

WET SCRUBBERS



MIKROPUL

DRY FILTRATION
WET SCRUBBERS
CYCLONES
WET ELECTROSTATIC
PRECIPITATORS

MIKROPUL WET SCRUBBERS

MikroPul has been a pioneer worldwide in providing wet scrubbers to solve air pollution control problems for over 40 years. We offer five principal designs customizable to meet your requirements:

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

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

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

Industries Utilizing MikroPul Scrubbers

Our scrubbers are found in a wide variety of industries around the world, including:

- Aluminum
- Automotive
- Chemicals
- Coal
- Detergents
- Fertilizers
- Foundries
- Incineration
- Iron ore
- Mining (crushing, screening, pressure oxidation)
- Plastics
- Potash
- Pulp & Paper
- Rock products
- Steel
- Waste water treatment

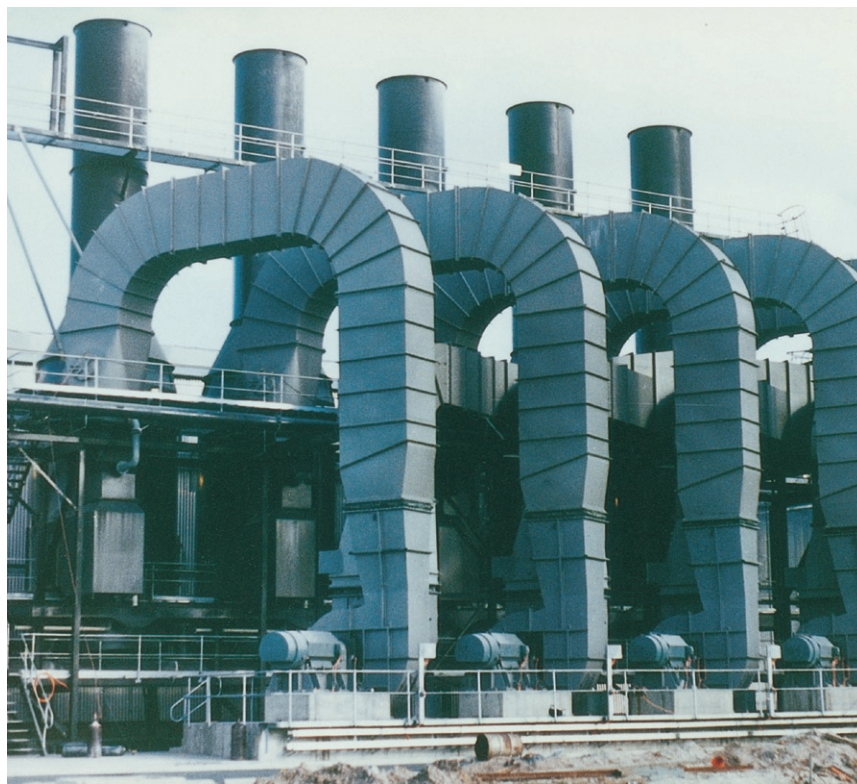
Systems Capability

MikroPul can provide 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

MikroPul offers unmatched collective experience, facilities, equipment, and expertise—the best overall capabilities in the world of dust control and product recovery.

Selection Guide				
Sample Applications				
Mikro-Vane	Dynamic	Venturi	Multi Venturi	Packed Tower
Dryers General dedusting Mining Polypropylene dryers	Lime kilns Lime shakers Dissolving tanks Mining Minerals	Lime kilns Dryers Foundries Shredders Minerals	Wood fired boilers Metallurgical fumes Mining	Waste incineration Flotation cells Calcining Odor control Reagent preparation
Typical Pressure Drop Ranges				
2–6 in. w.g. (0.5–1.5 kPa)	5 in. w.g. (1.2 kPa) equivalent to Venturi @ 16 in. w.g. (4 kPa)	10–60 in. w.g. (2.5–15 kPa)	6–60 in. w.g. (1.5–15 kPa)	2–3 in. w.g. (0.5–0.75 kPa)
Approximate Liquid Requirement/1,000 ACFM (l/m³)				
2–4 gpm (0.3–0.6 l/m)	2–3 gpm (0.3–0.4 l/m)	8–15 gpm (1–2 l/m)	5–15 gpm (0.6–2 l/m)	Application dependent



Scrubbers on aluminum pot lines (Australia).

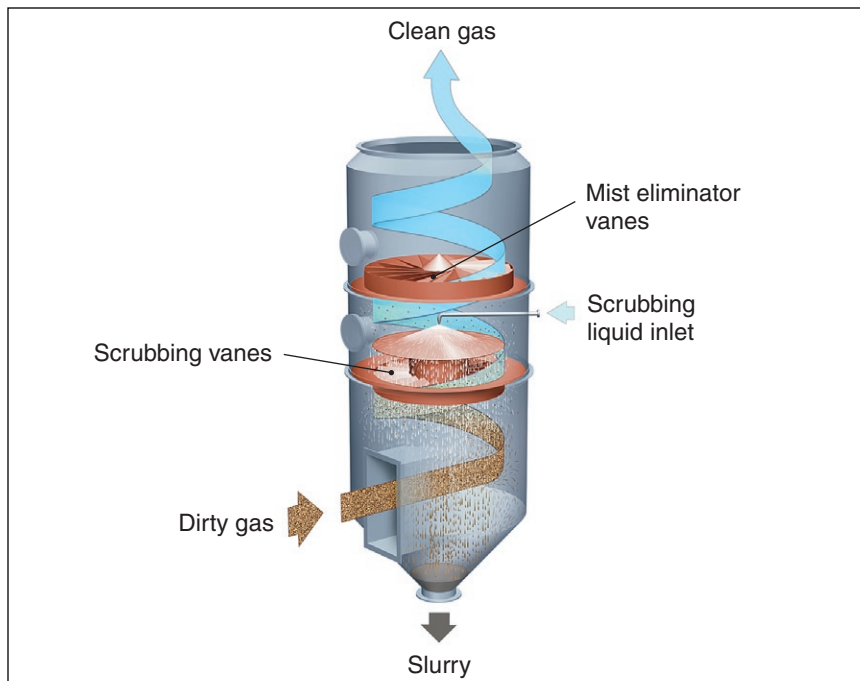
MIKRO-VANE SCRUBBER

Operation

Scrubbing liquid is introduced into the scrubber as a spray directed down over a circular “scrubbing vane” arrangement. As the liquid drains through the vanes, it creates curtains 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 flood of atomized liquid from the spray 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.

DYNAMIC SCRUBBER

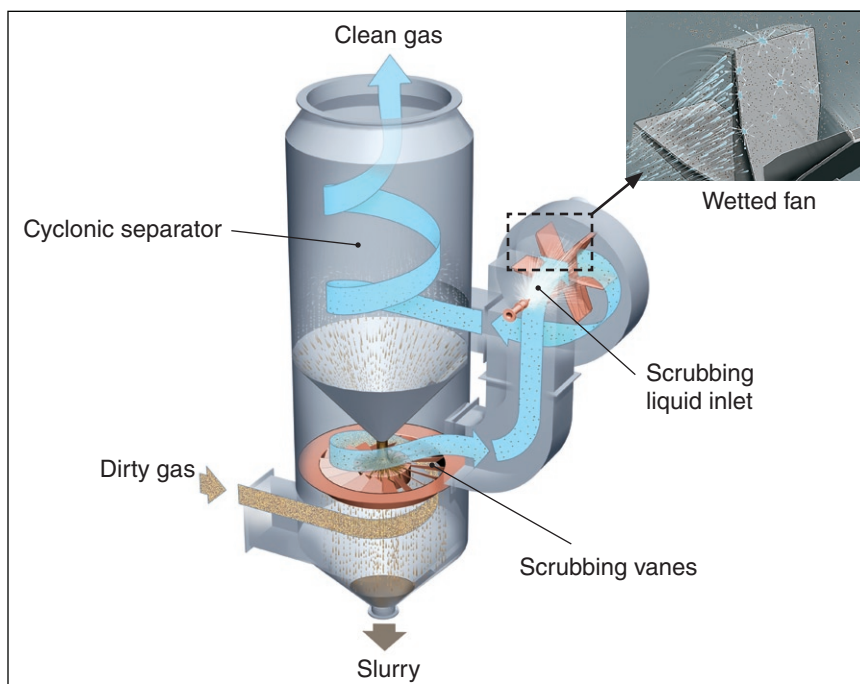
Operation

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 wetted 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 into the



upper chamber tangentially 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 an outlet atop the scrubber.

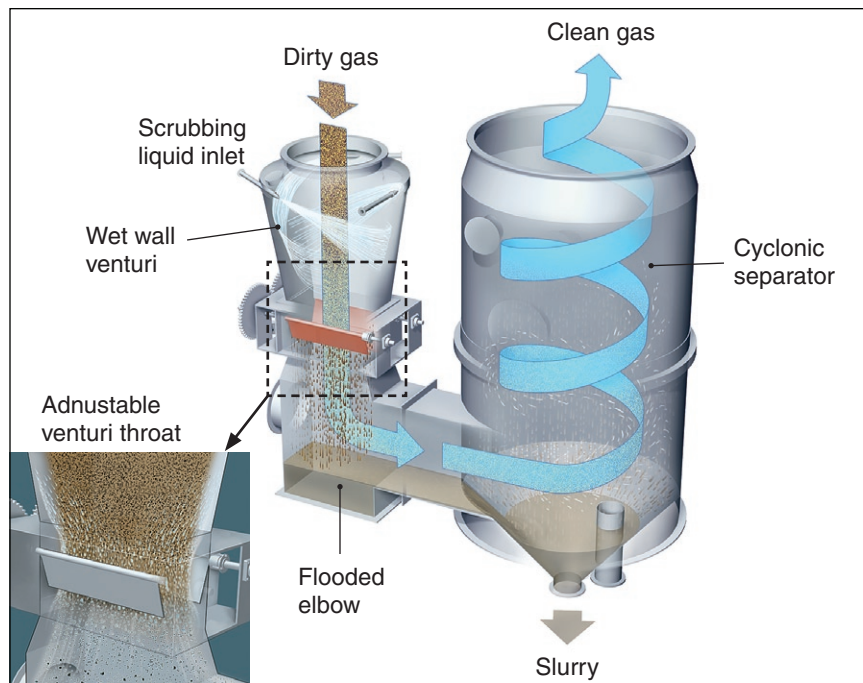
VENTURI SCRUBBER

Operation

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 a flooded elbow, 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 discharged from the separator bottom drain and



the cleaned gas leaves through the top of the separator.

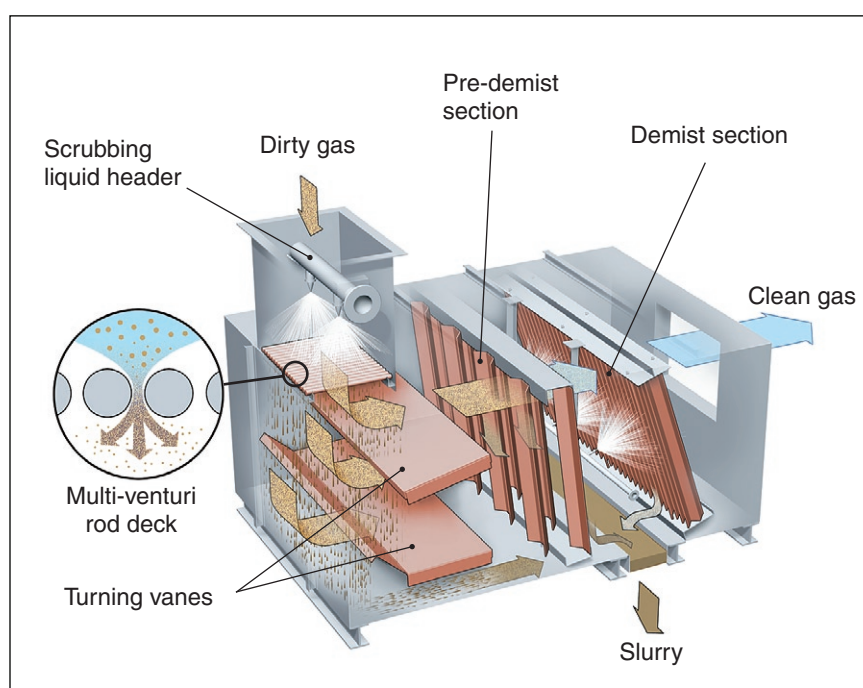
MULTI-VENTURI SCRUBBER

Operation

The dirty gases are directed through a venturi-rod deck where atomized scrub water is introduced cocurrently with the gas stream. The scrub water is sprayed through a series of low pressure, large orifice nozzles, distributing it evenly across the deck.

The gas rapidly accelerates as it passes through the venturi-rods. This action creates smaller droplets, causing encapsulation of the particles and increasing the collection efficiency of submicron particles.

As the gases exit the venturi-rod area, velocity slows causing the larger particulate laden droplets to fall out of the stream. The scrubbed gasses are then directed toward a two-stage demisting zone by distribution baffles or turning vanes. Primary demisting and gas distribution occurs in the pre-demist area, which removes 90% of the water. The remaining free water droplets are removed by impingement on the final stage demist vanes.



The scrub water collected prior to the demist section flows down the scrubber floor to the drain trough. The de-watered scrubbed gases are exhausted

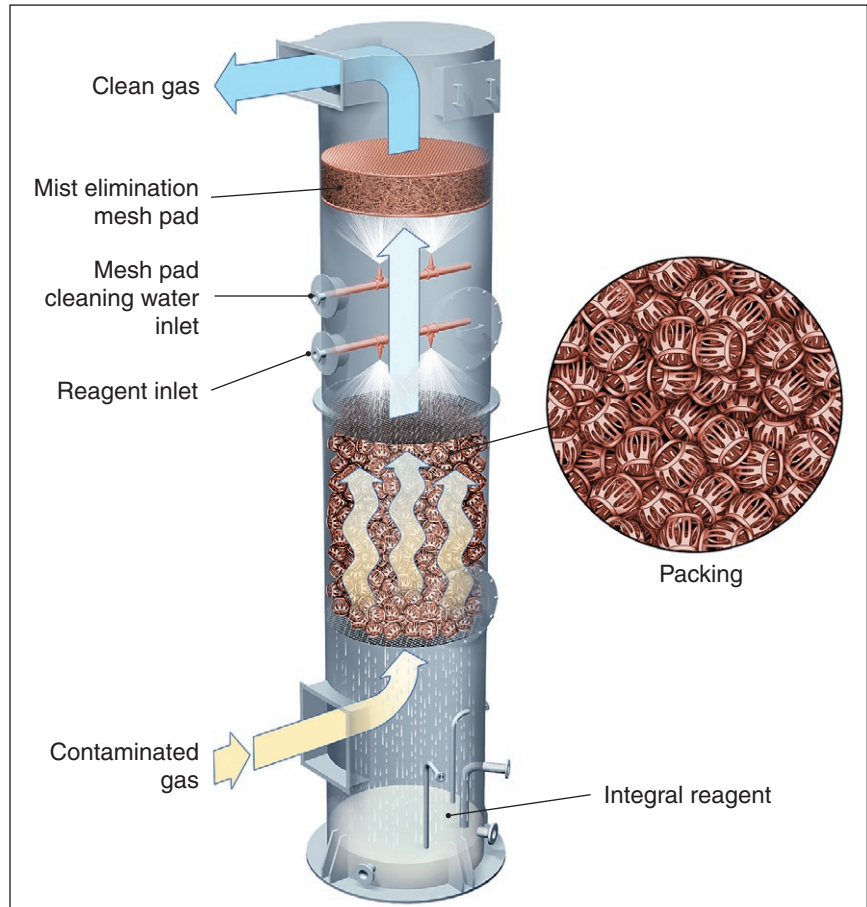
via the scrubber outlet.

ABSORPTION TOWER

Operation

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

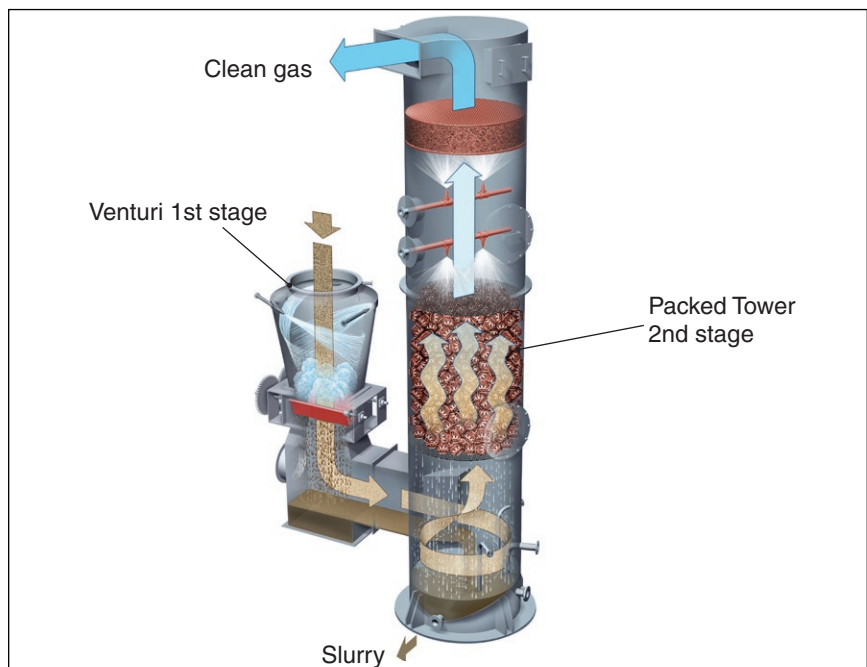
Scrub liquid from the eliminator is collected in an integral reservoir and recycled to the tower. Makeup liquid is constantly introduced, and reagent is added on demand using a dosing pump controlled by a pH monitor.

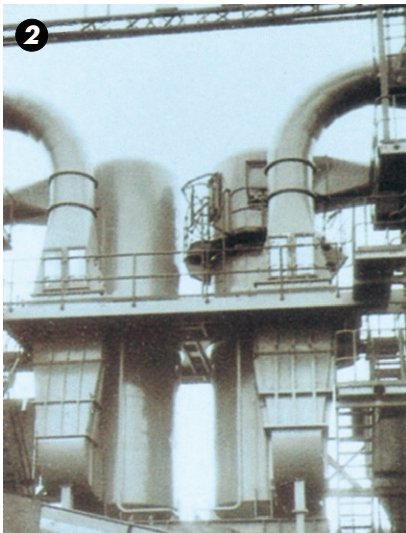


TWO-STAGE SCRUBBERS

Mikropul has developed various 2-stage wet scrubber designs. The most commonly used is a Mikropul Venturi Scrubber with a Packed Bed section. It is used to remove particulate as well as gaseous contaminants from the gas stream. The principles of operation are as described for the Venturi scrubber and Packed Tower designs. The designs are optimized by using pH control, liquid circuit separation, and mist eliminators to enhance removal efficiencies for specific contaminants.

Another common 2-stage design is a Multi-venturi inlet with a Dynamic or Mikrovane Scrubber. It utilizes the Multi-Venturi rod deck technology as a pre-cleaner to the Dynamic Scrubber or as a retrofit component to enhance performance of an existing Dynamic or Mikrovane Scrubber.





Installations Around the World

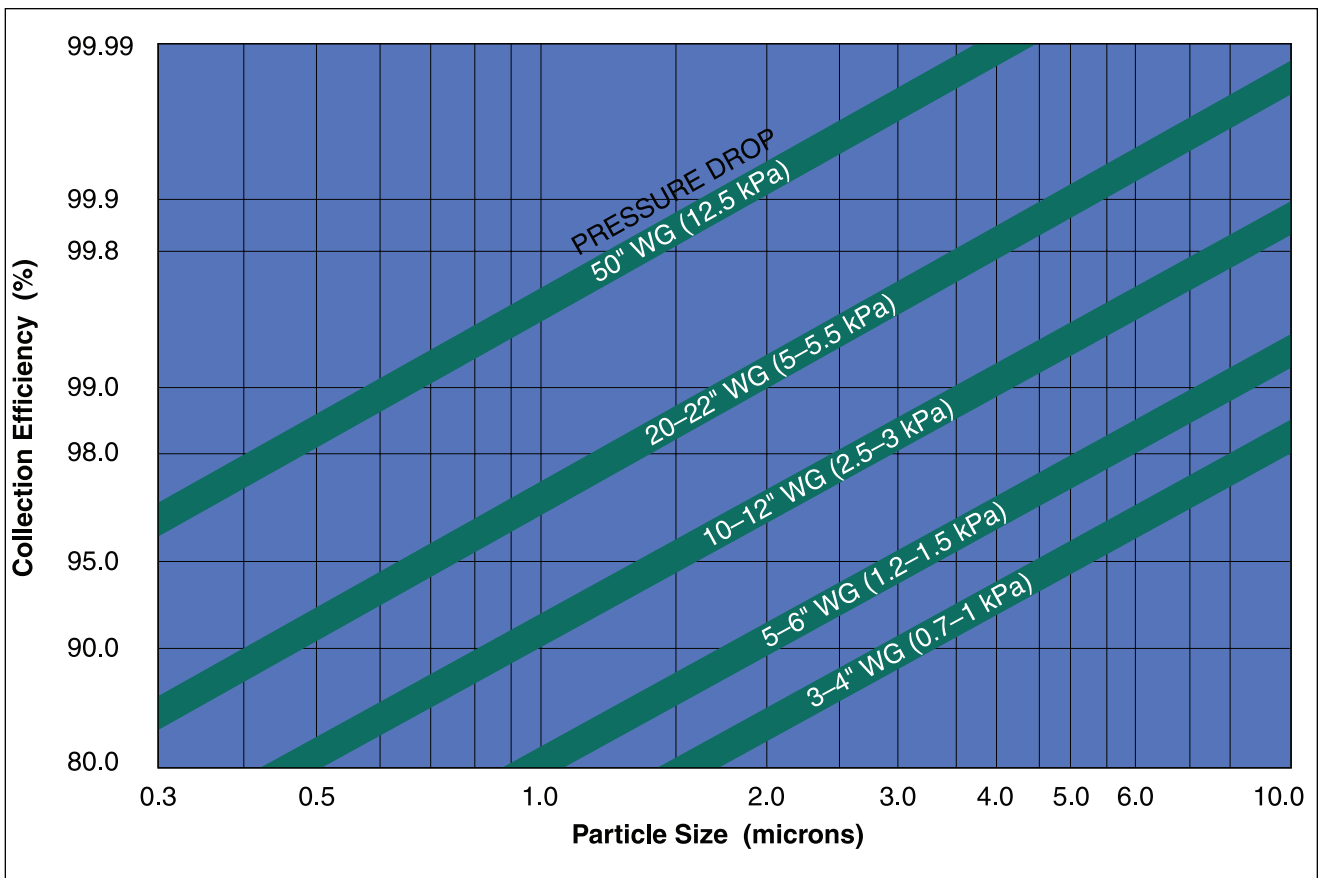
MikroPul offers substantial engineering and manufacturing capabilities on a global scale. Examples include:

1. Venturi scrubber for automotive plant foundry (Canada).
2. Venturi scrubbers for car shredding plant (United Kingdom).
3. Venturi scrubber on autoclave vent for gold mining operation (USA).
4. Dynamic scrubber for ore crushing plant (Australia).
5. Pressure-shock resistant venturi scrubber (Germany).
6. Rotary scrubber for ammonia absorption (Germany).
7. Venturi scrubber on autoclave vent for gold mining operation (Scandinavia).
8. Venturi scrubber for mine production shaft dedusting (under construction, South Africa).
9. *next page* Multiple scrubbers venting high pressure grinding circuit (South America).
10. *next page* Multi-venturi scrubber for Bark boiler (Canada).





EFFICIENCY GUIDE



Collection efficiency of wet scrubbers can usually be related to pressure drop. This graph shows the efficiencies obtainable for various pressure drops from 0.3 to 10 microns.

Care should be taken to use this as a general information tool rather than a

product selection guideline. The actual performance of a given scrubber will depend on the specific dust characteristics and the amount of scrubbing water.

MIKROPUL SUPPORT

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

Parts

Because we know your equipment, MikroPul is your best resource for parts. We carry a full line of replacement parts, and keep high wear items such as pumps, valves, fans, spray nozzles, packing, vanes, etc. in stock for immediate shipment.

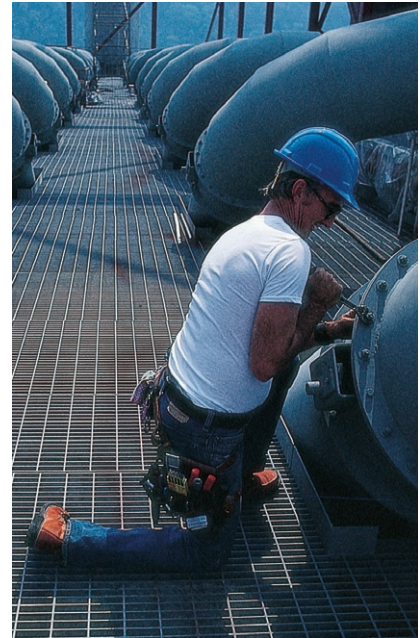
Services

MikroPul provides an array of services to help you select, install, operate, and maximize your equipment investment. We also have the unique capability to update your system to meet today's changing operating

conditions and performance requirements. Services include:

- Complete systems evaluations
- Mechanical equipment review and evaluation
- Equipment refurbishing
- Equipment rebuilding
- Technical training
- Maintenance training

Whether you need spare parts, equipment service, or complete system rebuilds, we are here to support your requirements.



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