

Plant equipment and components

Water-cooled Vølund combustion grates



VØLUND SYSTEMS

Increased capacity at existing plants with grate technology of the future

As more biological material and other types of recyclable items are sorted from normal waste and increasing volumes need to be handled, waste treatment plants have to burn a wider spectrum of waste types with varying combustive properties.

In order to prepare the plants for the new conditions, we have been developing water-cooled grate systems over the last ten years in an effort to increase plant flexibility

and to maintain or increase capacity and operating hours when handling varying fuel qualities.

Since 1997 we have installed several hundred m² of water-cooled grates, distributed on nine waste to energy plants with a capacity of 7-35 tonnes per hour. Based on our experience and ongoing product development, we now present an optimised model of our water-cooled combustion grate.





*Grate bed at
Häsleholm Fjärrvärme,
Sweden*



The water-cooled combustion grate offers many advantages:

- The grate is not dependent on primary air as a cooling medium, and waste can therefore be burned at high heating values and with low excess air.
- The grate is capable of operating with thin waste layers without suffering thermal overload.
- The grate can be adjusted without taking the current waste layer into account.
- A water-cooled grate offers a great deal of flexibility and is capable of burning waste with heating values of 8-18 MJ/kg.
- The grate increases the combustion capacity up to 5%.
- The grate offers a notable reduction of the volume of grate siftings.
- The reduced volume of cooling air at start-up results in lower fuel consumption.
- The grate has a long service life.
- Particularly at plants that operate at very heavy loads, the grate has lower maintenance requirements than the air-cooled grate, and it offers stable operation between planned stops.

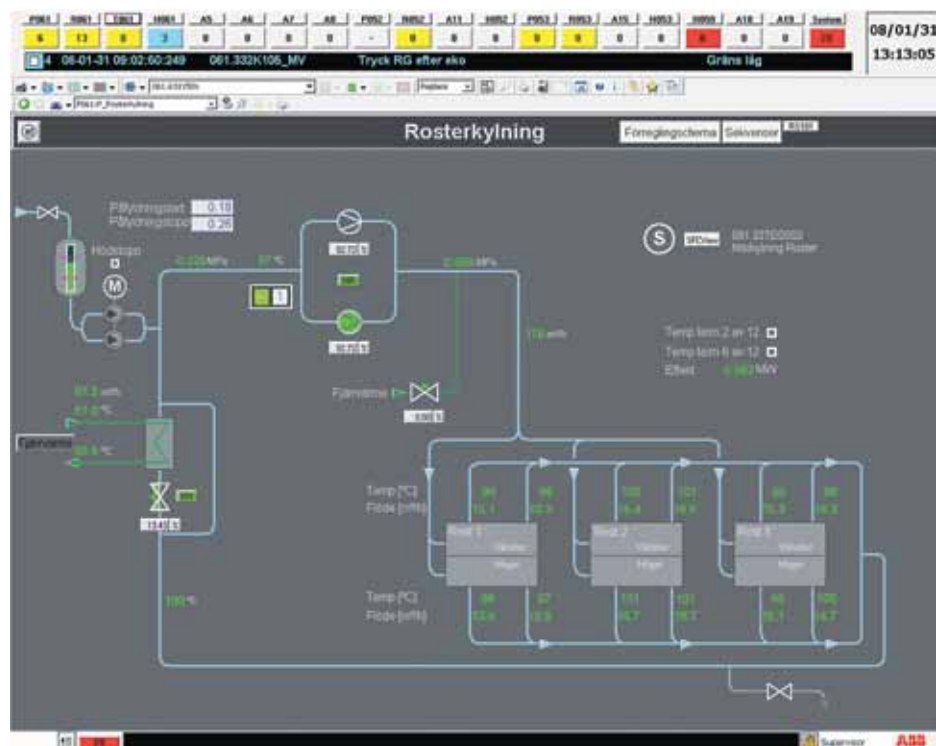
- Depending on the connection of the cooling cycle, increased capacity or higher efficiency can be reached.
- Because of the effective cooling, the thermal expansions in the grate are small.
- Increased earnings as a result of increased capacity and efficiency.

A water-cooled combustion grate supports the familiar qualities of the grate system, such as operational stability, long service life, efficiency, reliability as well as simplicity of construction and maintenance. Furthermore, it will increase plant flexibility with respect to the amounts of waste that can be processed, and optimisation of plant adjustment.

The heat uptake from a water-cooled combustion grate varies depending on the quality of the waste and will generally range from 10-25 kW/m². The energy is utilised for condensate preheating for air preheating energy, or is used in the district heating system.



Screen picture from the Gärstad plant in Linköping, Sweden



Optimised production

The two most significant advantages of a water-cooled combustion grate are the increased plant capacity and flexibility. These advantages are the result of the ability of the combustion air to be regulated without consideration for the grate temperature, and the insensitivity of the grate to thin waste layers.

The grate is designed to be part of product-optimising adjustments and to treat waste with both high and low heating values.

A water-cooled grate is capable of burning waste with relatively low heating values, because the internal grate temperature and the preheated combustion air serve to dry and ventilate the waste, which has a positive effect. A water-cooled combustion grate maintains the plant capacity with the net heating value design, and increases the plant maximum heating value capacity.

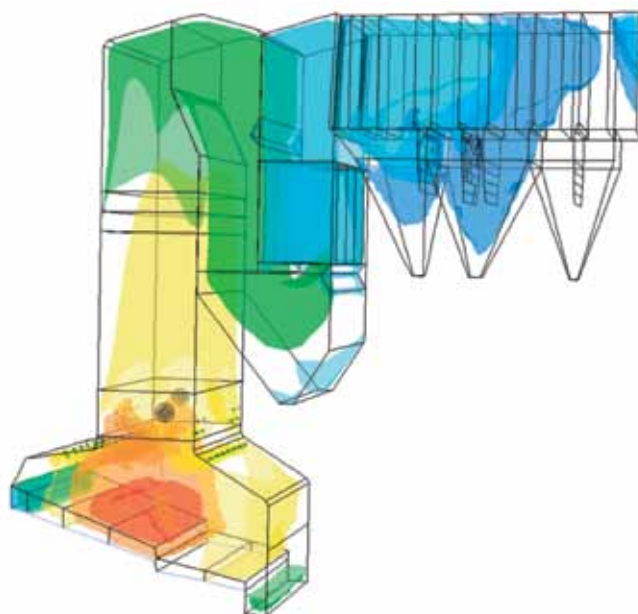
Thoroughly tested quality

The new generation of the water-cooled Vølund grate has been designed and flow-optimised using CFD calculations.

A grate block consists of two separate, parallel water chambers that are welded together at 3-4 mm distance, thereby creating the characteristic longitudinal air gap. Another visible modification can be seen in the top plate which is now folded upward, thereby creating an even surface without sharp corners where molten metal can accumulate. Seen from the side, the wearing rail is de-

signed to closely follow the geometry of the top plate. This is to ensure optimal cooling of the wearing rail.

The only wear parts are the wearing rails, which are located between the water chambers that form the sides of the grate. The wearing rails have a service life of more than two years.





300 mm grate block.
Note the air gap and side section



Tube work at the Häsleholm plant. The water system beneath the grate consists of steel pipes with steel flex connections

Construction

The grate is designed and approved as a 16 bar pressure part, which provides a working pressure with high heating capacity in the cooling water and prevents condensation. Internally, the cooling chamber has been designed and the flow conditions optimised for efficient cooling of all parts of the grate.

The steel pipes featured for the water flow beneath the grate eliminate the risk of damage due to contact wear or fire beneath the grate. Furthermore, as the steel pipes are relatively cool, they are resistant to the build-up of molten metal. The cooling system is connected through a flex connection.

Increased capacity with the new grate features

With a water-cooled combustion grate, the combustion intensity is increased due to the increased primary air injection velocity. The pressure drop above the grate is increased from approximately 50 Pa for an air-cooled grate to around 500 Pa for the water-cooled unit. The high air velocities result in a much more turbulent combustion, which again results in a capacity increase of up to 5 %.

Grate siftings and tightening

The volume of grate siftings is reduced because a water-cooled grate is almost completely sealed and only allows small amounts of sand and gravel to fall through. Molten metal cannot be prevented from making its way through the grate, although the amount is significantly reduced due to the small gaps and the large pressure drop. Upon contact with the cool grate surface, part of the molten metal will solidify and be discharged. The water-cooled grate is tightened by mechanical grate clamps or by hydraulic tightening.

Future-proof

A water-cooled combustion grate future-proofs the plant, as the plant will be able to handle greatly varying heating values, and because production can be optimised without taking anything other than the optimal fuel consumption into account. The overall benefit for the plant includes increased flexibility, capacity and operational availability, direct energy from the cooling and reduced maintenance requirements. Together, these elements make investment in a water-cooled grate extra beneficial.

For further information please contact our service department.

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