

MIST ELIMINATION

Mist eliminators for Flue Gas Desulphurization

Theory and practice

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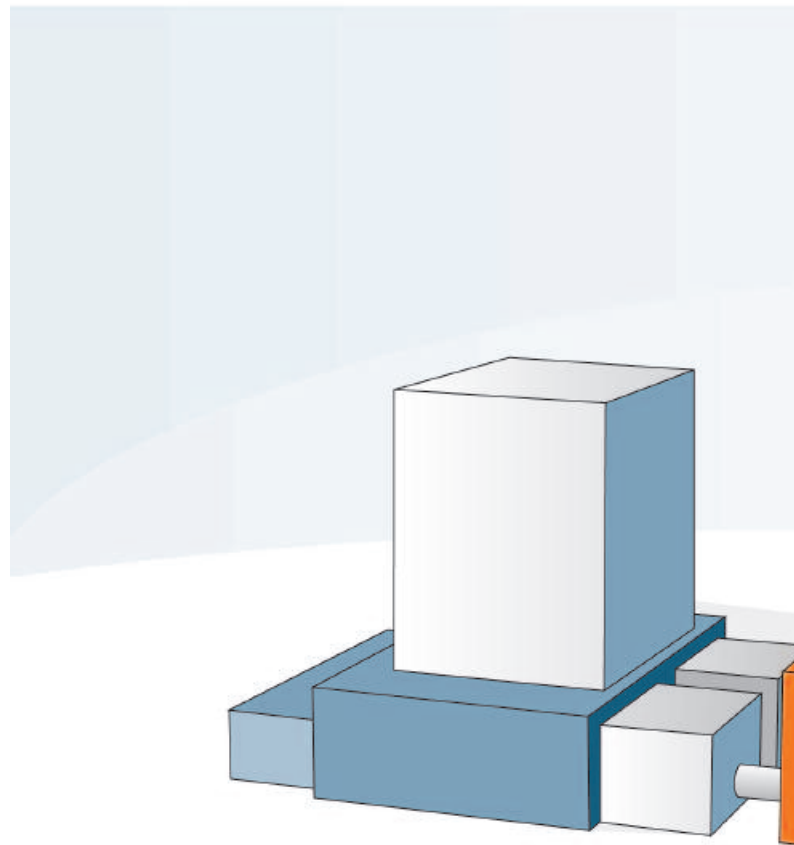
An absorber tower is installed downstream of the combustion process. The exhaust gas passes through this cleaning process stage prior to being emitted into the environment.

The gases are washed by a spray-injected suspension of limestone in water. Acidic compounds in the exhaust gases (HCl, HF, SO₃ and SO₂) react with this suspension. The SO₂ is absorbed into slurry droplets containing calcium sulphite that is partly oxidized into gypsum by the oxygen in the flue gas and partly by the oxygen in the air blown into the absorber sump. Cleaned gas now passes out into the atmosphere while the gypsum suspension falls back down into the absorber tower. This gypsum can eventually be used, for example, in the building industry.

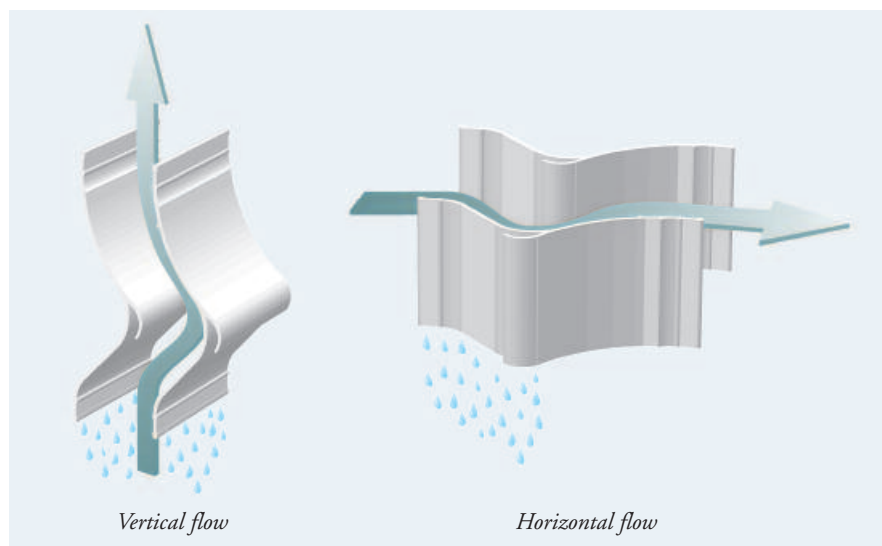
Efficient mist elimination

Excellent performance of the mist eliminator is very important for the success of this desulphurization unit. The fewer the liquid particles that pass the mist eliminator, the lower the pollution for the environment.

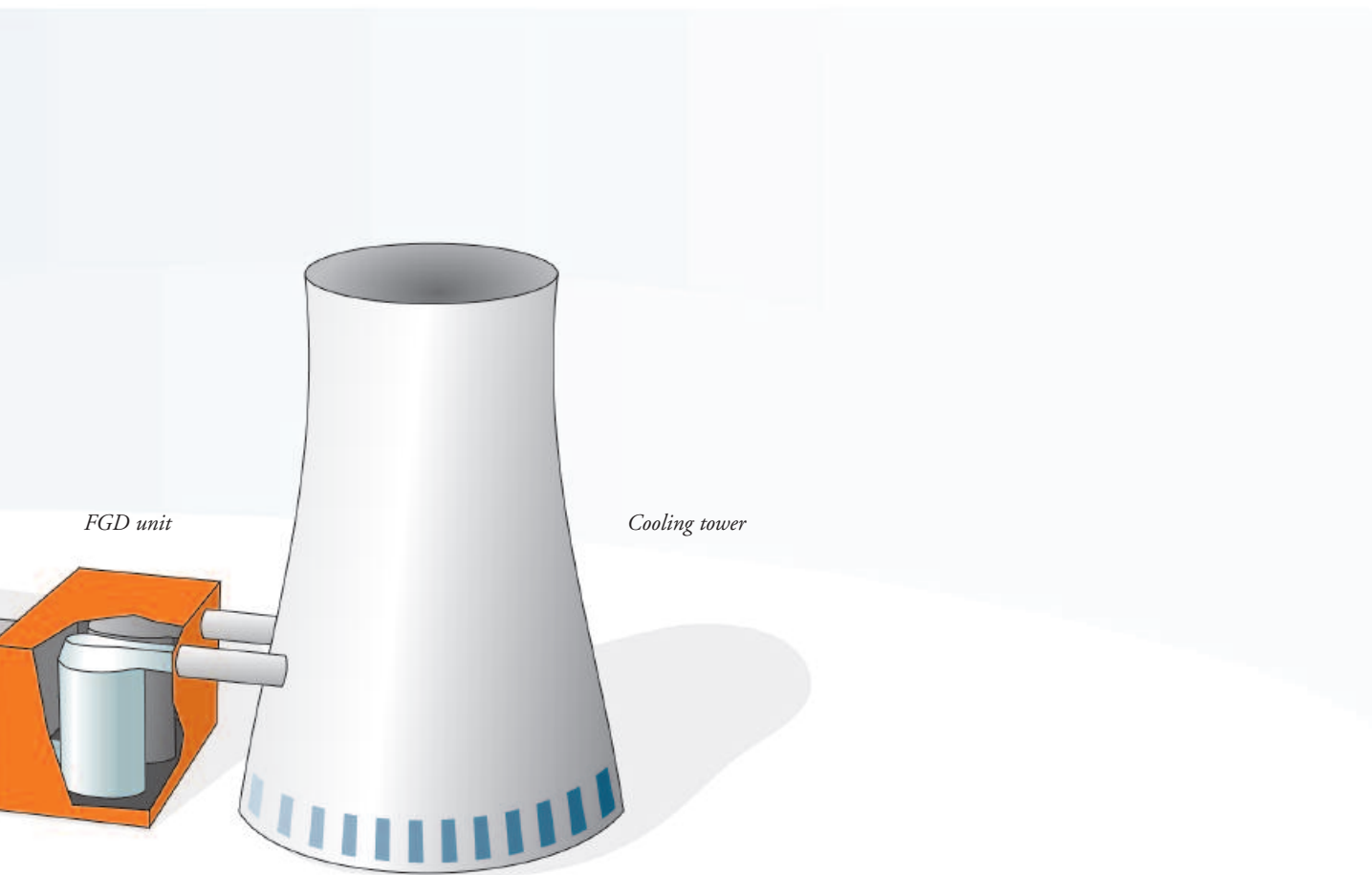
The mist eliminator is made of profiles (vanes), accommodated inside panel systems that divert the gas flow and cause liquid droplets to impact with the vane surface. These droplets collide on the vane surface and they finally form a liquid layer.



This layer drains back down because of the force of gravity.



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The most common process design for mist elimination is in a vertical gas flow, but it is also possible to install mist eliminators in the horizontal gas flow.

Mist eliminators can be manufactured from stainless steel, PVC, PVDF and polypropylene depending on the process parameters. The choice of vanes and design is influenced by the system pressure loss, the cleanability of the mist eliminator and the risk of clogging.

Mist elimination and plant efficiency

Typically, flue gas desulfurization systems represent just a few percent of the total capital costs of a coal-fired power plant but their impact is far

more important than that. By reducing approximately 90% of all sulphur, mist eliminators ensure that the power plant can continue to operate within the permitted emission control. Well-designed mist eliminators have virtually no impact on the process pressure and so have no impact on the performance of the plant.

The choice of whether to install the mist eliminator vertically or horizontally in the gas stream is determined by the details of the tower design and the requested performance data. Design parameters also impact on the cleaning cycles and other maintenance factors to ensure the continued high efficiency of the complete FGD plant.

Flexible

I. THE PANEL DESIGN for horizontal flow

DH 2100-FGD

The DH 2100-FGD panel system is installed into exhaust ducts with horizontal gas flows. The panel system is located directly behind the spray system of the absorber and its flushing system can be either on both up- and downstream sides of each stage or upstream of both stages and downstream of the coarse separator. This solution allows the process designer to apply higher gas velocities in comparison to vertical gas flows. Separated liquids flow away from the direction of the gas flow via a drainage system and back to the washers.



Features DH 2100-FGD:

- Extremely low pressure loss
- Suitable for high velocity applications
- Suitable for retrofit

II. THE FLAT DESIGN for vertical flow

DV 880 (Flat Design)

The DV 880 is used for lower gas velocities, as it is built flat into the head of the washers. The mist eliminator is compatible with the washers in use and comprises individual rectangular sections resting on parallel support beams and a surrounding wall support. The washer jets require their own support. Separated liquids fall directly back into the sump of the absorber.

Depending on the process the equipment is used as either a double or a triple stage system.



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Features the DV 880:

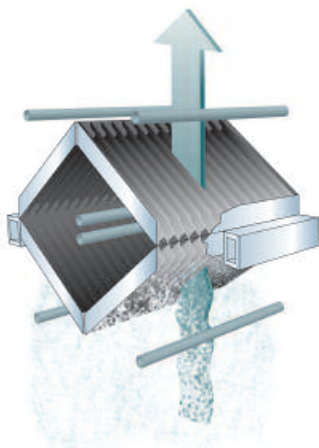
- Minimal pressure loss
- Good elimination performance at medium velocities
- Suitable for retrofit with existing washers
- Provides a higher net face area than any other design

III. THE ROOF DESIGN

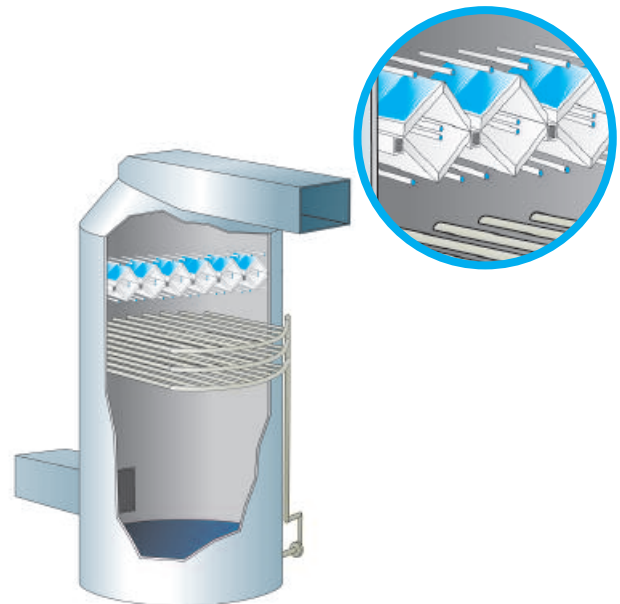
DV 210 (Roof Design)

The DV 210 eliminator is specifically designed to address the increasing demands on high mist elimination performance imposed by higher gas velocities. Its performance is unaffected by uneven downstream flow distributions.

The system is built into the upper part of the absorber tower. Both coarse and fine separators are either mounted onto a double or onto a single layer of support beams. The flushing system is linked to the mist eliminator, thus it does not require a separate support structure that would incur additional costs.



Separated liquids drain down into the absorber tower. A three-stage system addresses the growing



demands for performance and for reduced volume of liquid waste.

This design allows ideal access to the mist eliminator providing a safe and quick inspection of the components. Design of the DV 210 has been improved continuously over the years and three separate configurations are available.

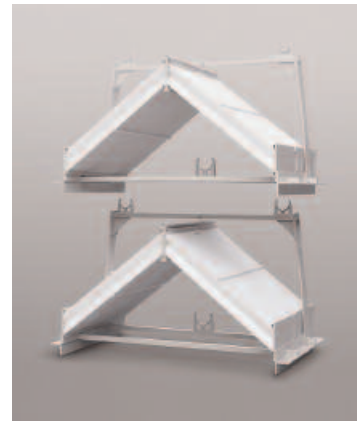
Roof design I–III

DV 210 Design I

Coarse and fine separators are sited on top of the other on two layers of support beams. The flushing system of each stage works independently for each stage.

Features the DV 210 design I:

- Minimal pressure loss
- Handles extreme flow patterns easily without losing performance
- Best performing mist eliminator at high vertical velocities
- Flushing systems are connected to the mist eliminator system, thus no additional support elements are needed
- Quick and very easy access for maintenance and inspection purposes

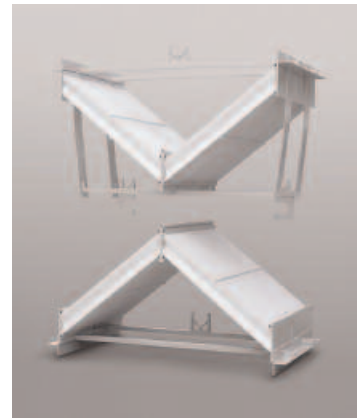


DV 210 Design II

Coarse and fine separators are sited on top of the other on two layers of support beams. The flushing water of the upper stage is used on the lower stage thus providing better cleaning. The system requires less installation height than design I.

Features the DV 210 design II:

- Minimal pressure loss
- Handles extreme flow patterns easily at excellent performance
- Best performing mist eliminator at high vertical velocities
- Flushing systems are connected to the mist eliminator system, thus no additional support elements are needed
- Quick and very easy access for maintenance and inspection purposes
- Requires less cleaning water than any other design

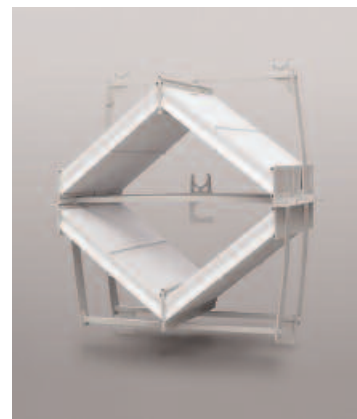


DV 210 Design III

Coarse and fine separators are sited on top of the other on a **single beam structure**. This system is ideal when there is reduced height for installation and to optimize the use of the flushing water of both stages.

Features the DV 210 design III:

- Requires the least installation height of all designs
- Uses a single beam support structure only
- Minimal pressure loss
- Handles extreme flow patterns easily at excellent performance
- Best performing mist eliminator at high vertical velocities
- Flushing systems are connected to the mist eliminator system, thus no additional support elements are needed
- Quick and very easy access for maintenance and inspection purposes



Tried and tested

Cleaning and spray systems

Solids such as dust and plaster are deposited on the surfaces of the mist elimination units and these can build up into layers that are almost impossible to remove. To avoid this problem, each mist elimination system in an FGD plant should have a properly-designed cleaning system.

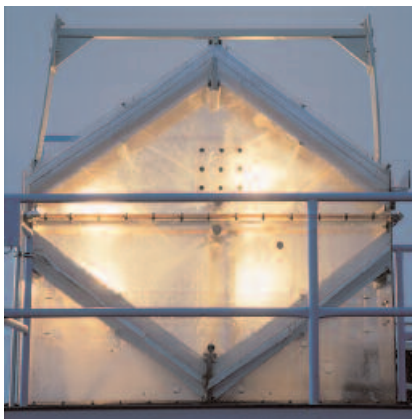
The cleaning system comprises a multitude of pipes with fully integrated nozzles, installed close to the vane sections. This allows thorough cleaning on both sides of the vanes and side-to-side cleaning can also be incorporated. Cleaning cycles can also be automated.

For many years Munters have offered customized cleaning systems. These systems are configured to

Refining the technology

In evaluating mist elimination requirements for Flue Gas Desulphurization, many process parameters need to be taken into consideration. These parameters are evaluated using an extensive database and a powerful design program. The results are then laboratory tested. As a result, the vane shapes have changed and been optimized over many years.

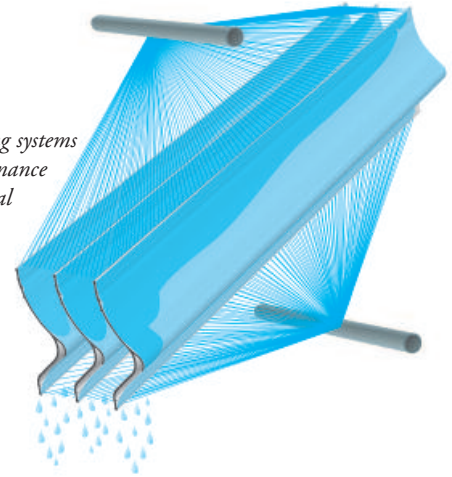
Munters has been refining the shape of these profiles for more than three decades and our intense attention to detail and the role of our R&D



Rigorous, large-scale testing of mist eliminators. New designs and configurations can be fully evaluated under authentic conditions.

target tough performance requirements, exhaust velocities and the individual dust contents of the power station in question. This helps to minimize the cleaning intervals. It also serves to enhance the efficiency, the availability and the durability of the mist elimination system.

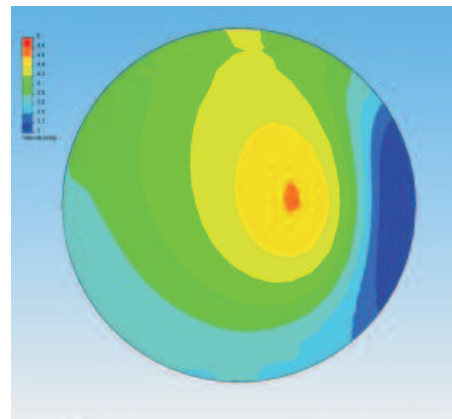
Integrated cleaning systems minimize maintenance and ensure optimal performance.



departments have contributed to our technological leadership in this area.

To operate efficiently, the mist elimination unit must be seen as a complete, integrated system comprising the mist elimination components, the spray systems for cleaning as well as all the construction supports, mounts and covers.

To date, well **over 600 FGD** plants all around the world have been equipped with mist elimination units from Munters.



Virtual simulations of different velocities in the FGD unit help design the best fitting mist elimination solution.



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