

MIST ELIMINATION

Mist elimination in Flue Gas Desulphurization.

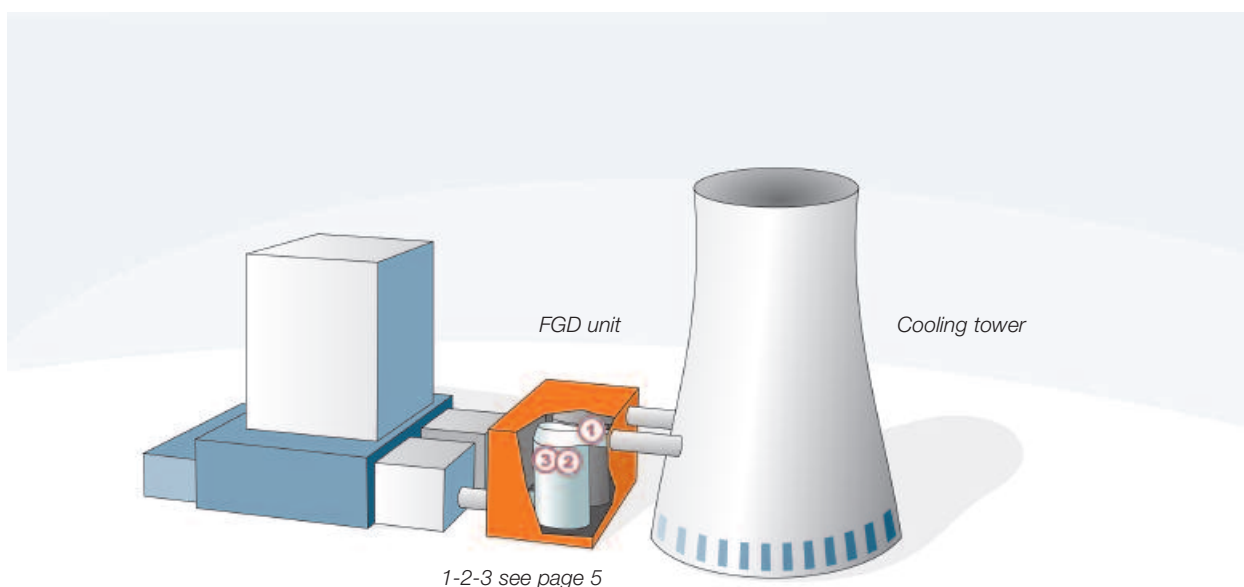
The buck stops here.



Are you seeing potential profits go up in smoke?

In removing SO₂ from exhaust flue gases through flue gas desulphurization (FGD) it can be too easy to miss a golden opportunity to enhance profitability.

Instead of simply viewing FGD as a statutory requirement to reduce emissions of harmful substances, you can actually squeeze even more from your operations by installing efficient mist elimination systems and achieve tangible savings.



- It protects the environment. The mist eliminator prevents droplets from escaping into the environment so you meet legislative requirements and avoid sanctions.
- It cleans the exhaust phase from droplets thus protecting the downstream gas-gas heat exchanger (GGH). The more efficient the mist elimination, the less risk there is of wasting energy through clogged heat transfer surfaces. An efficient mist eliminator makes a clear contribution to the improved functionality of the overall process.
- It protects downstream equipment and infrastructure by preventing caustic and corrosive rain onto nearby located plant and buildings and by extending the service life of your plant.
- It serves to capture the solvent liquid, thus minimizing the cost of cleaning the gases.



Mist elimination for a clear contribution.

Yet achieving tangible savings that would otherwise literally be lost into thin air is simple and cost-effective.

Getting the best in mist elimination

In an ideal world, Munters' mist elimination systems are designed as an integral part of the FGD system from the very start. When this is not possible, they can be implemented wherever Flue Gas Desulphurization systems are in use.

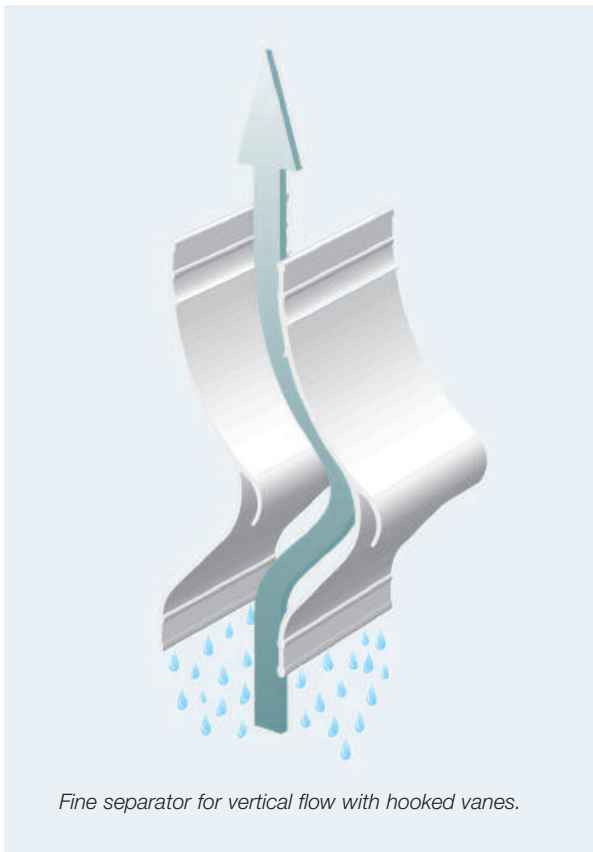
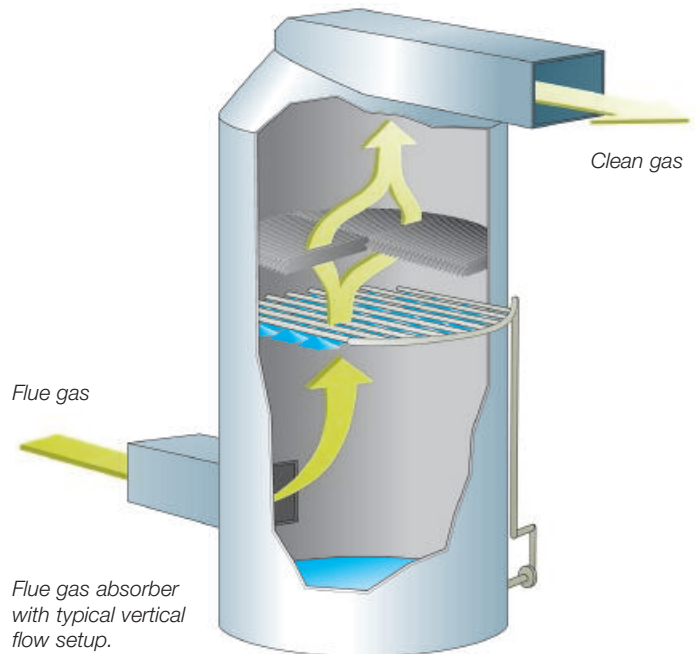
Munters' systems are designed for the real world, to accommodate towers of widely varying designs,

What you get is a range of optional configurations optimized by experts who know how to get the very best out of each system.

Getting it right - First time

How mist elimination works in FGD

Exhaust flue gas is de-dusted and then it passes through the absorber where it is washed with a suspension of for example limestone in water or sea water. Acidic compounds in the exhaust gases react with this suspension. The SO_2 is absorbed into slurry droplets containing calcium sulphite that is then partly oxidized into gypsum. The cleaned gas passes through while the mist eliminator stops the liquid droplets from escaping into the atmosphere. Gypsum is a valuable by-product of this process and it can be reclaimed and used, for example, by the construction industry.



The mist eliminators themselves are precision-engineered systems containing vanes that divert the gas flow passing through them. As the gas impacts with the vanes, the droplets entrained in the gas coalesce into a liquid layer which drains downwards through the force of gravity.

The principle is very simple, but miscalculation or using an inappropriate mist eliminator can result in excessive pressure loss (energy costs) with impact on performance or in excessive carry-over and inefficient cleaning. Yet with the right expertise you can achieve significant benefits while also being certain that use of flushing water is optimized and space and engineering costs are kept to a minimum.

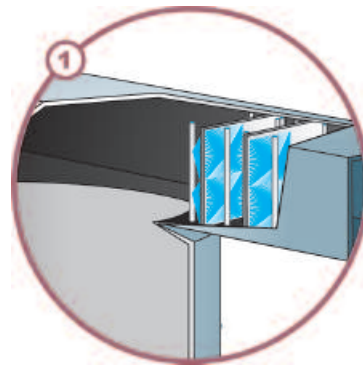
Mist eliminators can be installed in layers and in vertical or horizontal configurations depending on the design of the absorber.

Horizontal flow configurations

In horizontal flow applications you can use frame or panel designs.

Designs

The mist eliminator system (DH2100-FGD) is typically installed in the exhaust duct directly downstream of the spray system. Horizontal flow configurations accommodate higher gas velocities than vertical flow. The horizontal flow installation requires less surface area while still achieving excellent efficiency.



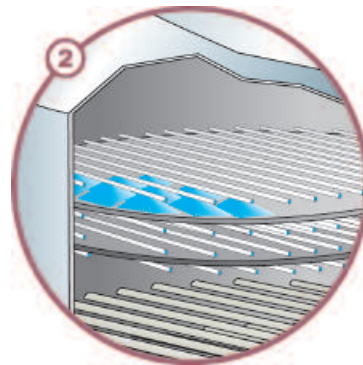
For more product information please see the technical leaflet for DH2100-FGD.

Vertical flow configurations

In vertical configurations you can use flat- or roof- designs, or a combination of both.

Flat designs

Munters' DV880 is a flat design panel system that is particularly suitable for use in towers with lower to medium gas velocities. It is built into the head of the absorber tower and comprises individual sections resting on parallel support beams and a surrounding wall support. Separated liquid falls directly back into the sump of the absorber. Munters' DV880 can be installed as either double or triple stage systems.

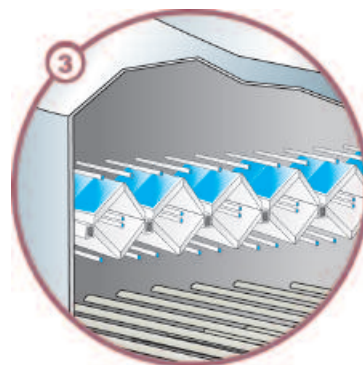


For more product information please see the technical leaflet for DV880.

Roof designs

Munters' DV210+ is a roof type mist eliminator that is installed in any of three different ways. It has been specifically designed to address the increasing demands on high efficiency mist elimination. The system includes an integrated online cleaning system to ensure optimal performance in cases where plugging or scaling of the vane surface is a risk.

Munters' DV210+ systems are installed in the top section of the absorber tower. With design III, a single support beam can be employed, reducing investment cost and height requirements (see table, page 10).



For more product information please see the technical leaflet for DV210+.

DV210+ – Improved functionality, significantly reduced pressure loss

The design of the DV210 has been continuously improved over the years. In its latest form, the DV210+, Munters have achieved significant reductions in pressure losses compared with previous designs, thereby further contributing to energy saving.

Configuration I – the classic design

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

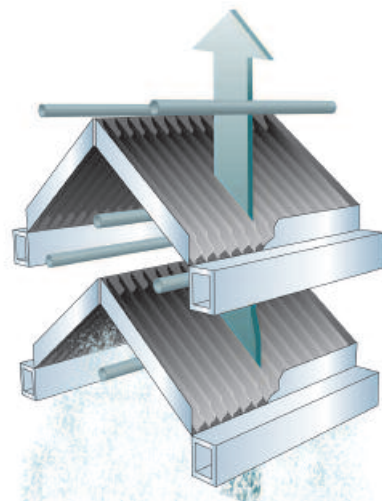
Configuration II – for more efficient use of washing liquid

The coarse and fine separators are sited on top of each other on two layers of support beams. The flushing liquid of the upper stage drains through the lower stage making for a more efficient use of the water. This configuration requires less height than Configuration I (see table, page 10).

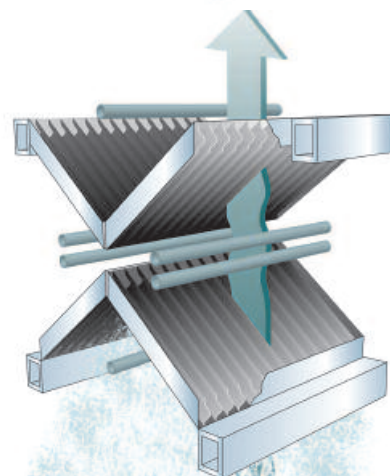
Configuration III – with minimal height requirement and a single support

The coarse and fine separators are sited on top of each other on a single beam structure. The single support design reduces installation costs and is also ideal when there is less height available. Compared with Configuration I, the absorber height can be reduced by up to 1,000 mm without affecting maintenance access.

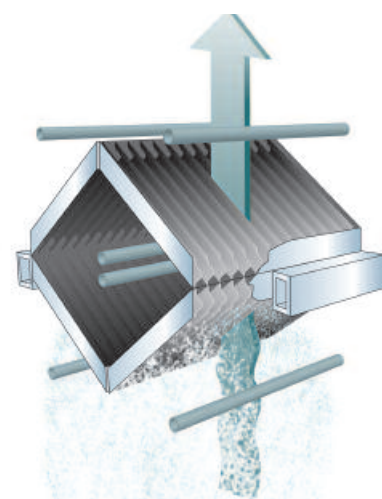
For more product information please see the technical leaflet for DV210+.



DV210+ Design I



DV210+ Design II



DV210+ Design III

Comparison of standard designs

Type		DV880		DV210+		DH2100-FGD
Design		Vertical – flat		Vertical – roof		Horizontal
Stages	[No.]	2	3	2	3	2
Velocity	[m/s]	3.8**	3.8**	4.2**	4.2**	5.0***
Rest content	[mg/Nm ³]	<75*	<50*	<50*	<20*	<50*
Pressure loss clean condition ⁺	[mbar]	0.20–0.80	0.25–1.20	0.20–1.55	0.30–2.60	0.25–1.90

* Exact number upon submission of process design data

** Superficial gas velocity in absorber, data valid for flow variance of +/-25%

*** Superficial gas velocity inside the horizontal duct, data valid for flow variance of +/-25%

+ Pressure loss data are based on gas density and are subject of reconfirmation.
Data given for min – max applicable velocities.

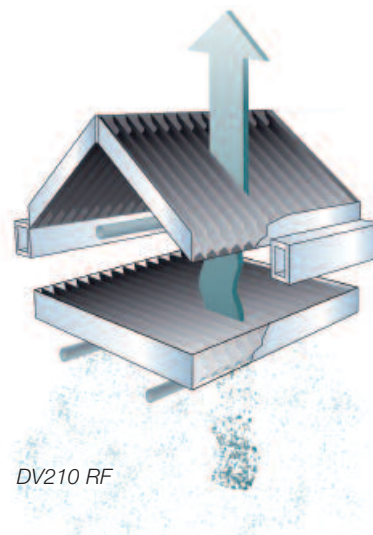
DV210 RF

Munters has also extended its product range with the DV210 RF which is specifically designed to address average velocities.

new flushing system to eliminate clogging and extend service life. (see table, page 10)

Configuration RF – Fit for purpose

Munters has also developed a new, combined configuration in response to widespread demand, the DV210 RF. This accommodates high, though not very high velocities through a combination of pitched and flat separators. DV210 RF can be installed using a single support layer and features a



DV210 RF

For more product information please see the technical leaflet for DV210 RF.

Outlook

To reduce the servicing requirement for coarse separator, Munters has developed **EasyFlow**. This equalizes gas flow patterns and eliminates the problem of constantly increasing pressure loss caused by clogging. It extends the mist eliminator's service interval and contributes to reduced consumption of washing water.

The results also include **FastFlow**, meeting the demands for higher scrubber velocities and allowing significant decreases in scrubber diameter with attendant cost savings. This provides a tangible design benefit, allowing engineering companies to increase their competitiveness.

Getting even more from your FGD systems

EasyFlow – one step ahead

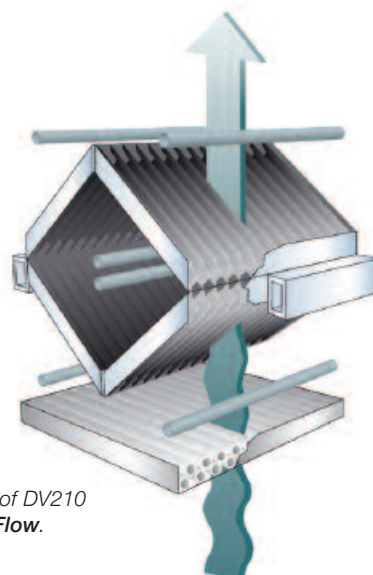
Munters' **EasyFlow** is a technology concept that increases the service life of coarse and fine separators in gas cleaning devices and it equalizes uneven gas flows at a high velocity to ensure smoother process operations.

The concept incorporates an additional stage comprising a series of round rods. These balance out the gas flow and at the same time actually separate out most of the entrained liquids before they reach the coarse or fine separator.

EasyFlow is particularly well suited for applications where there are very high levels of solids in both the gas and liquid phase which can cause plugging and scaling of the vanes resulting quickly in pressure loss.

It also eliminates localized liquid carry-over due to high gas velocities and uneven flow, thereby also preventing loss of valuable product. **EasyFlow** is designed for both newbuild and retrofit applications.

EasyFlow can be retrofitted to existing plants to achieve the above benefits or it can be designed into newbuilds from the start.



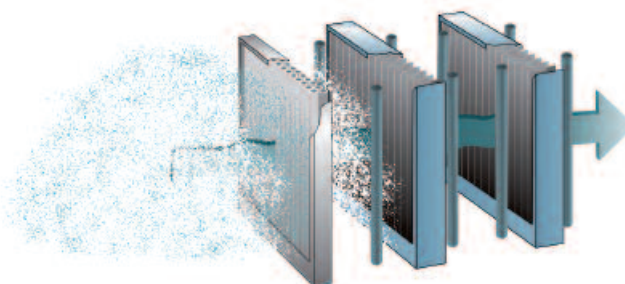
Principle illustration of DV210 with **EasyFlow**.

The new technology concept **EasyFlow** in particular reduces the amount of required wash water and it also requires fewer cleaning levels. This is a clear contribution to more environmentally-friendly technology.

For more product information please see the technical leaflet for Munters **EasyFlow** technical concept.



EasyFlow module for vertical flow.

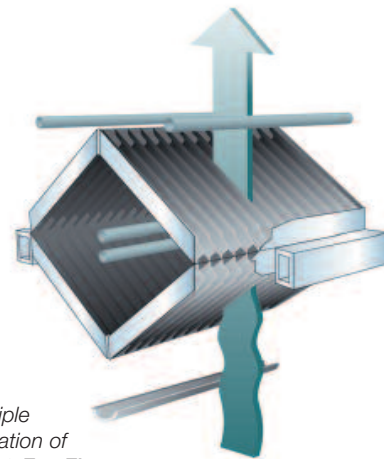


EasyFlow module for horizontal flow.

FastFlow – two steps ahead

FastFlow is a mist elimination technology concept at the very cutting edge and developed to address the next generation requirements of increased scrubber velocities. Maximum scrubber velocities today can reach 4.3 m/s which are well within **FastFlow** parameters. **FastFlow** allows the significant reduction of scrubber diameters and permits the increase of superficial gas velocities up to 5.1 m/s (+18%).

Achieving this has been possible through many small but highly significant design changes. Water consumption is also reduced and new drainage systems eliminate the risk of liquid reentrainment. **EasyFlow** can also be incorporated with the **FastFlow** system. The success of this concept demonstrates that the conventionally-accepted parameters of what is possible are there to be challenged – and Munters is up to the challenge.



Principle illustration of DV210 **FastFlow**.

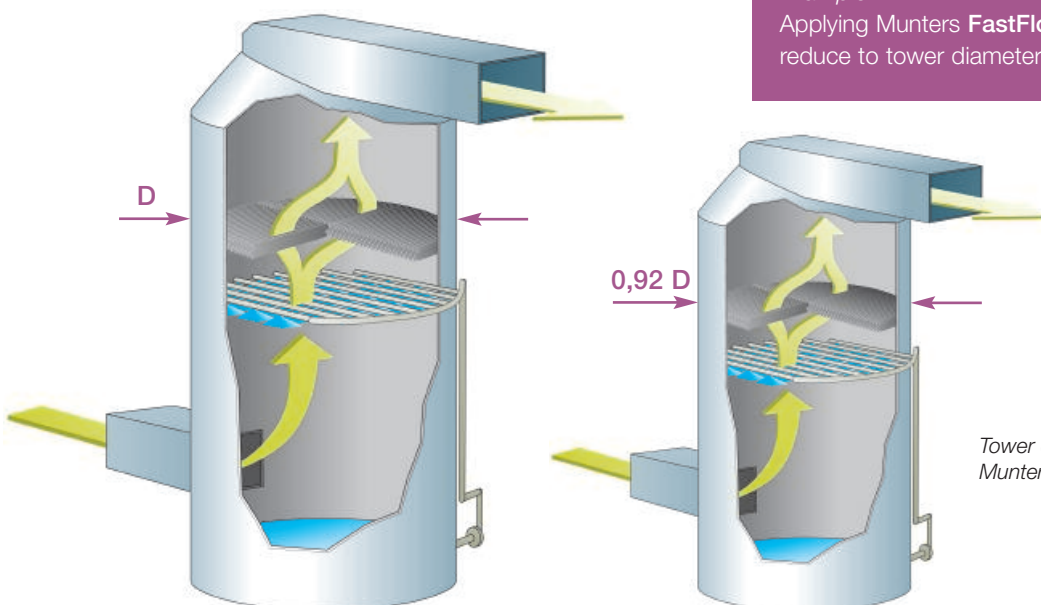
For more product information please see the technical leaflet for Munters **FastFlow** technical concept.

With Munters **FastFlow**

Looking at the progress of wet scrubber technology, the size of the absorber towers has been constantly reduced over the decades. Munters has always been contributing fine mist elimination systems to this development.





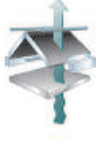
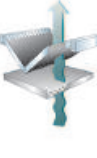


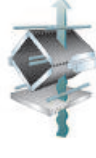
Example:








Applying Munters **FastFlow** concept allows to reduce to tower diameter up to 8%.



Tower diameter with Munters **FastFlow**.

Comparison of all designs

	Design data	DV210+				DV210 EasyFlow				
		2-stage			3-stage	Single stage		2-stage		
										
Design type	–	I	II	III	III	I	II	I	II	III
Superficial gas velocity in absorber	m/s	4.3			4.3	4.5		4.5		
Max. flow deviation	%	25			30	25		25		
Absorber diameter*	m	14.5			14.5	14.2		14.2		
Liquid rest content	mg/m ³ (dry)	50			15	50		15		
Indexed flushing water consumption	%	100			100	45		65		
EasyFlow	–	No			No	Yes		Yes		
Required height**	m	+1.0	+0.1	0	+1.6	-0.8	-1.0	+1.2	+0.4	+0.2
No. of support layers	–	2	2	1	2	1 or 2		2 or 3	2 or 3	1 or 2

	Design data	DV210 FastFlow		DV880		DV210 RF		
		2-stage	3-stage	2-stage	3-stage	2-stage		
								
Design type	–	III	III	–	–	I	II	II plus
Superficial gas velocity in absorber	m/s	4.8	5.2	3.5		4.0	4.0	4.3
Max. flow deviation	%	25	17	25		25		
Absorber diameter*	m	13.7	13.2	15.1		15	15	14.5
Liquid rest content	mg/m ³ (dry)	50	15	75	50	50	50	15
Indexed flushing water consumption	%	90	65	100	140	100		
EasyFlow	–	No	Yes	No		No		
Required height**	m	0	+1.6	-0.4	+1.3	-0.2	-0.8	+0.8
No. of support layers	–	1	1 or 2	2		2		

* Gas volume
2,000,000 Nm³/h
** Increase (+) /
decrease (-) of
mist eliminator.

Don't just take our word for it

Munters has been the pioneering and driving force in mist elimination for FGD for close to 30 years. But what matters most is performance today. The new developments described here are a testament to our commitment to ongoing development and to an understanding of what is needed in the real world and of what will be needed in the future. To ensure that what we say about our systems is not vanity, we have all our products subjected to outside evaluation by 3rd party testing bodies around the world. Only performance figures independently tested are quoted in Munters' documentation.

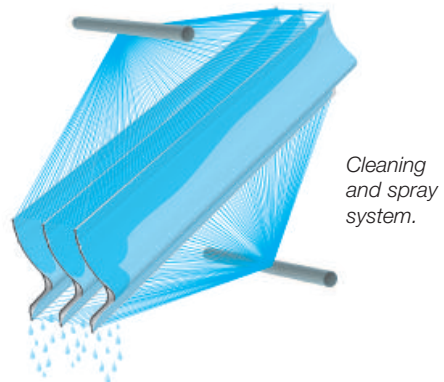
Cleaning and spray systems

The build-up of solids deposited on the surfaces of the mist elimination units can form layers that are almost impossible to remove and this can impact performance.

Each mist elimination system in an FGD plant should therefore have a properly-designed cleaning

system. Cleaning cycles can be automated or manually operated. Munters offers customized cleaning systems that can be configured to target tough performance requirements, exhaust velocities and the individual dust contents of the power station in question.

The new technology concept **EasyFlow** in particular reduces the amount of required wash water and it also requires fewer cleaning levels. This is a clear contribution to more environmental- and economically-friendly technology.





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