

# WET SCRUBBERS



**MIKROPUL**

DUST COLLECTION  
GAS CLEANING  
PRODUCT RECOVERY  
ENGINEERING  
SERVICES

# WET SCRUBBERS

MikroPul has been a pioneer worldwide in providing wet scrubbers to solve air pollution control problems for over 40 years.

We offer different designs to meet almost any requirement:

- Vaned scrubber with no moving parts
- Dynamic scrubber with integral fan
- High efficiency venturi scrubber
- Multi-venturi scrubber
- Rotary scrubber
- Packed towers for gas absorption

In addition, we can provide these in several configurations and a full range of sizes. Our scrubbers can be supplied in carbon steel, plastics/FRP, or corrosion resistant steels.

With our experience and worldwide resources, MikroPul has the capability to engineer a wet scrubber system that efficiently meets your specific needs.

MikroPul offers unmatched collective experience, equipment, and expertise. Our scrubbers are found in a wide variety of industries around the world, including:

- Aluminum
- Steel plants/smelters
- Recycling
- Incineration plants
- Chemicals
- Mineral ores
- Coal
- Plastics
- Detergents
- Pulp & Paper
- Fertilizers
- Rock products
- Foundries
- Waste water treatment

## Systems Capability

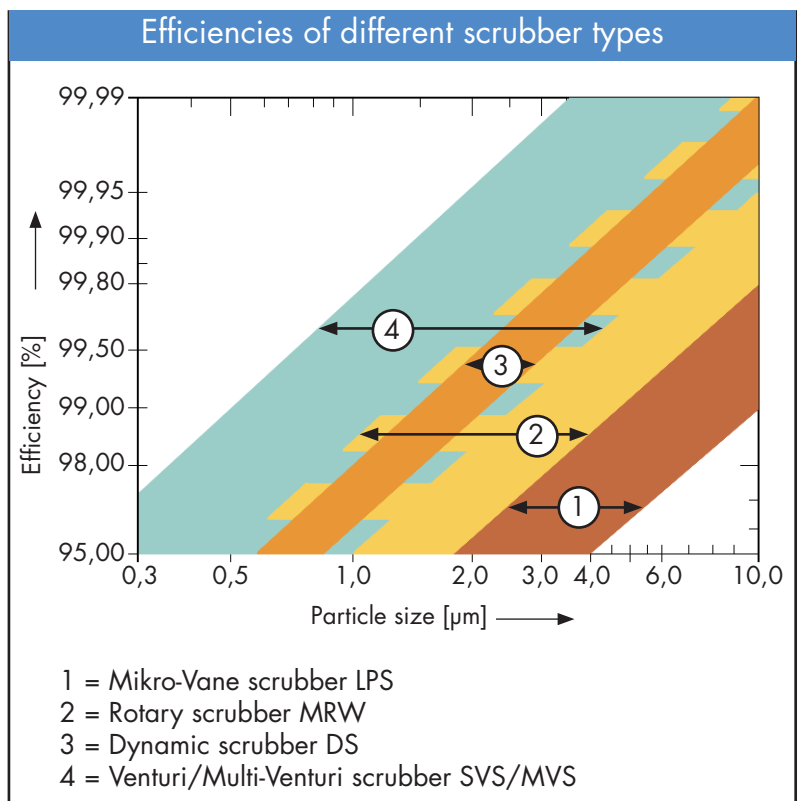
MikroPul provides individual units and complete turnkey dust control system design including scrubbers, cyclones, fabric filters, and other components.

Our capabilities include:

- Process analysis
- System design
- Equipment supply
- Installation
- Start-up
- Testing
- Upgrading and Retrofits

SCRUBBER DATA			
Mikro-Vane LPS	Rotary MRW	Dynamic DS	Venturi Multi-Venturi SVS/MVS
TYPICAL APPLICATIONS			
Dryers	Waste Incineration	Lime Klins	Lime Klins
General Dedusting	Pigments	Lime Slakers	Dryers
Mining	Fertilizers	Solvents	Steel Plants Smelters
Plastics	Absorption of HF, H <sub>2</sub> S, NH <sub>2</sub>	Mining	Recycling
Minerals	Odor Removal	Minerals	Minerals
TYPICAL PRESSURE DROP RANGES [kPa]			
0,5 - 1,5	0,8 - 1,5	1,2 - 2	1,5 - 15
CAPACITIES [m <sup>3</sup> /h]			
1.000 - 150.000	1.000 - 100.000	1.000 - 100.000	500 - 250.000

...what about YOUR specific gas cleaning requirements?



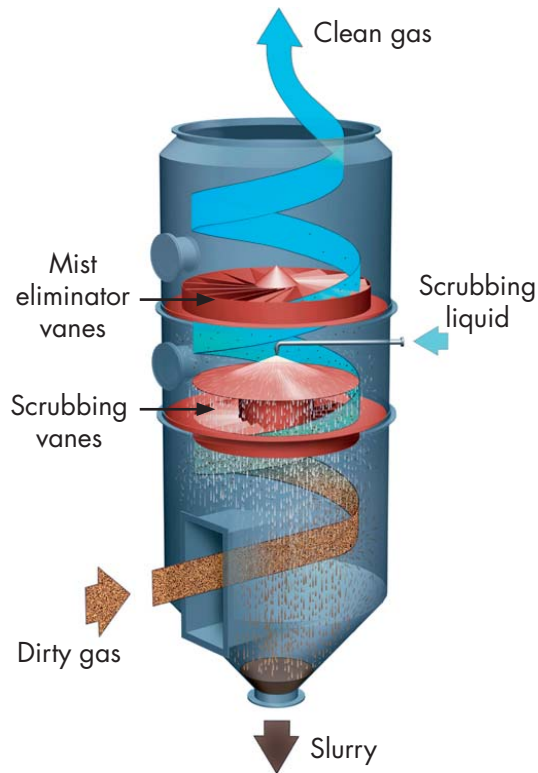
## MIKRO-VANE SCRUBBER LPS

Scrubbing liquid is introduced into the scrubber as a spray directed down over a circular scrubbing vane arrangement.

As the liquid falls through the vanes, it generates a mist of scrubbing liquid.

Dust laden gas enters the scrubber tangentially and collides with the curtains initiating particle agglomeration. The coarser particles produced are washed down to the slurry outlet. A restriction disc located in the scrubbing vane assembly accelerates the spin velocity of the gas.

This action combined with the spray of atomized liquid causes the formation of fine liquid droplets which encapsulate the fine



particulates, again enhancing agglomeration. The cyclonic action of the saturated gas stream as it spins upward forces the agglomerated particles to fall out of suspension.

The coarser droplets impinge on the mist eliminator vanes and the finer droplets are forced to drop out of suspension by gravitational and centrifugal forces acting on the gas stream as it exits through the top.

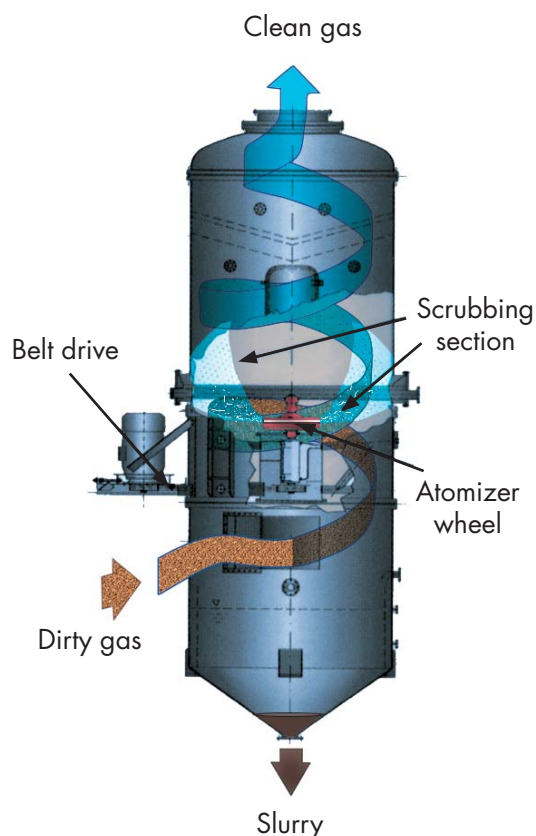
## ROTARY SCRUBBER MRW

The dust laden gases enter the unit tangentially. A significant portion of dust is eliminated by intermixing the scrubbing liquid with the cyclonic gas flow.

The gas passes one or two washing sections. Drop dispersion is induced by a fast rotating atomizer wheel which is driven by a belt drive, located outside the scrubber housing. The atomizer wheel is mounted horizontally or vertically to the rotor bearing.

Washing liquid is centrally supplied to the guide vanes of the atomizer wheel and accelerated in guide channels to a thin liquid film.

At the outside edge of the wheel the liquid film disintegrates into fine droplets, whose size is influenced by the number of revolutions and the liquid quantity.



Over the entire cross section of the flow a continuous liquid mist is created.

Due to forces of inertia and diffusion, solids and gaseous pollutants in this vortex wash zone are separated.

Particle/droplet agglomerates are forced against the chamber walls and washed down to the sludge outlet.

If higher separation efficiencies are necessary, a second washing stage is applied.

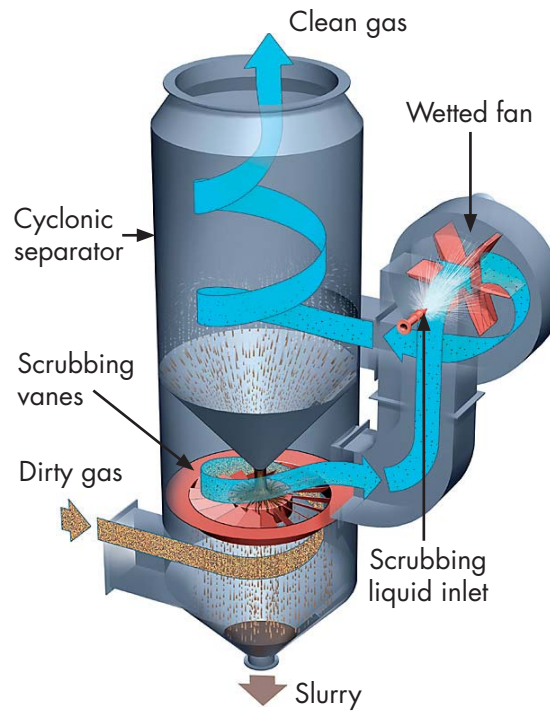
The final stage is a mist eliminator, after which the cleaned gas exits at the top of the unit.

## DYNAMIC SCRUBBER DS

Dust laden gas enters the lower chamber of the scrubber tangentially, imparting a cyclonic action to the stream.

Coarse particles are removed by a combination of centrifugal and gravitational forces.

The stream encounters slurry, created in a later stage, coming down from the upper chamber and becomes partially wetted, initiating agglomeration. As the stream spins through a series of scrubber vanes, intermediate sized particles impinge on the wetted surfaces of the vanes. These particles are then washed down. The gas stream containing the remaining fine dust is drawn



into an adjacent chamber containing a fan.

Atomized scrubbing liquid is sprayed into the eye of the fan, further reducing droplet size. These droplets encapsulate the fine dust particles, thus enhancing agglomeration.

The gas stream then flows tangentially into the upper chamber at high velocity. The wet agglomerated particles are forced by cyclonic action against the chamber walls and drain down to the internal discharge cone. The gas stream, free of liquid droplets, spins out through the outlet at the top of the scrubber.

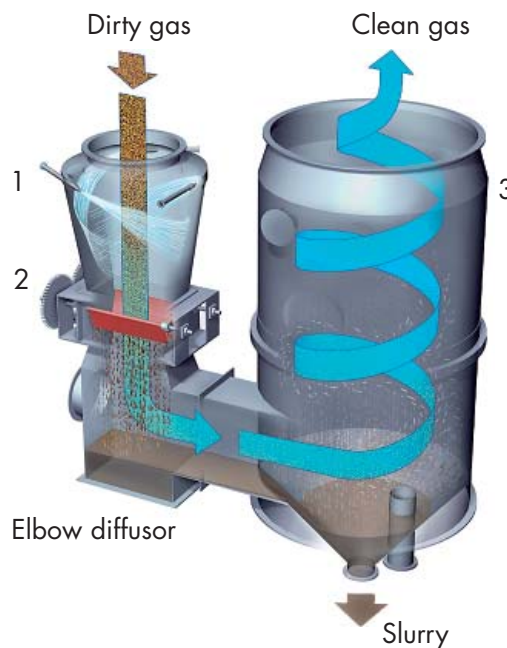
## VENTURI SCRUBBER SVS/MVS

The design of the MikroPul Venturi Scrubber consists of a wet approach venturi followed by a liquid entrainment separator. Dust laden gases enter the venturi and instantly make contact with the tangentially introduced scrubbing liquid swirling down the venturi's converging walls.

At the venturi throat, the gas and liquid streams collide and the liquid breaks down into droplets which trap dust particles. This gas/liquid mixture passes through an elbow diffusor, and then enters the entrainment separator through a tangential inlet. Centrifugal action removes the heavy wetted particles from the gas stream.

As an alternate, when very large diameter separators are required, the liquid is separated by passing the stream through a chevron-type mist eliminator baffle.

The dust/liquid mixture is



- 1 = Scrubbing liquid inlet
- 2 = Adjustable venturi throat
- 3 = Cyclonic separator

discharged from the separator bottom drain and the cleaned gas leaves through the top of the separator.

MikroPul Venturi Scrubbers are equipped with an adjustable venturi throat, allowing flexible adaptation of the required separation efficiency to operating conditions.

For higher flow rates or special requirements, Multi-Venturi Scrubbers MVS are a preferred solution.

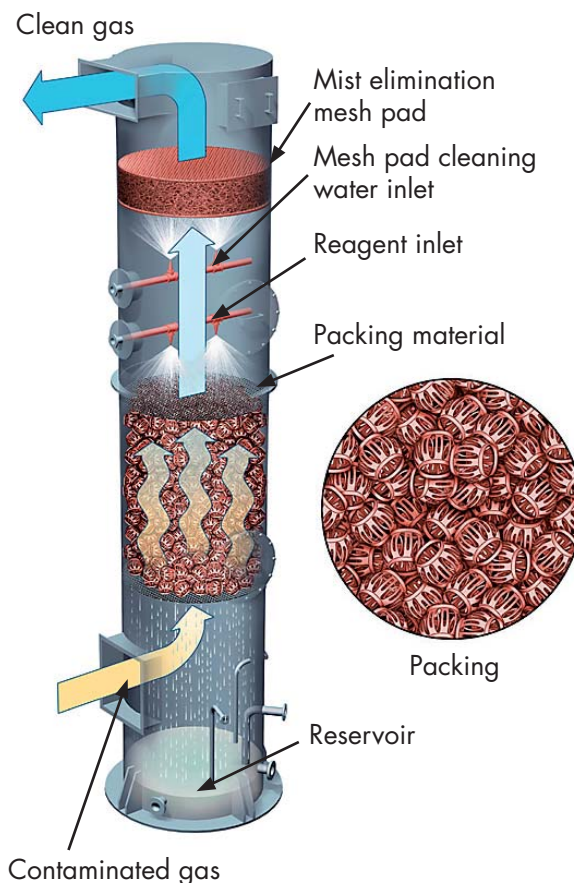
A series of venturi throats in parallel or serial arrangement provide intensive contact of scrubbing liquid with the gas stream. The scrubbing liquid is sprayed through low pressure, non-clogging nozzles, distributing it evenly across the deck.

Primary demisting and gas distribution occurs in the pre-demist area. The remaining free water droplets are removed by impingement on the final stage demisting vanes.

# ABSORPTION TOWER MAW

For applications where gas absorption is required, MikroPul offers the MAW Absorption Tower. SO<sub>2</sub>, HCl, HF, NH<sub>3</sub> or similar soluble gas components can be efficiently removed.

Pollutant laden gases enter at the bottom of the packed tower and rise upward, making contact with the scrubbing liquid draining down through the packed column. Since the pollutant concentration decreases as the gas rises, there is constantly fresher solvent available for contact, resulting in an efficient removal of contaminants. To achieve a high absorption rate for the gas stream, a large area of contact, a longer retention time and an intensive mixing with the



scrubbing liquid are essential. MAW Absorption Towers fulfil these requirements with built-in high performance tower packing layers or multiple spray levels.

Finally, the fine moisture droplets, still suspended in the cleaned gas stream, are removed by a mist eliminator.

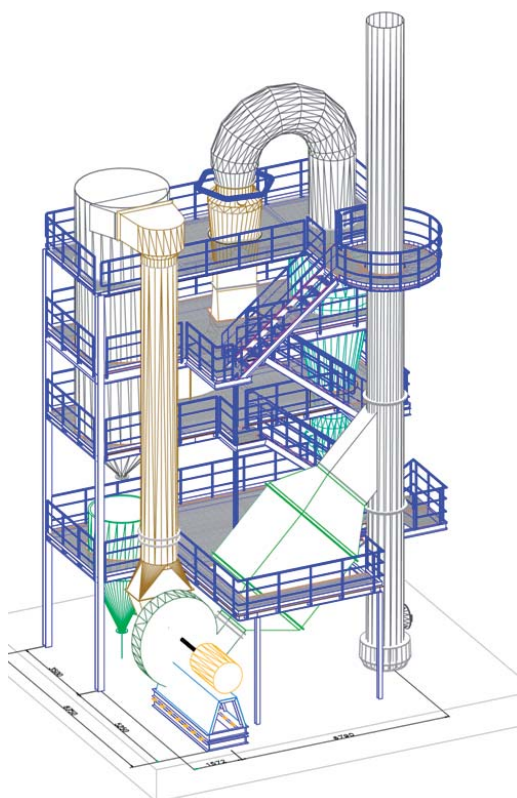
Scrubbing liquid from the eliminator is collected in an integral reservoir and recycled to the tower. Makeup liquid is continually introduced, and reagent is added on demand using a dosing pump controlled by a pH monitor.

## SYSTEM DESIGN

MikroPul offers flexibility in design and construction unmatched by any other supplier.

Wet scrubbers can be built from your choice of materials in standard models plus multi-stage and other special designs to suit your exact requirements.

Based on your specifications, we supply complete skid mounted units with ideally combined components such as reagent preparation, fan, pumps, ductwork, controls, wiring etc., providing an optimum output for the entire system.



Examples for complete system engineering are:

- Car shredder dedusting plant (venturi scrubber, cyclone, fan, slurry scraper tank).
- Materials handling dedusting for iron ore direct reduction (cyclone, scrubber, fan, stack).
- Product recovery and gas cleaning for drying plants for e.g. PVC, salts, amino compounds, glass/wood fibers, urea, food (Mikro-Vane LPS systems).
- Separation of solvents for the paint industry (venturi scrubber and absorption tower).

# INSTALLATIONS AND REFERENCES WORLDWIDE

Examples of plants and systems built:

- 1 Pressure shock resistant venturi scrubber SVS in a recycling plant (Germany).
- 2 Turn key scrubber system (pressure shock resistant) with cyclone, ductwork, fan, stack for a recycling plant (Turkey).
- 3 Mikro-Vane LPS for a salt drier plant (Russia).
- 4 Venturi scrubber for lime slaker (Germany).
- 5 Absorption tower MAW for ammonia (Germany).
- 6 Venturi scrubber and cyclone for car scrap recovery (Belgium).
- 7 Rotary scrubber for the chemical industry (Germany).
- 8 Venturi scrubber SVS for building materials (Germany).
- 9 Factory floor scrubber installation (UK).
- 10 Dynamic scrubber for separation of heavy metals (Tunisia).





# MIKROPUL SUPPORT

## Maintenance

MikroPul backs up our products and systems with worldwide customer support. Contact us any time you need help.

## Spare parts

MikroPul systems are known for long lasting, reliable operation. Using original MikroPul spare parts ensures that your plant always operates with maximum performance. We supply a full line of parts, from valves, pumps, fans, spray nozzles and scrubbing vanes to major components, for all our products. High wear items are kept in stock for immediate shipment.

## Service

MikroPul provides an array of services to help you select, install, operate, and maximize your equipment investment. If your collector needs upgrading to meet increased demands or process changes, our engineering and service staff are here to help you.

Services include:

- Process analysis
- Inspections of plants and components
- Converting old equipment to new technology
- Conversions/Replacements
- Maintenance seminars
- Technical training



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