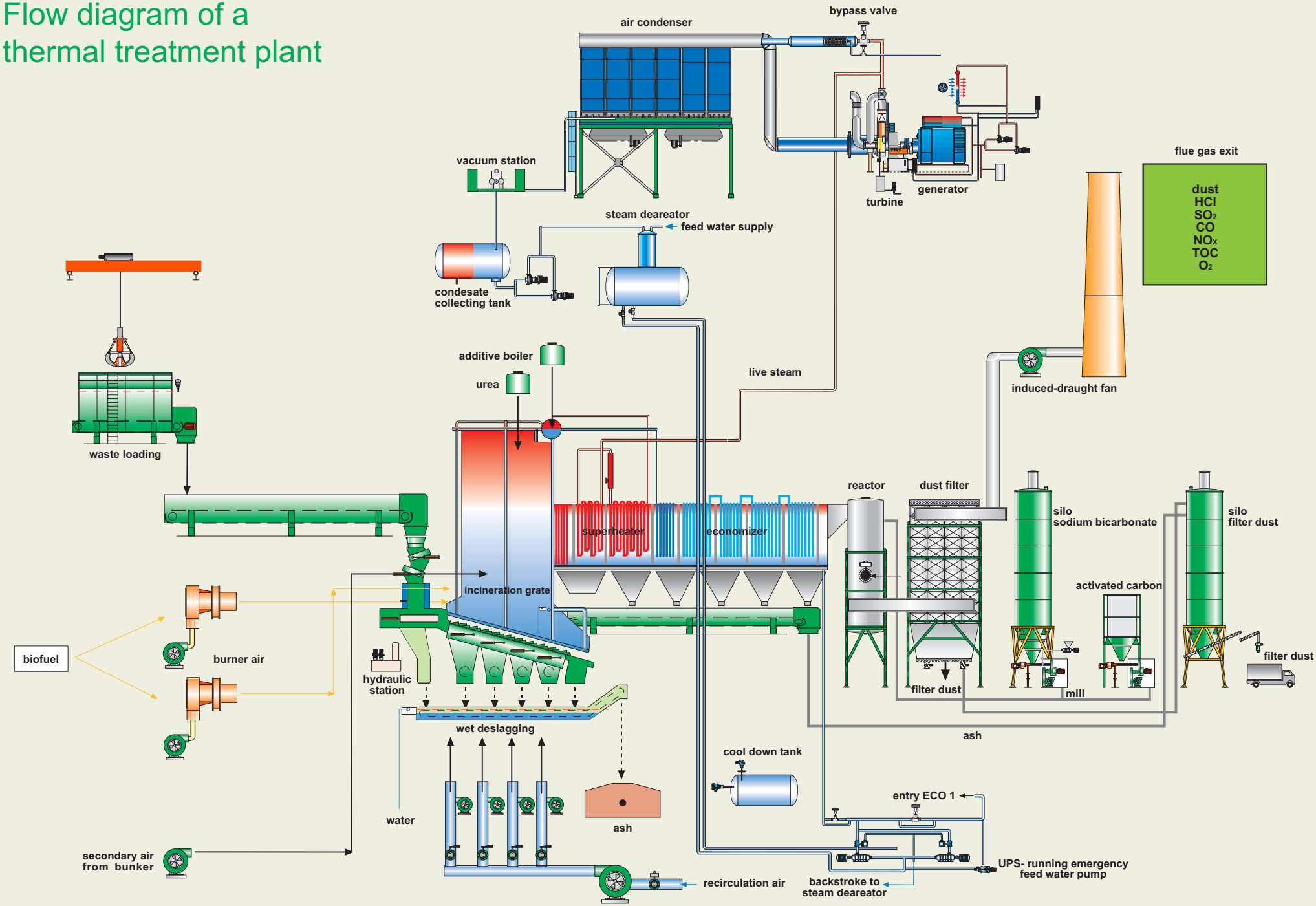


HAFNER develops individual thermal plants tuned to the clients' demands. The facilities are equipped with proven and sure technology, based on "incineration grate" or "rotary kiln". The plants are also characterized by low operational costs and reasonable investment costs.

We produce facilities for the thermal treatment of:

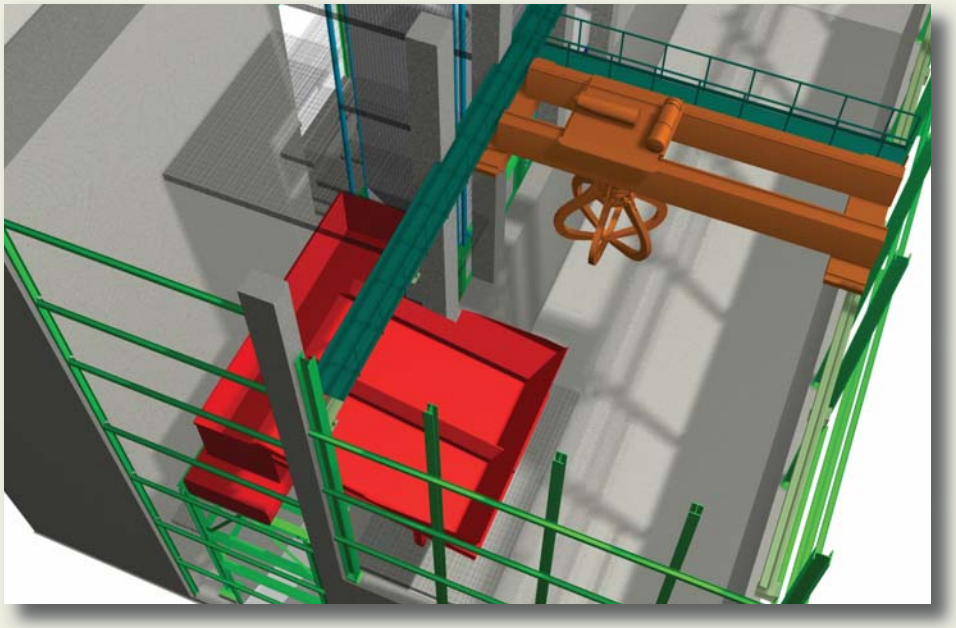
- household waste
- biomass
- hazardous waste
- hospital waste
- sewage sludge
- liquid waste

Flow diagram of a thermal treatment plant



Waste bunker

Grab



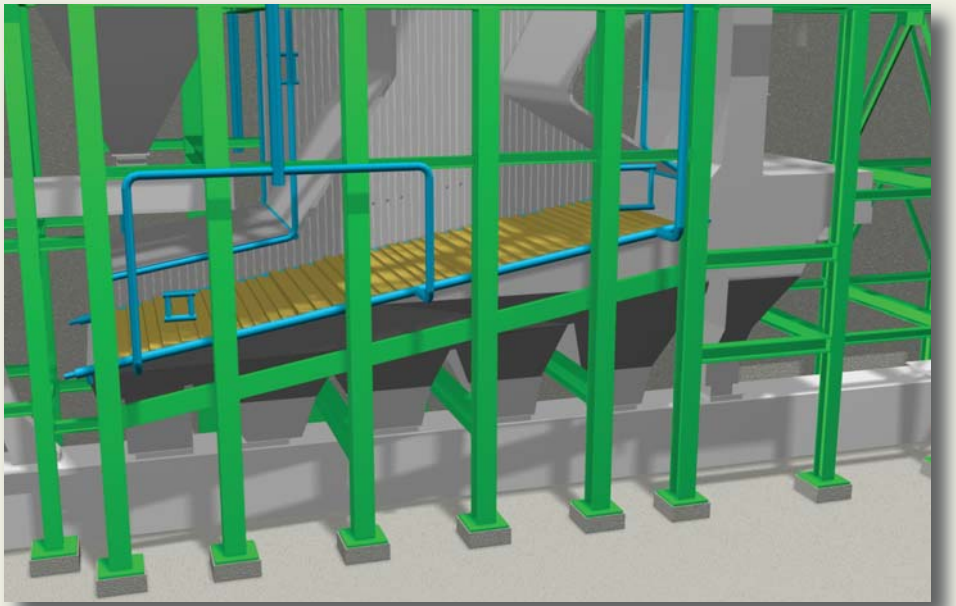
Waste feeding

The material is tipped from the delivery vehicles into the bunker. Thanks to a rolling gate with light barrier controlled by a key-operated switch fuel can be delivered also when the facility is not being operated.
For the bunker management and the feeding of the kiln a bridge crane is used. With its runways and trolley the crane can reach over the entire bunker area. The grab is moved by the lifting gear and can be operated manually, by radio or automatically.
A hydraulic slide conveys the material through the feeding duct onto the incineration grate.

Incineration grate

The feeding grate has four parts. It is driven hydraulically via proportional valves, just as it happens in the feeding cylinder.

The feeding changes from one grate segment to the other by tuning the cycles.



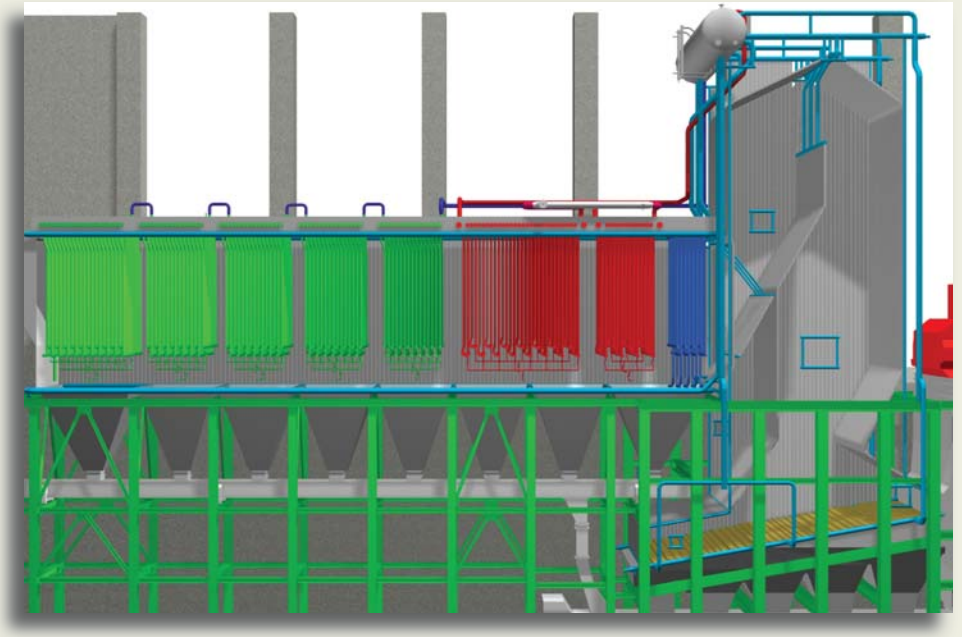
First the combustion-flue gases are pushed upwards.

The gases are then diverted and pushed downwards to the evaporator, the superheaters 1 and 2 and finally to the 5 economizers.

The evaporator heat exchange surfaces work according to the natural circulation flow.

Boiler

The boiler consists of various membranes in order to produce saturated steam.



Planning and production of boilers

HAFNER calculates, plans and produces complete steam boilers of 5 – 150 tons with a pressure of 10 -110 bar and a temperature of up to 450°C.

Boiler and steam drum

The feedwater flows first through the economizer heat exchange tube bundles and then through the economizer air pre-heaters, where it is heated before finally flowing into the steam drum. The steam drum is placed on the boiler roof.

Flowing through draught tubes the water reaches the membranes where water is transformed from liquid to gas.
The resulting saturated steam is conveyed from the steam drum directly to the superheater.

Recirculation of flue gases

By means of correction factors the number of cycles per grate segment against slag production is being adjusted in a declining manner, the feeding speed thus decreasing towards the end of the grate.

The aim is, to guarantee the constant covering of the grate with waste and slag as a protection against overheating. The number of cycles of the grate segments is managed by the kiln master controller.

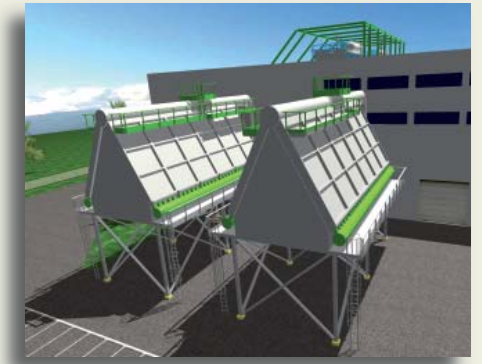
By its movement the feeding grate has a poking effect which improves the burn-out.

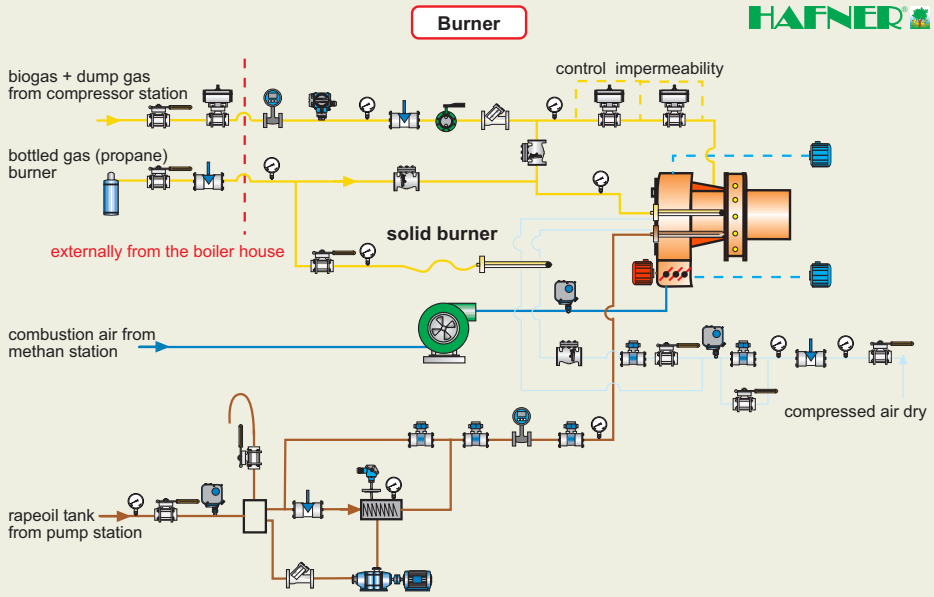
Part of the stream of flue gases is being mixed with primary air which helps to reduce the NOX emissions and to lower the grate temperature.
The recirculation air blower is being put into manual operation mode, the amount of air being defined by speed pre-selection.

Generally speed regulation can also occur automatically in relation to kiln temperature.

Condenser

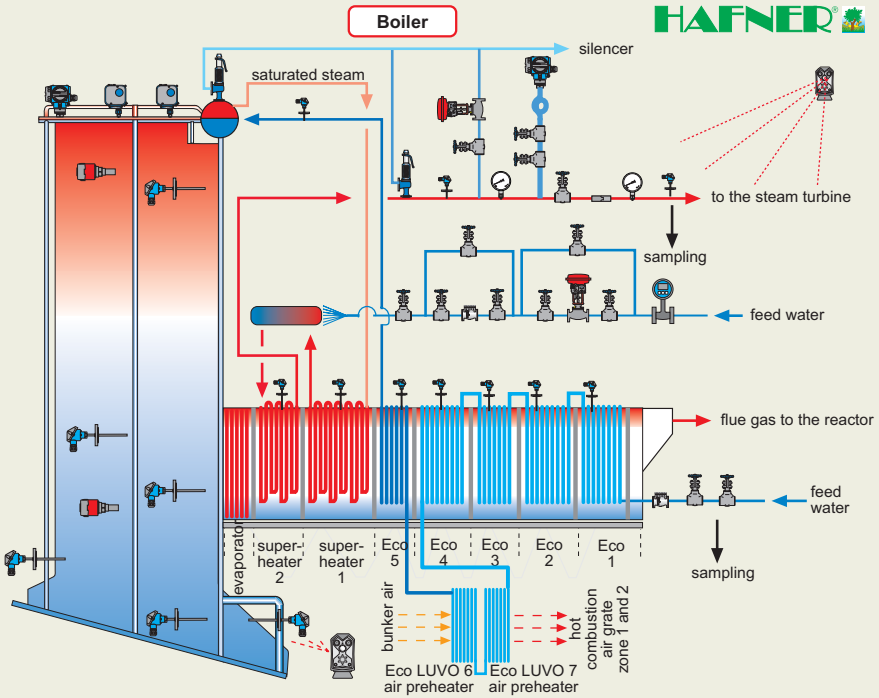
This view shows the back coolers on the roof of the boiler.
The steam coming out of the turbine is being changed from gas into the liquid state of matter by being cooled and transformed by the condenser. The steam passes through various bundles of fluted tubes which are streamed on with air by fans from outside.
In the feed water tank (with de-areator) the condensed water at a temperature of 50°C - 55°C is heated up to 104°C before being led back to circulation.





Burner

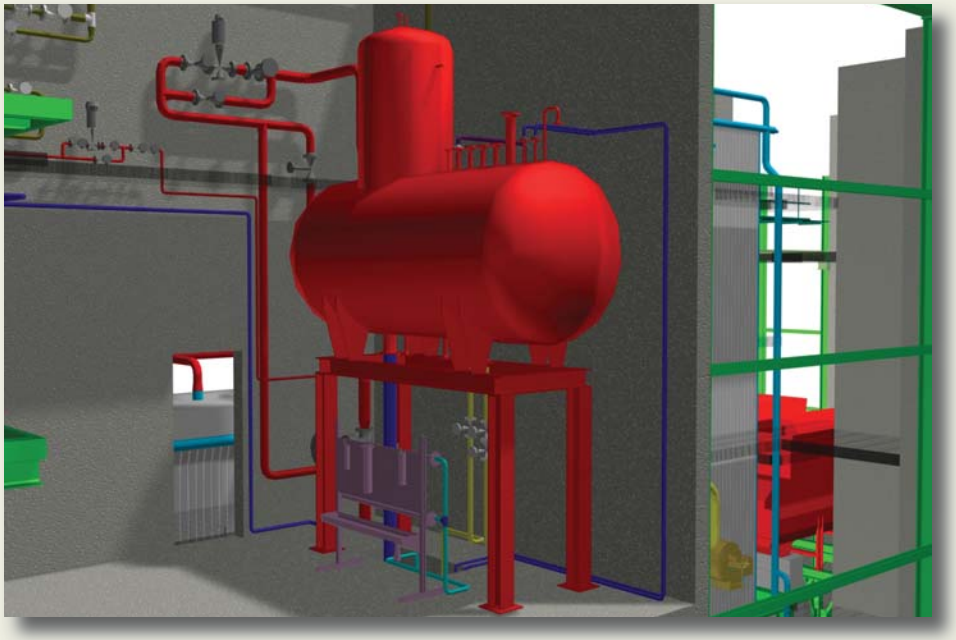
*(Dumeco ultrasonic burner)



Function of the boiler

Saturated steam purged from the boiler drum reaches the first and then the second superheater.

Between the two superheaters the steam is cooled by a water-spray-system, which regulates steam temperature, and conveys it to the turbine.

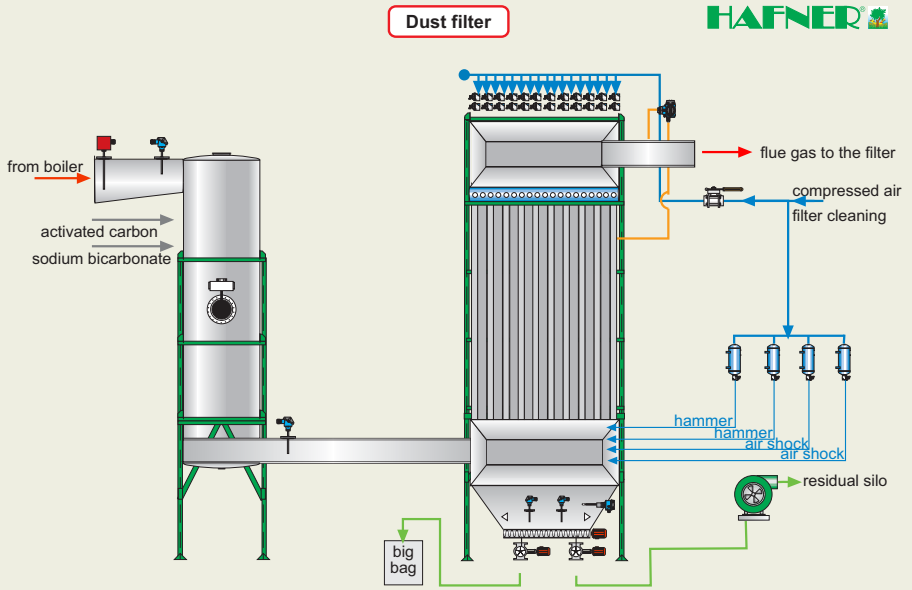


Steam deareator

The feedwater tank consists of a tank and a manhole to degasify the boiler feedwater.

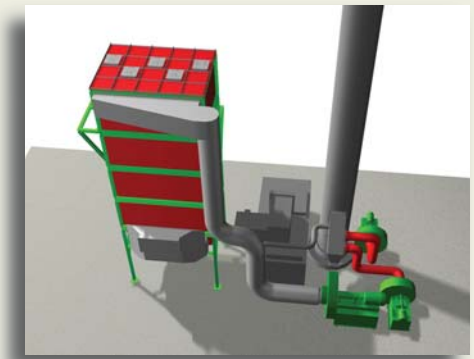
The water supply in the boiler is granted by the pumps of the feed-water tank feeding water through the economizer entry.

Condensed water (approx. 50°C) flows from the air cooler into the feedwater tank and is heated up to 104°C by injecting steam (extraction turbine). The blowdown water is replaced via the pumps.



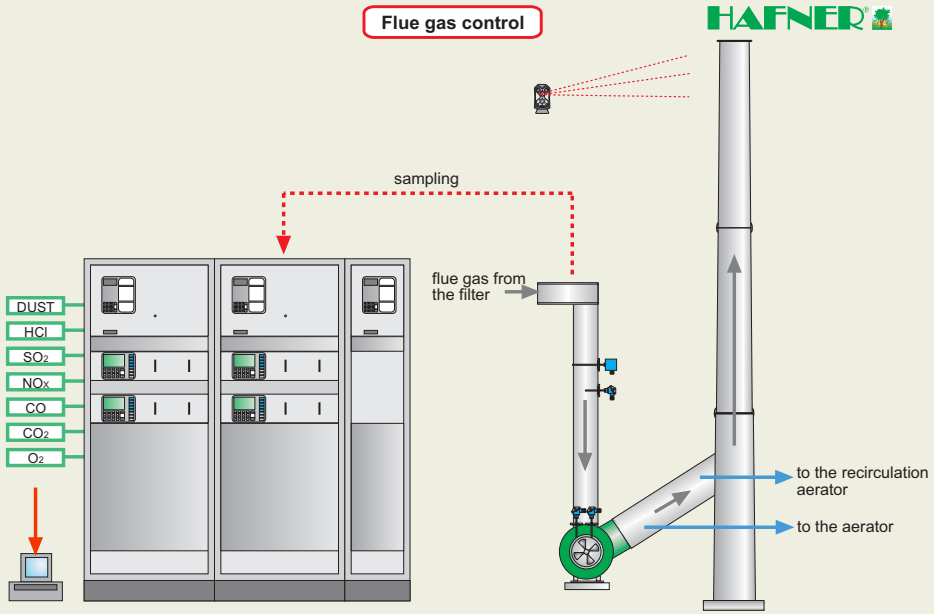
Dust filter

Fly ash falls down on filter bags hanging in the dust filter. Compressed air is periodically blown onto the filter bags (impulse-jet-system) making fly ash fall down into the hopper of the dust filter before being ejected by a spiral-like screw.
Process guidance system starts off the cleaning process by means of compressed air once the pre-selectable differential pressure is exceeded.
The cleaning process triggered off automatically by the “filter cleaning” device. The hopper is also provided with “air-shocks”. Blowing in compressed air prevents the formation of dust bridges.



Cleaning of exhaust gases

After the boiler the flue gases are introduced into the upper part of the reactor which is a vertical vessel. The additives sodium bicarbonate and activated carbon can be added to the flue gases through nozzles inside the reactor before the conditioned flue gases exit at the bottom of the reactor, reaching the ensuing bag filter. There is a control flap on the upper part of the reactor. In case of overheating, according to the measurement taken in waste gas flue after the reactor, this flap opens in order to lower flue gas temperature thus protecting the bag filter (filtration plant).



Rotary kiln plant

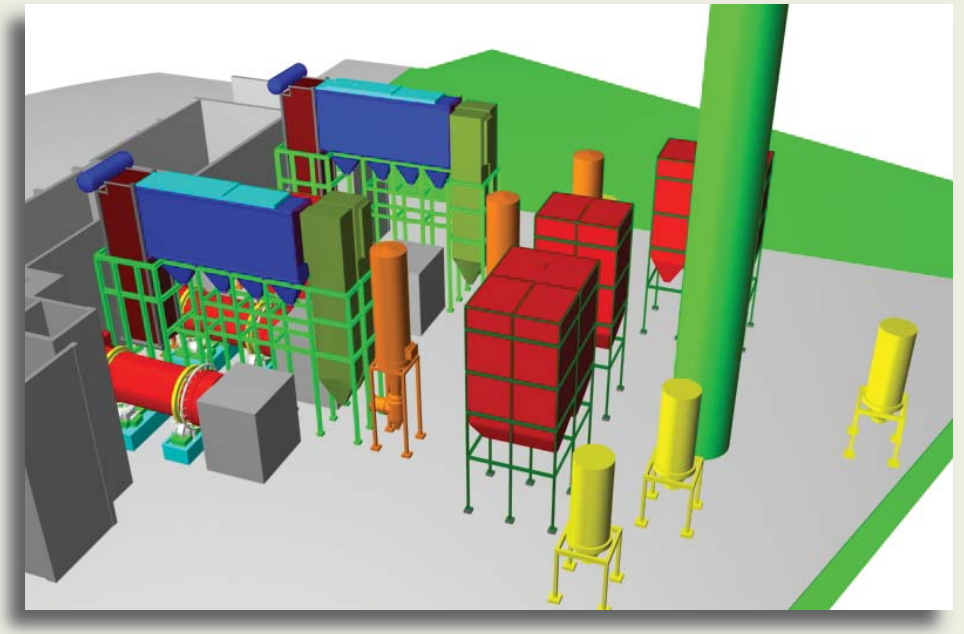
The rotary kiln incineration plant can basically be divided into the following parts:

1. waste feeding
2. incineration in rotary kiln and afterburner chamber
3. waste heat reuse
4. cleaning of flue gases
5. emission measurement

Waste loading

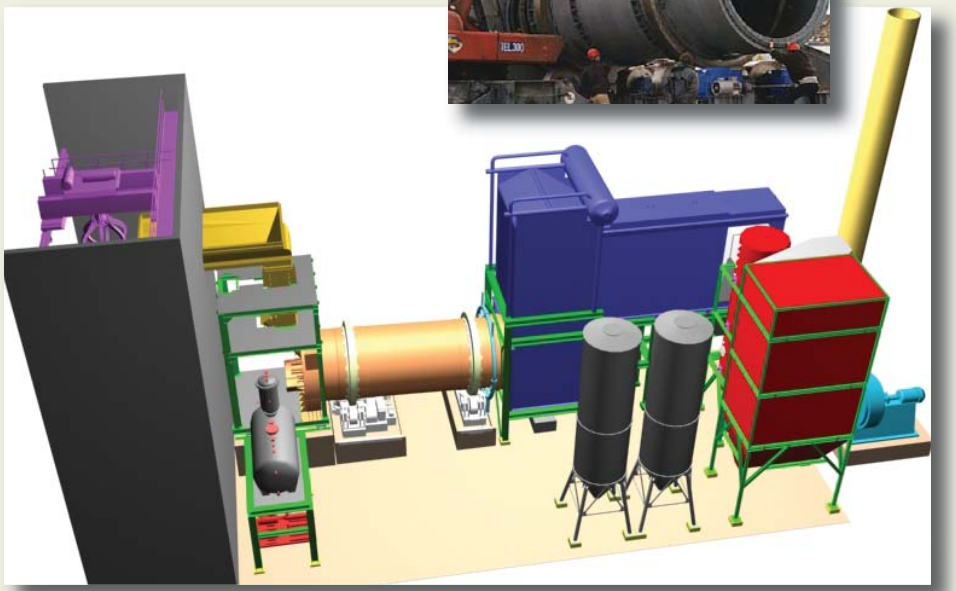
The given waste menu usually consists of not reusable household and industrial waste. After delivery the waste is weighed and registered before being conveyed into the corresponding bunker.

When doing so the waste is fed into the bunker via delivery chutes. If necessary the waste is cut in a shredding machine.
With the hydraulic grab of the waste crane the waste is mixed, homogenized and transported towards the feeding chute. The storage capacity of the waste bunker is of approx. 5 days if fully operated.
Exhaust air from the bunker is withdrawn by suction via the primary air ventilator and is led into the rotary kiln as combustion air. Shredded waste is being continually transported into the combustion chamber by means of an O_2-regulated screw conveyor.



Rotary kiln

By means of the feeding spiral-like screw conveyor waste is fed into the brick-lined rotary kiln for incineration. Every rotary kiln module has a capacity of 25,000 t/a. Operational capacity per unit is of 3.5 t/h with an incineration temperature of 950°C.
In the projected operational model the arising exhaust gases stream in the opposite direction of the kiln into the afterburner chamber. Rotating speed and the feeding are regulated by a temperature- and oxygen tube.
Through various nozzles primary air is being injected causing increased turbulence and guaranteeing good oxidation. At the end of the kiln a burner has been installed which is ignited only at the beginning (or in case of decreasing waste with low heating capacity). The slag resulting from incineration falls into a water bath at the end of the kiln. With a chain conveyor the sintered material is transported into a container (33m³). Every rotary kiln has a length of some 15 metres and it is erected on an 18-metre-long building module (container).
If required and depending on menu and incineration temperature glazed slag can be produced as incineration product. To do so the rotary kiln is run “in parallel flow”.



Afterburner chamber

Hot flue gases flow from the rotary kiln into the afterburner chamber where they are held for about 2 seconds at a temperature of 950°. Fly ash is collected in a spiral-like screw conveyor at the bottom. Secondary air is being injected by an O_2-controlled fan.

Heat exchanger and boiler

At the exit of the afterburner chamber there is a flue gas heat exchanger which has two main tasks: on the one hand it cools the hot flue gases down to about 700°, on the other hand it heats the cleaned flue gases up for NOx catalytic preparation.
Flue gases are cooled down from 700° to 300° in a steam generator, the resulting heat being reused for warm water, steam or electricity.
The waste water resulting from the exhaust gas cleaning process is collected in the water spray reactor from which it is directly injected into the hot flue gas (300°C). Consequently, water evaporates while the solid particles (salts) are separated in the bag filter.

Burner

The burner, placed on the front of the rotary kiln, is a multi fuel burner (gas, liquid) disposing of its own draught.

An interconnection system adds proportional quantity of air and gas.

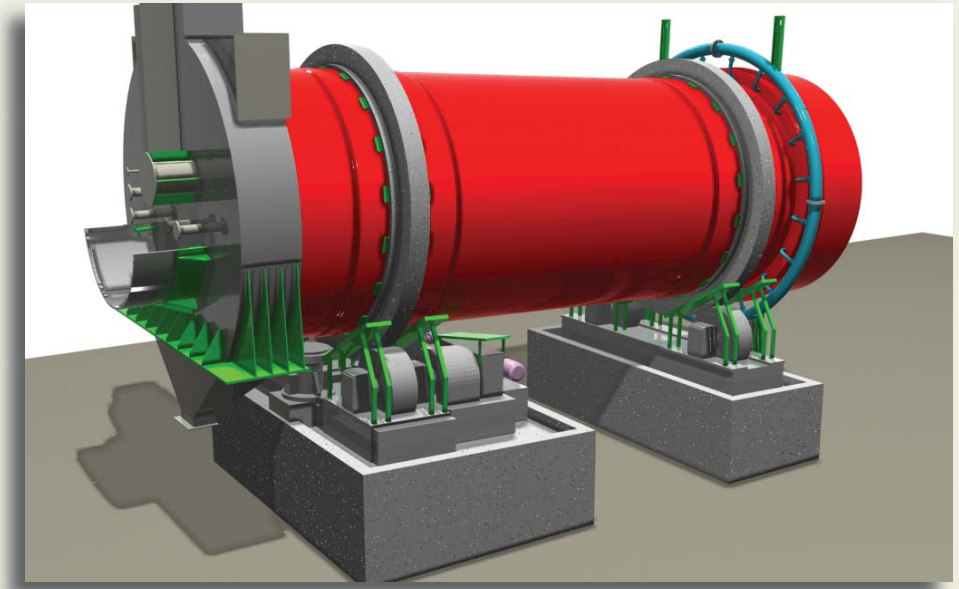
Every burner disposes of the checking equipment and shut-off arrangements required by law.

Fuel pressure and combustion air pressure

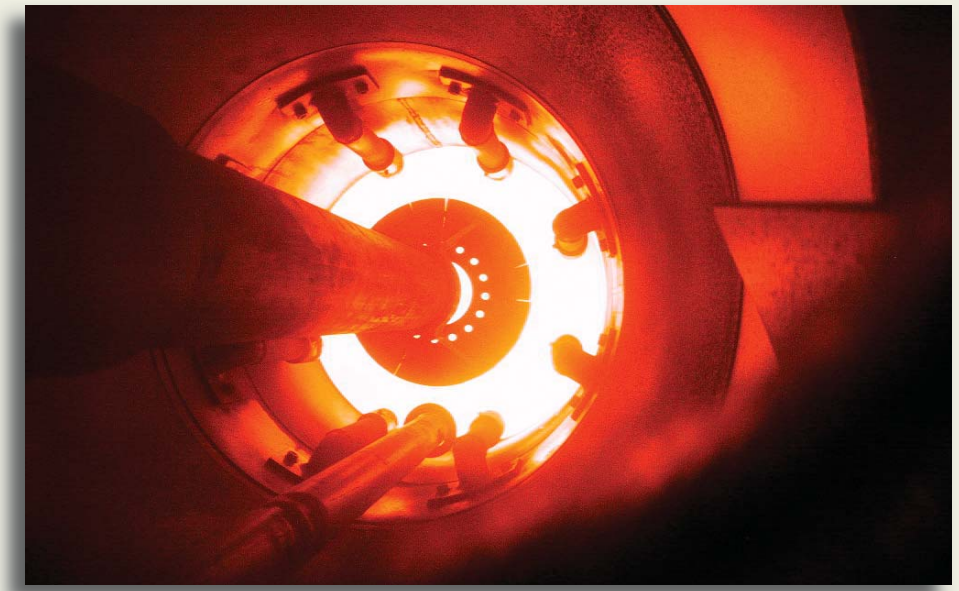
Burner draughts are set off by activating the automatic “burner air” system or automatically when the kiln temperature exceeds 300°C in order to avoid the overheating of the air feeding unit.

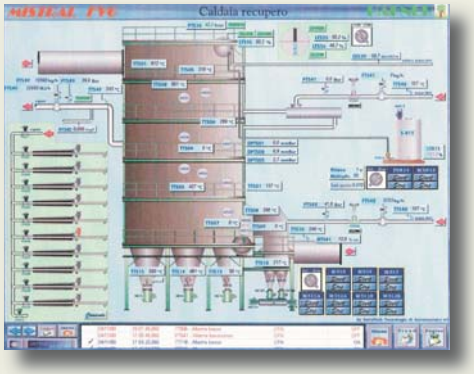
Burners are operated automatically.

The temperature in the burning chamber can be regulated according to burner set values indicated by the control system.



Rotary kiln with burner





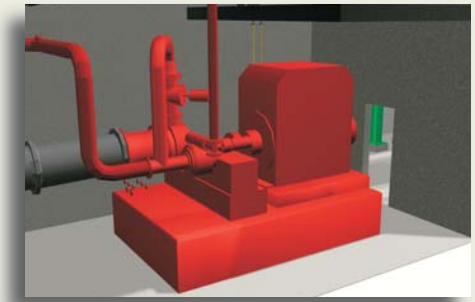
In case of powdery dust or increased temperature at the bottom of the boiler in spite of low frequency vibrators the ultrasound cleaners are activated. The ultrasound cleaners, too, are regulated by an operation – break time control system providing for a periodical cleaning of this part of the boiler.

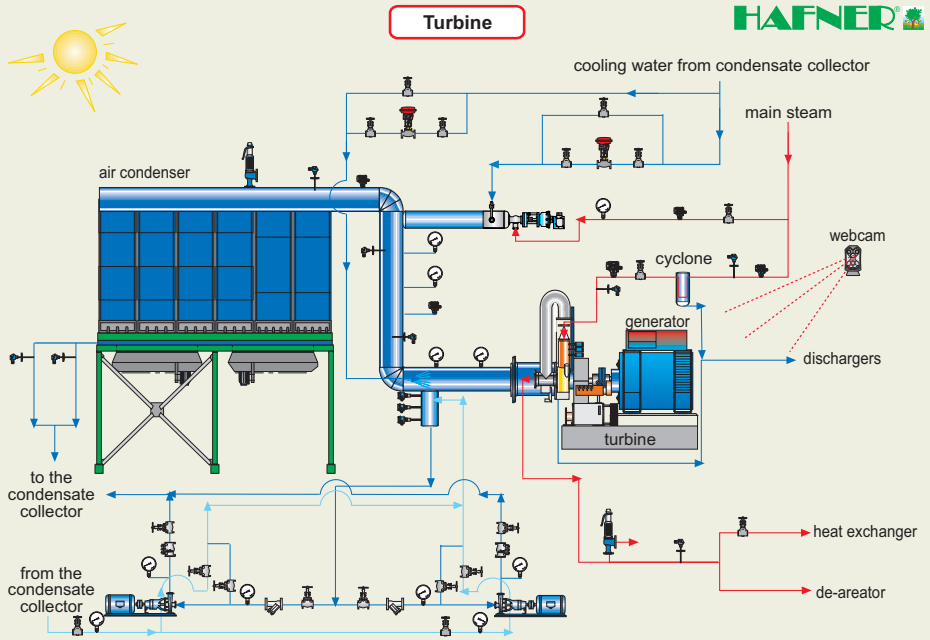
Ash removal from the boiler

Our cleaning procedures foresee the installation of low frequency vibrators for the superheater and economizer of the kiln. Low frequency vibrators are periodically activated in accordance with an operation – break times control system, cleaning the boiler from boiler ash. Beneath the ends of the boiler's hoppers there is a drag link conveyor taking the boiler ash away.
The ECO part is additionally provided with an ultrasound cleaner.

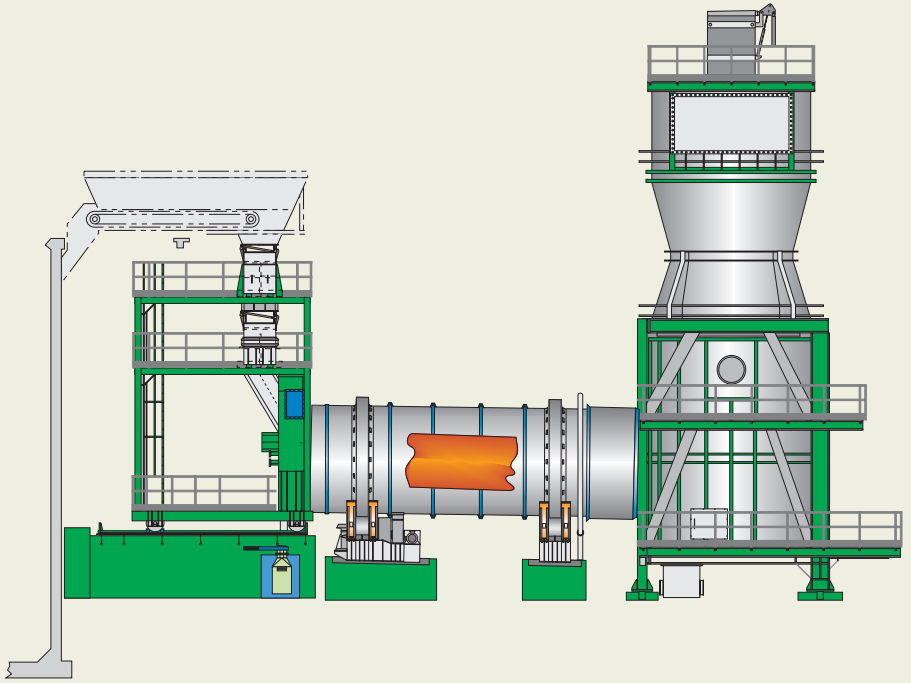
Steam turbine

The steam turbine consists of a high-pressure and a low-pressure part. Between them there is the extraction steam valve aimed at various users. Depending on quantity, pressure, and temperature the main steam moves the turbine wheel(s) and by means of a coupling the resulting mechanic power is transmitted to the generator.
The generator produces electricity which is supplied into the net via a transformer. Exhaust steam of 0.15 bar reaches the air condenser where it is cooled down and led into the feed water container as condensate.





Rotary kiln plant with burner/Rack



Rotary kiln plant with afterburner chamber

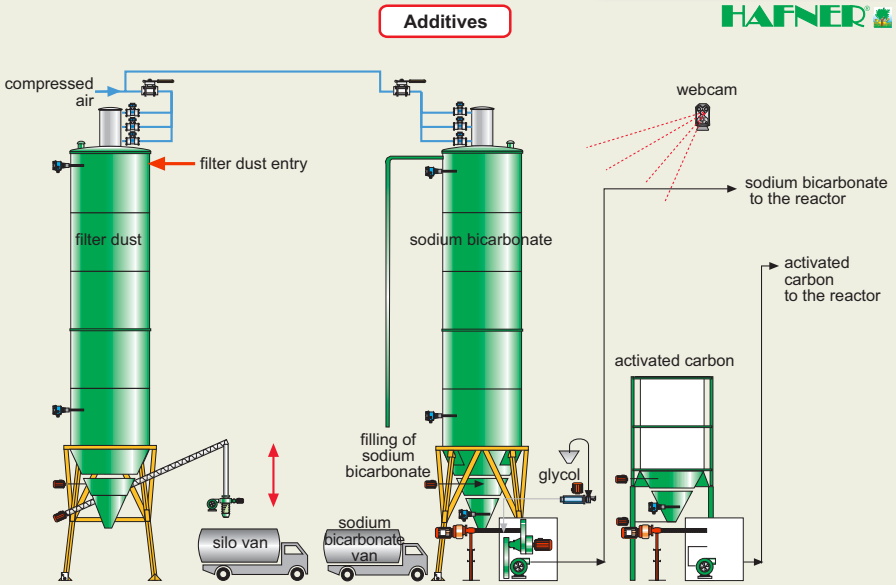
Feed regulation of the additive
(Sodium bicarbonate)

The feed regulation of the additive takes place in a unit consisting of conveyor blower, rotor mill, and screw conveyor. The management system regulates the feeding quantity according to the revs-controlled screw feeder.

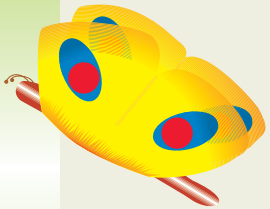
The sodium bicarbonate silo is provided with a vibration device. The management system starts both the operation – break time control system and the bottom ash filter placed on the sodium bicarbonate silo. This filter is needed for the system bleeding during the supply.

Activated carbon

Activated carbon is conveyed out of a big bag through a screw feeder and it is blown into the reactor via a rotary feeder and a blower. The automatic device “activated carbon” starts the management of the parts involved in the feeding regulation process.



Contacts



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