



ZANNI COMBUSTION GRATE
TYPE SR10S

for the combustion of
SEWAGE SLUDGE



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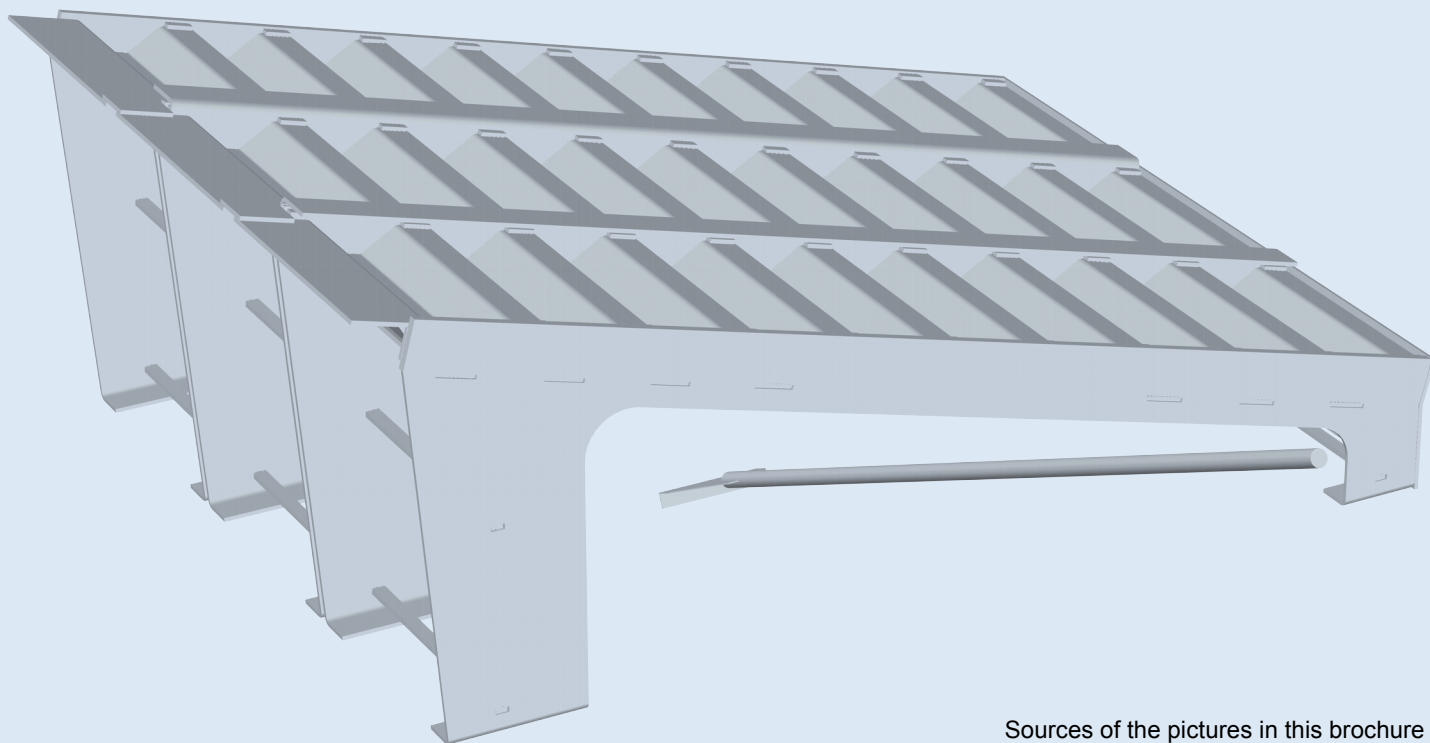
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Sources of the pictures in this brochure

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Essentials

Thermal waste disposal processes have become more important than ever. The handling of hazardous substances has held a mirror up to our eyes, especially in times of pandemics.

The first plants with closed firing systems and grates were developed for waste incineration around 150 years ago. The first waste incinerator was in the Paddington district of London in 1870. Since then the combustion technology has been further developed.

In the field of grate furnaces there were several developments which are still in use today, as well as rotary kilns and fluidised bed furnaces. Grate firing systems are used in almost all cases for the incineration of municipal waste and most hazardous materials, including for example hospital waste.



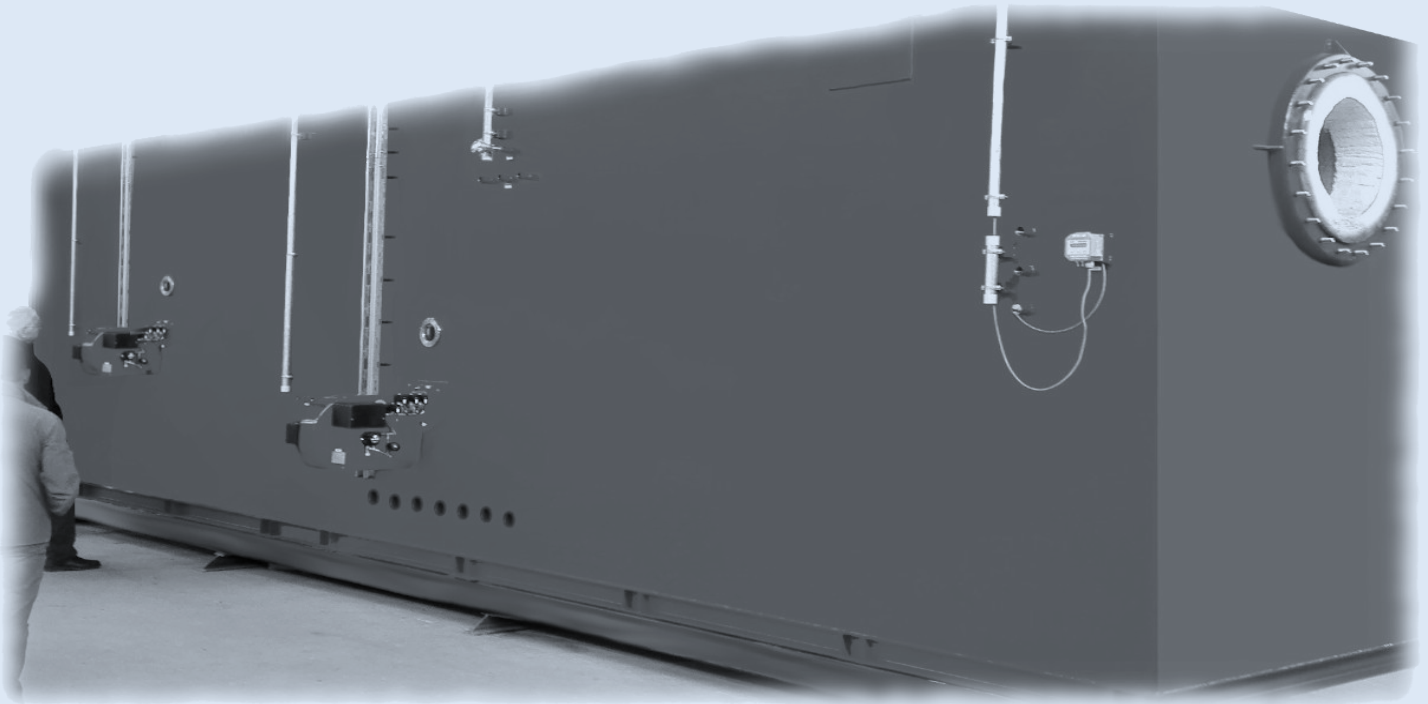
Picture by Ole Poulsen

Already since 1 June 2005, untreated municipal waste may no longer be landfilled in Germany and in other the EU countries. As there was insufficient capacity at waste incineration plants at that time, the high-calorific fractions were used as substitute or secondary fuels in industrial plants, such as cement factories and power stations.

This improved the energy balance of the industrial plants and led to a reduction in the volume of residues. In addition, organic and inorganic pollutants were destroyed and eliminated.

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Waste treatment in modern waste incineration plants makes it possible to mineralise the residual waste, reduce the volume of waste, save on landfill volume, reduce waste emissions (including methane, a dangerous greenhouse gas), remove harmful or hazardous components, provide thermal energy and, if there is sufficient thermal combustion energy, produce electricity.

In all incineration systems, complete combustion of the fuel takes place at temperatures above 1,000°C, preceded by a drying and gasification process. The incineration temperature achieved is determined by the calorific value of the waste and the excess air from the incineration.

The German 17th BImSchV for example defines the combustion conditions with regard to oxygen content, residence time and combustion temperature for environmentally friendly combustion, i.e. minimisation of emissions on the flue gas side.

A further prerequisite for environmentally friendly residual waste incineration is the disposal of the residual materials produced. This results in rust slag, boiler ash and fly ashes.

The ash content of the waste is determined by its composition and is generally between 15 - 35% of the waste throughput.

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The burnout of the residues that are led to incineration is influenced by the incineration technology, i.e. grate firing, rotary kiln or fluidised bed process.

The worst combustion results are achieved by systems without combustion grate, such as fix-bed or smooth surface burners. In this case there is a partly large amount of unburnt material in the ashes.

In all processes, the oxygen content supply to the burnable material and the residence time play an important role.

The ZANNI combustion grate

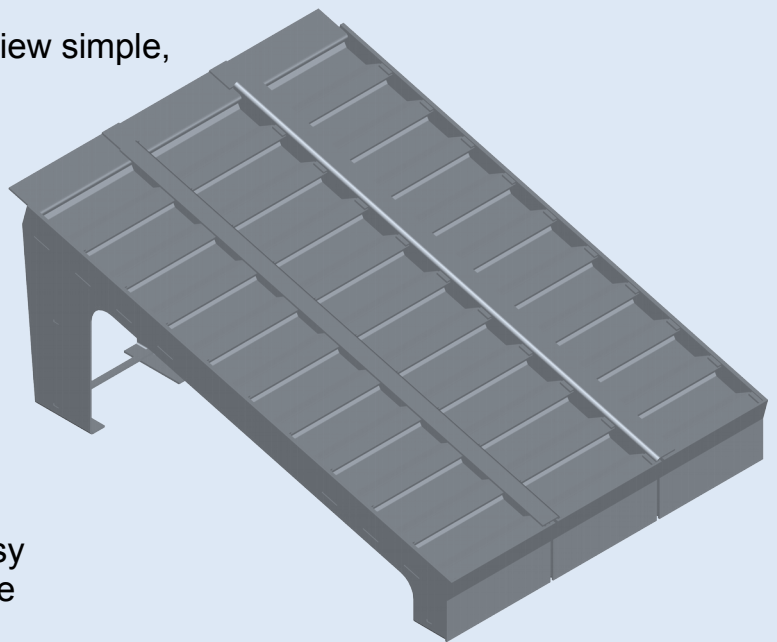
The ZANNI combustion grate is on a first view simple, but it is more a clever solution, because its technology advantage is lying in its details.

It offers a huge potential for the combustion process!

The grate area is very big and the supply with combustion air inside the combustible materials is optimal.

Because due to the clever supply of the needed oxygen into the waste it is also easy possible to control the residence time of the combustible materials.

Controlling of the incineration process at a maximum.
An extension of time can be reached with a minimum of effort.



Multi-Medium combustion grate

Due to the design of the ZANNI combustion grate it is suitable for solids and sludges.

- Solids could be for example municipally waste, industrial waste, clinical and other contaminated waste.
- The solid wastes could be also mixed with liquids.
- Sludges could be oily sludges, sewage sludge and others.

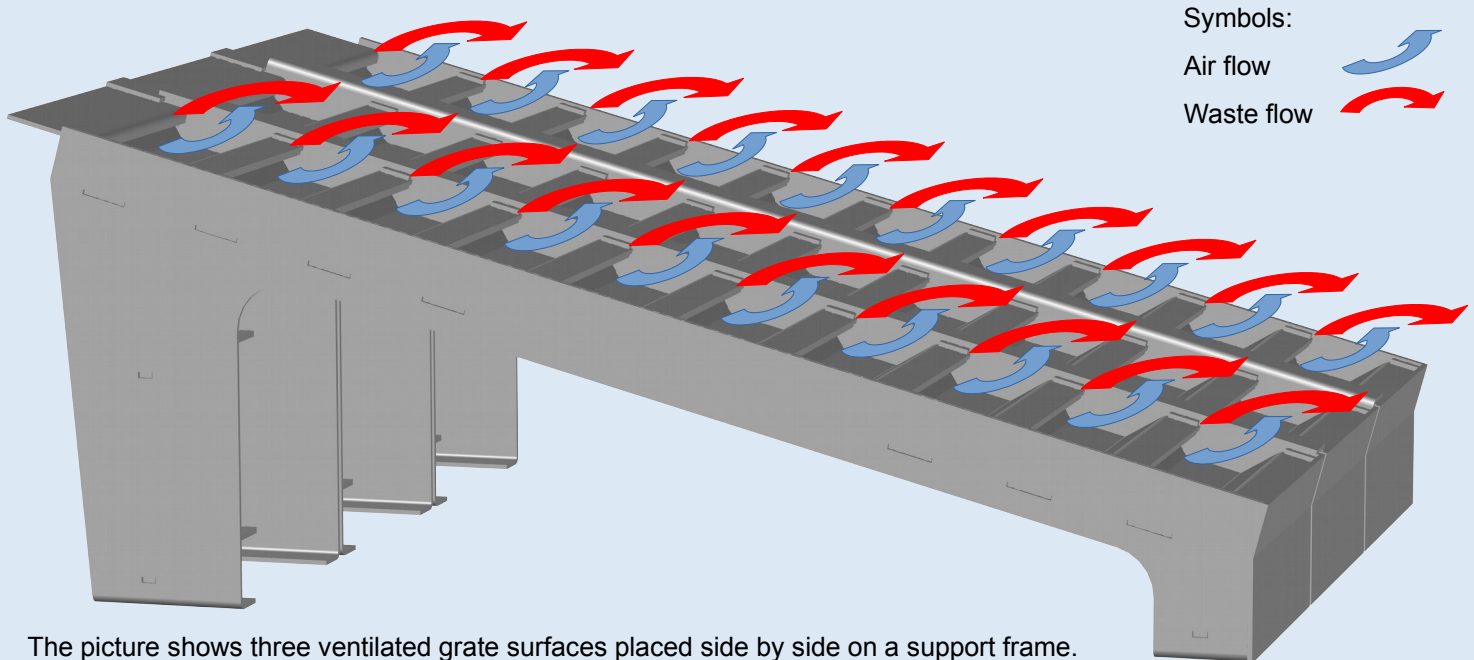
Criteria for the amount of waste fed into the incinerator are the composition of the combustible material and thus its calorific value.

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Functionality of the system

The heat resistant steps of the grate are equipped with air impulse slots, as a kind of nozzles.



The picture shows three ventilated grate surfaces placed side by side on a support frame.

The air swirl with a huge amount into the combustible materials and convey them along the grate. The swirling combustion air turns over the combustible materials, cracks it up and assist the whole combustion process. Therefore also a high throughput rate is achieved per unit area of grate.

The system allows the user to be flexible in the choice of load cases. Either mass throughput or residence time can be selected, depending on the application and, above all, on demand. Everything can be controlled by the air flow rate and air pulses. That is a giant step in the combustion technology.

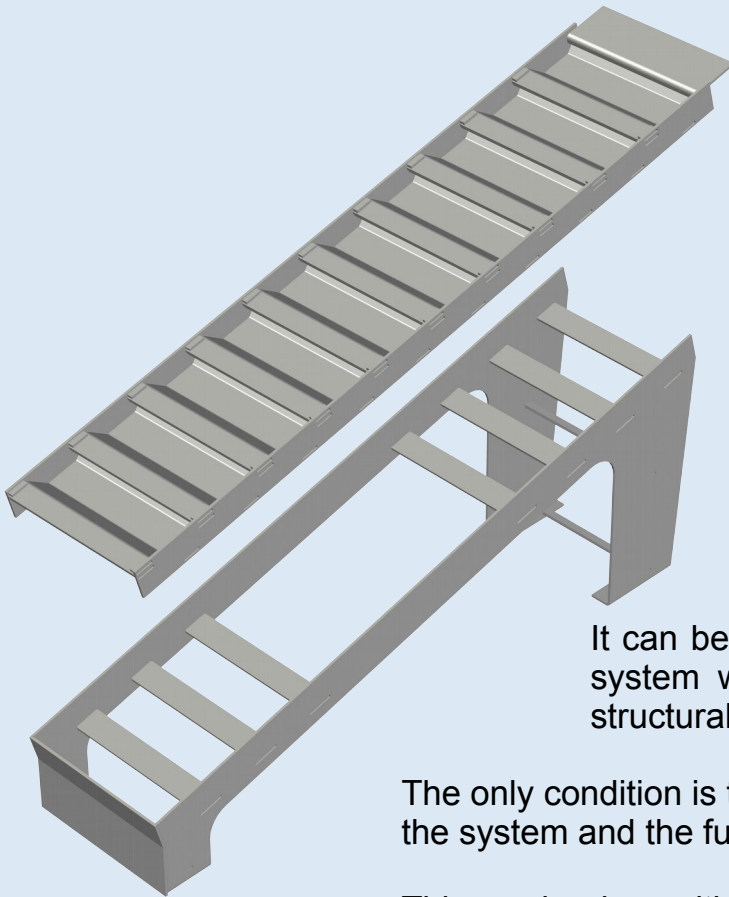
The grate can be described as:

- multi-medium combustion grate,
- suitable for solids and sludge, such as sewage sludge,
- simple but clever,
- rigid and strong,
- no moving parts,
- dynamic and efficient,
- high throughput rates,
- advantageous investment costs,
- advantageous operating costs,
- advantageous maintenance costs,
- designed as a wear part for easy replacement.

A large potential is contrasted with a small investment!

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Conversion or retrofitting of old plants

Especially in existing combustion plants, which have operation problems, an enormous advantage in operation conditions and environmental protection can be achieved with minimum effort for conversion or retrofitting.

The adaptability of the grate is obvious

Both the number of grate steps and the parallel arrangement of several grates allow the adaptation to constructual and local requirements.

It can be supplied both as a completely closed stand system with side parts and grate, or adapted to structural conditions as a pure combustion grate.

The only condition is that a sufficient air supply is ensured and that the system and the furnace are accessible for assembly.

This can be done either by yourselves or by us.

Incineration of critical waste as sewage sludges

Landfilling of untreated sewage sludge is no longer permitted by law in many countries. Incineration in waste or coal-fired power plants is required as a sewage sludge disposal method. However, a number of problems stand in the way of this requirement.

Firstly, the global and already existing incineration capacities are not sufficient for this purpose. In many places there are licensing problems for new incineration plants.

In addition, pre-drying units must be installed for incineration systems commonly used on the market. Incineration ashes still have to be disposed of and stored.

The incineration of sewage sludge offers many advantages.

It contributes to a more environmentally friendly disposal, in which organic pollutants are destroyed without leaving any residue.

In about 30 years' time, the world's reserves of phosphorus, an essential plant fertiliser, will be exhausted. The ashes of sewage sludge contain a high proportion of phosphorus, which can be recycled and reused in industry.

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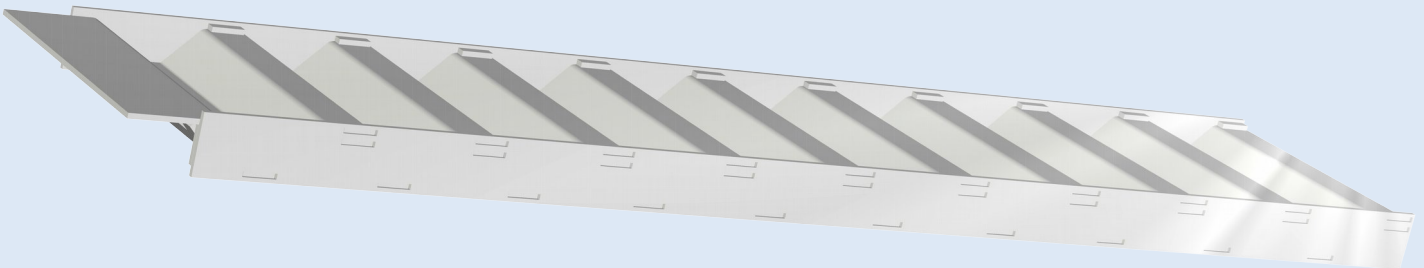
In addition, the thermal process can also be used to generate energy.

Interesting aspects of the system for the incineration of sludges

On this simple but clever combustion grate, the sewage sludge can be burned out to a maximum at high temperatures.

The ZANNI-Grate-Process makes it possible to thermally recycle sewage sludge easily and efficiently. The sewage sludge is dried on the combustion grate. The grate area is very big and the supply with combustion air inside the combustible materials is optimal.

The arrangement of the combustion shingles is designed for a safe discharge of the sludge via the combustion grate.



The combustion air cools the grate, absorbs the energy and dries the sludge even faster on the first stages by preheating. This also protects the grate. But if necessary the hot air generated before the filter due to our Air/Air cooler can be used also as pre-heated combustion and circulation air. In this way a heat cycle could be created. This could also be support the combustion and reduce costs. But this could only be a case by case decision.

The amount of sewage sludge is minimised to a maximum by combustion. Phosphorus, as a valuable component of the sewage sludge, can be recovered from the remaining ash in a later recycling process. This grate technology enables sustainable waste management through independent thermal utilisation of the sewage sludge and the recovery of residual substances from the ashes.

The incineration can be decentralised on site in close proximity to the producer of the sewage sludge, thus eliminating transport costs and associated emissions. This is also an additional contribution to environmental protection.

The ZANNI combustion grate is flexible in design and can be adapted to the given boundary conditions. It is therefore also very suitable for retrofitting existing plants.

Of course, sufficient ventilation of the grate surfaces must be ensured and if necessary appropriate adjustments of the ventilation system, like fans and pipes, should be made.

As a generally advantage we could figure out that the combustion can be excellently controlled by combustion air at the right places.

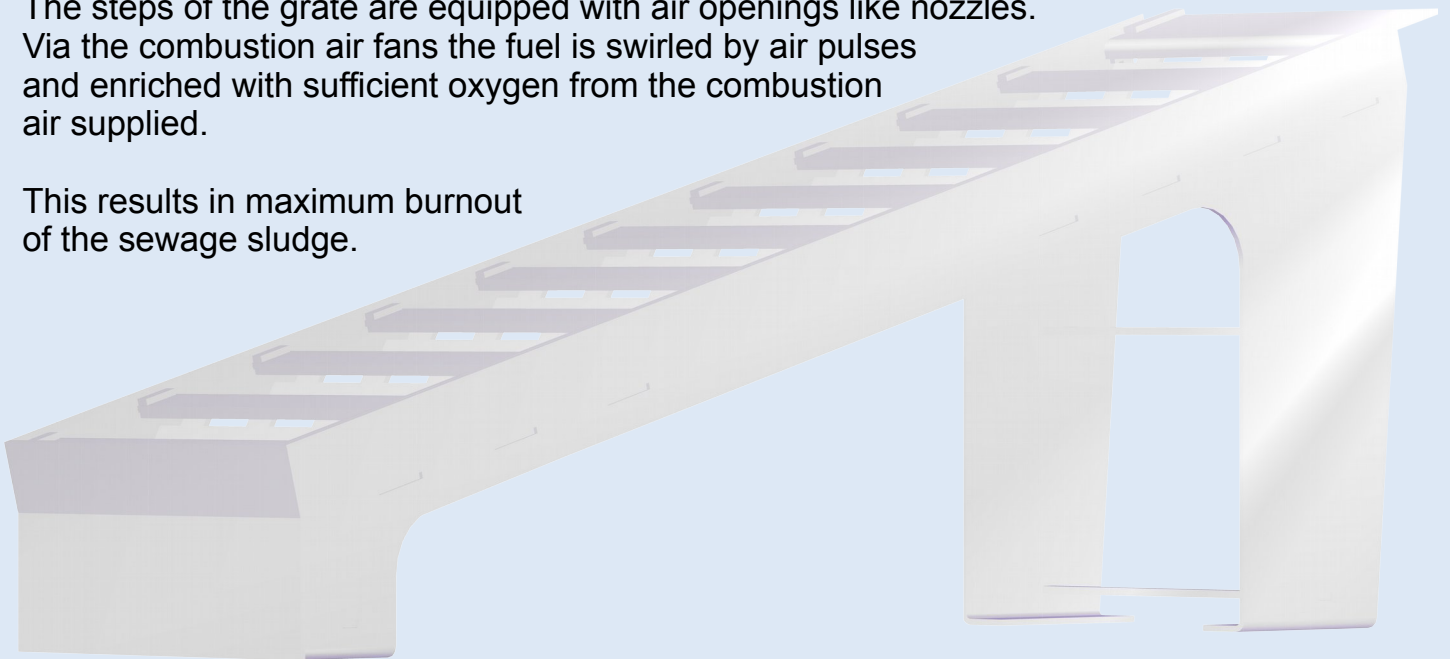
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The ZANNI combustion grate is a flexible and logical development

The steps of the grate are equipped with air openings like nozzles. Via the combustion air fans the fuel is swirled by air pulses and enriched with sufficient oxygen from the combustion air supplied.

This results in maximum burnout of the sewage sludge.



The picture shows a ventilated grate surfaces on a support frame for sewage sludge.

In addition, the combustion air flow transport the sewage sludge step by step over the combustion grate.

Due to the combustion air fans, the air pulses and the resulting swirling of the sewage sludge, a very high throughput capacity is achieved on the combustion grate.

Another advantage of the ZANNI combustion grate is that heavier particles of the burning sewage sludge could remain on the grate until their thermal utilisation is completed.

The utilisation is carried out on the combustion grate according to a classical principle:

- feeding,
- drying,
- degassing,
- ignition and burnout.

For the incineration process, the design and construction of the ZANNI combustion grate is an optimal solution to ensure a sufficient residence time of the sewage sludge.

With classical grate systems or other mechanical blade solutions, the sewage sludge must be pre-dried delivered. A drying of the sewage sludge and mechanical preparation is therefore necessary in almost all cases.

On the ZANNI combustion grate the sewage sludge can be burned easily.

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The capacity of the grate is not significantly influenced by the mass, but by the consistency of the sludge. This means that the condition of the sewage sludge determines only the throughput on the combustion grate not its possibility for incineration.

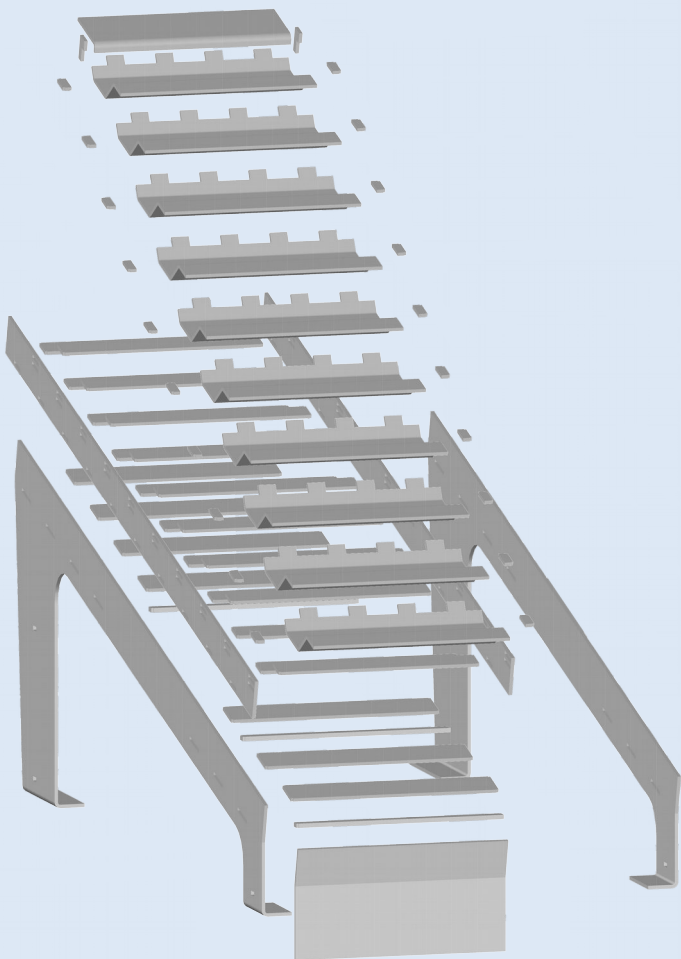
Pre-treatment and re-treatment is only necessary to control impurities, inert components, pollutants and of course to adjust the calorific value and flow rate for combustion on this multi-stage combustion grate.

The design of the individual grate stages enabled the ZANNI combustion grate to burn sewage sludges in an excellent way.

Deciding arguments

Working principle and advantages on a view:

- The sewage sludge is fed to the combustion grate through an opening on ceiling or via a front filling system depending on the local requirements.
- On the first stages of the combustion grate system the sewage sludges fed will be dried. Depending on consistency, the local requirements, the constructional condition and so on, it is also possible to built a system of multi-stage grate on various levels. It is a flexible solution.
- After the drying area the dried sludge will be slowly transported further by the combustion air ventilation of the grate as well by air impulses, pyrolysed and ignited on the subsequent stages before it be burnt out at a maximum on the rear stages.
- The residence time of the sewage sludge can thus be also increased and a maximum energy yield achieved.
- In many cases, the combustion grate system can be adapted to the structural conditions of old plants and makes these plants a valuable investment again.
- In many cases, modifications, also due to the circumstances mentioned on the previous pages, are a sensible measure and good for the environment.



In classic grate systems or other mechanical blade solutions, there are mechanically moving components in the combustion chamber which are damaged in a relatively short time and wear thermally and mechanically.

Maintenance is therefore necessary at relatively short intervals and is usually also very expensive, as entire systems usually have to be replaced.

With the ZANNI combustion grate all mechanical parts are located outside the combustion chamber.

Thus, there is only wear material in the combustion chamber, i.e. the grate surface.

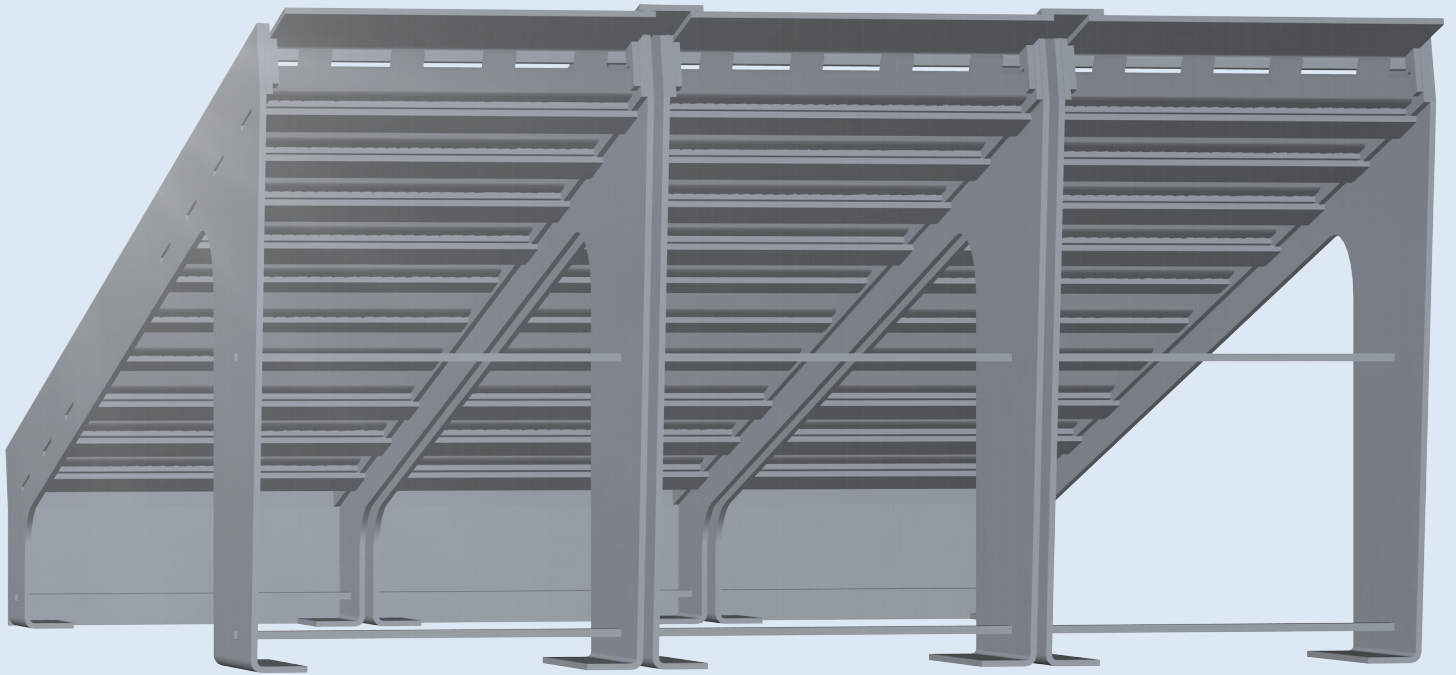
The simple construction of the system leads to comparatively low investment and follow-up costs, as well as low installation and maintenance times.

The availability of the system is thus also increased, which also improves the economic efficiency of a plant.

The ZANNI combustion grate is a sustainable innovation for an environmental friendly incineration.

A combustion grate example

Combustion grate size:	400 kg/h Also available in other sizes
Calorific value of waste:	15000 kJ/kg
Waste type:	All types of waste, such as solid and sludgy wastes, sewage sludge, clinical and contaminated waste etc.
Combustion temperatures:	800 – 1000 °C
Combustion air / grate ventilation:	2700 Nm ³ /h dry @ 400 kg/h waste
Grate capacity of this example:	130 kg/m ² /h
Benefits of the ZANNI grate technology:	Lower emissions, higher availability, higher reliability, reduced downtime, lower investment costs, lower maintenance costs, maximum of energy recovery.



The picture shows the back of three ventilated grate surfaces for solids placed side by side on a supporting frame.

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