



The miracles of science™

BRINK® MIST ELIMINATORS

INDUSTRIAL SOLUTIONS FOR CLEAN AIR



Opacity/Sub-Micron Mist - Before Brink

Technology you can clearly see

MECS®

BRINK®

www.mecs.dupont.com

GENUINE BRINK® FIBER BEDS . . .

BRINK® MIST ELIMINATORS – QUALITY, SERVICE, TECHNOLOGY

Dr. Joseph Brink developed the first fiber bed mist eliminator in 1958. These first mist eliminator devices were developed to solve air pollution issues in phosphoric acid plants. The positive results of this pioneering application led to the decision to commercialize



this new air pollution control technology and offer Brink® fiber beds to other industries. Building on the early

successes and steadily improving these custom engineered devices, has led to over 6000 installations throughout the world.

Air pollution control

Collection of spray and coarse mists from stack effluents may reduce emissions of a pollutant to acceptable levels on a pound per hour basis. However your plant may still be faced with a serious air pollution problem. Submicron mists generate visible and persistent plumes which can be seen for miles. Although generally not an economically significant loss of product or a pounds per day emissions limit, these submicron mists are the major cause of stack opacity and environmental citations for air pollution. Brink® mist eliminator systems can be designed to provide an essentially invisible stack plume. These systems have been in successful operation for over 50 years in a variety of process applications worldwide.

In process gases and equipment protection

The presence of mists in a process gas stream can cause problems associated with product purity, safety and decreased production because of increased maintenance. Fouling of catalysts, instruments and other pieces of equipment as well as serious corrosion of process equipment can be costly results of these aerosol mists. Mists can also affect both the design and operation of a process by requiring more exotic and expensive materials of construction and by dictating how a process is run due to misting and operating conditions which are not favorable for maximum output or yield. Brink® mist eliminator systems have solved many such process problems and excel at collecting the very difficult to remove submicron size mist particles from gas streams.

HOW IS MIST FORMED?

Mist can be formed in manufacturing processes in three different ways:

- Mechanical forces may break up or “atomize” a liquid to form a mist.
- Cooling of a gas stream may result in the condensation of vapor to form a mist.
- Chemical reaction of two or more gases may take place at temperatures and pressures where the reaction products are mists.

Mechanical forces typically create mists with large particles while particles formed by condensation and chemical reactions are usually very small (*submicron*).

WHY BRINK?

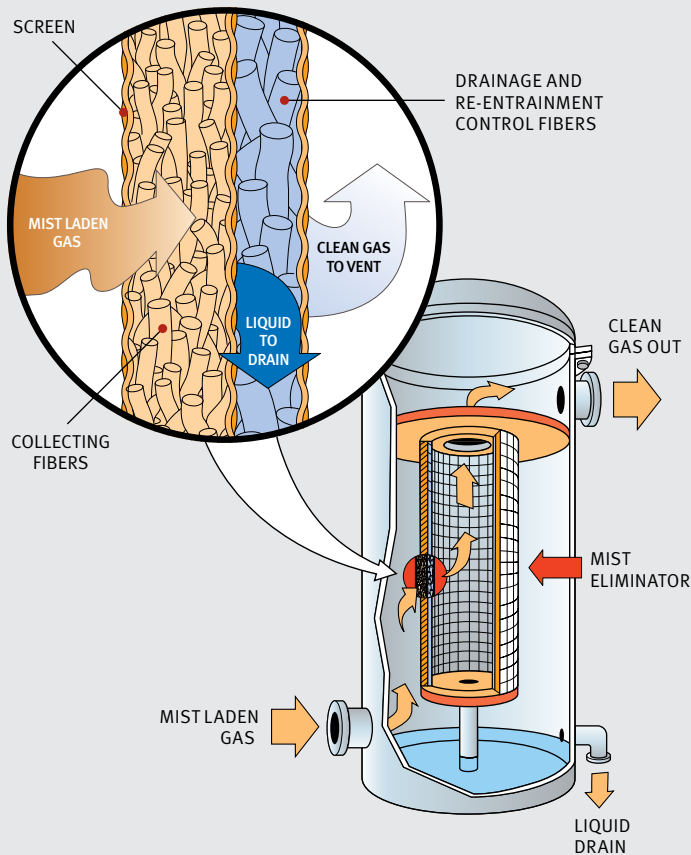
- Broadest selection of mist elimination designs and products
- Best technical support in the industry
- Worldwide manufacturing and availability
- Over 50 years experience with mist collection
- Thousands of installations in hundreds of applications worldwide
- Unique solutions for any application
- Patented mist eliminator designs

... FOR ALL YOUR MIST COLLECTION NEEDS

WHAT IS A FIBER BED MIST ELIMINATOR?

All Brink® Mist Eliminators operate in a similar manner. Gases containing mist particles are directed horizontally through a fiber bed. Particles collect on individual fibers of the bed, coalesce to form liquid films which are moved through the bed by the gas flow, then drain off the downstream face of the bed by gravity. Fiber bed mist eliminators are typically installed in a vessel or tank. Collected liquid is continuously drained from the tank.

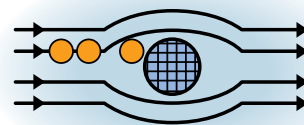
A design innovation is the addition of a second coarse fiber layer on the downstream side to facilitate drainage and control re-entrainment.



PARTICLES ARE COLLECTED IN THREE DIFFERENT WAYS:

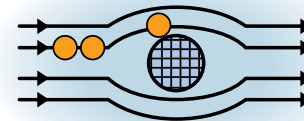
Inertial impaction

Particles larger than three microns are collected when their momentum prevents them from following gas streamlines around fibers. They leave the streamline, strike a fiber and are collected by the fiber.



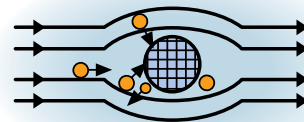
Direct interception

Between 1.0 and 3.0 micron size particles tend to follow the gas streamlines as they flow relatively close to fibers. A 1.0 micron particle, for example, passing within 0.5 micron of a fiber will be collected by the fiber.



Brownian diffusion

Extremely fine particles have random side-to-side movement caused by collisions with gas molecules. A 0.1 micron particle will have about 10 times the Brownian movement or random motion of a 1.0 micron particle, greatly increasing the probability of collision with a fiber.



GENUINE BRINK® FIBER BEDS . . .

ES – ENERGY SAVER

The ES (Energy Saver) Fiber Bed Mist Eliminator incorporates a special wound fiber, computer controlled quality, and a bi-component design.

ES elements are made with our proprietary, one-of-kind wrapping machine. The machine wraps the fiber in a unique angled pattern, which facilitates drainage.

In addition, the pressure drop across the element is monitored during the entire wrapping process ensuring that all mist eliminators in a set are packed to a uniform pressure drop.

ES element benefits include:

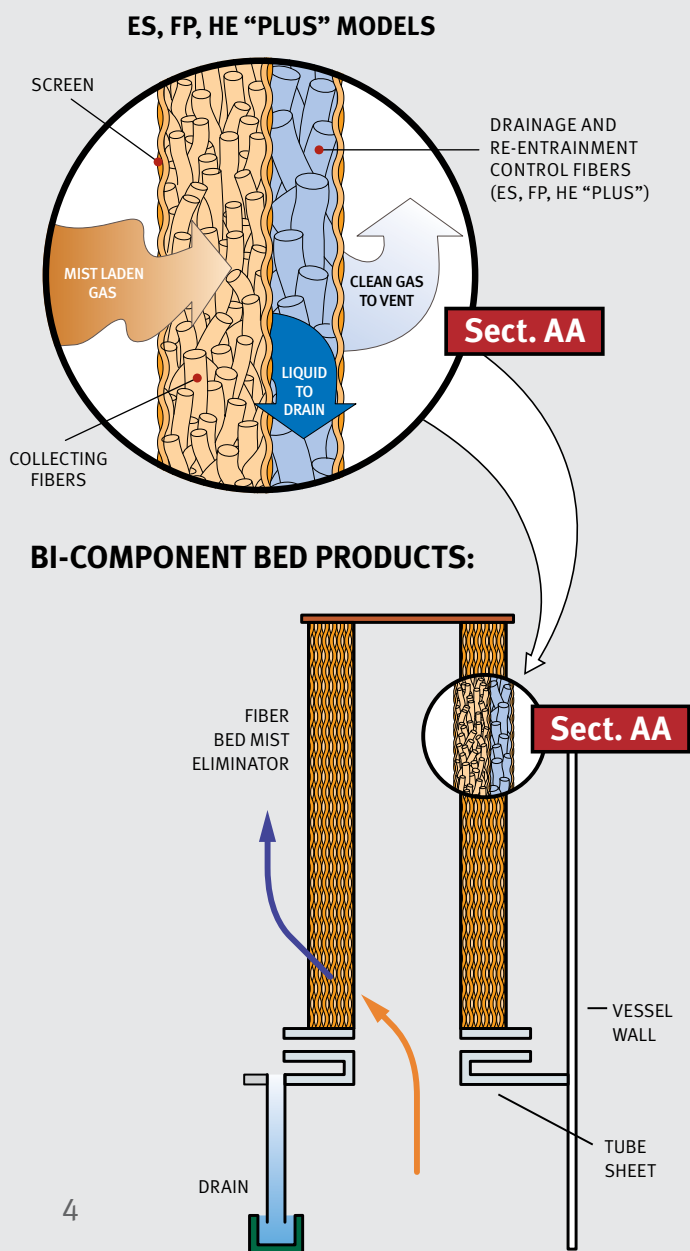
- Up to 20% more gas throughput capacity per element, with no loss in collection efficiency or penalty of increased pressure drop.
- Re-entrainment of collected mist in exit gas is virtually eliminated.
- Periodic repack is easier and less expensive with the ES.

THE HEART OF THE ES, IS ITS BI-COMPONENT FIBER BED DESIGN

In a conventional fiber bed, liquid draining on the downstream face of the fiber bed is sometimes re-entrained in the exiting clean gas. This re-entrainment becomes worse with higher loadings of mist and/or higher flow velocities.

The ES includes an engineered layer of coarse fibers downstream of the finer collecting fiber. Liquid that would re-entrain from the fine fiber bed is recaptured and drained in the re-entrainment layer.

The standard ES element diameter is 2 feet (610 mm) and elements are available in lengths from 6 to 24 feet (1829 to 7315 mm). The wound fiber may be glass, polyester, polypropylene, or special polymeric fibers. The element cage can be fabricated from any weldable metal or can be made of fiberglass reinforced plastic or polypropylene.



The ES – Energy Saver incorporates a computer controlled angle wrap



... FOR SUBMICRON MIST COLLECTION

HE – HIGH EFFICIENCY

The HE (High Efficiency) Fiber Bed Mist Eliminator is the original design that was developed in 1958. HE elements are still in use in many applications, and are typically used for soluble salt applications.

The HE element consists of fibers which are packed between two concentric cylindrical screens. HE elements vary in diameter from 8.5 inches to 24+ inches (216 mm to 610+ mm), and are available in lengths up to 288 inches (7315 mm).

Fibers may be glass, polypropylene, polyester, or ceramic. The screens can be fabricated from any weldable metal or can be made of fiberglass reinforced plastic or polypropylene.

The HE “Plus” adds a re-entrainment control layer similar to the ES design.



FP elements
are available in glass or polyester fiber.

FP – FIELD PACK

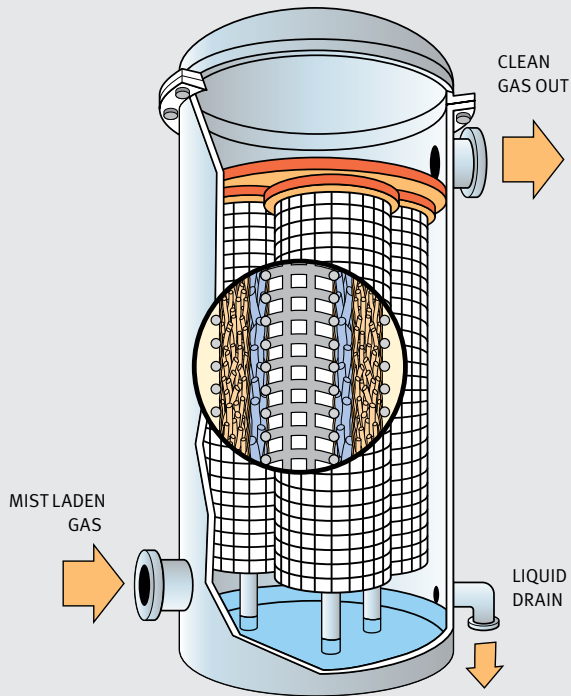
The patented FP (Field Pack) Mist Eliminator design enables fiber bed mist eliminator users to replace their fiber packing in the field without returning the element cage to the factory for fiber replacement.

This design utilizes a special mat material that is sewn to form a sleeve or tube. This sleeve is clamped to the inner element cage. An outer screen is then added to the element for further stability.

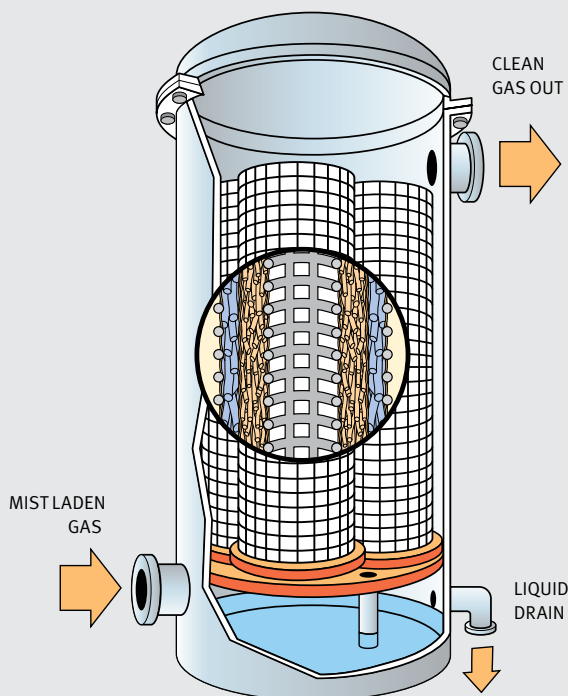
FP elements are available in glass or polyester fiber. Existing type ES elements can usually be modified to accept FP style packs. Efficiencies and pressure drops are comparable to type ES elements. FP elements are available in a wide variety of diameters and lengths. This makes them a perfect fit for applications which require a large amount of fiber bed area in a small vessel (*see page 6 for more details*).



HANGING STYLE ELEMENTS



STANDING STYLE ELEMENTS



INSTALLATION CONFIGURATIONS

Hanging style Brink® elements – also called Forward Flow, hang from the tube sheet/vessel division plate. This configuration features ease of installation and maintenance. In this style, the dirty gas goes in the outside of the element and the clean gas exits through the center core.

Standing style Brink® elements – also called Reverse Flow, stand vertically on the tube sheet/vessel division plate. This configuration permits the use of longer elements and vessels of reduced size. In this style, the dirty gas goes into the center core of the element and the clean gas exits through the outside.

Prefilters are available for applications where insoluble particles in the gas stream cause the useful life of the fiber bed mist eliminator to be limited due to pluggage.

PREFILTERS

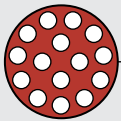
Prefilters are replaceable “bags” that are placed around the outside of the element or inside the element, depending on the gas flow direction. These “bags” are made from a special mat material that is quite efficient yet has an open structure to enhance the dirt holding capacity.



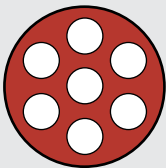
Prefilters are available in polyester or polypropylene.

... WHEN PRESSURE DROP IS AT A PREMIUM

Brink® has products available that can lower pressure drop, increase capacity, improve efficiency or reduce vessel size.



8" (204 mm) DIAMETER ELEMENTS



CONVENTIONAL 24" (610mm) DIAMETER ELEMENTS

CONCENTRIC ELEMENTS

- Increases the element surface area without requiring tubesheet modifications.
- Lowers pressure drop or increases flow capacity.
- Available in all element types.

SMALL DIAMETER BEDS

- Increases the flow area without increasing vessel size.
- Lowers pressure drop or increases flow capacity.
- Lighter elements are easier to handle.
- Fewer attachment points required.

QUAD BEDS

- Retrofitting increases the area with conventional bolting.
- Lowers pressure drop or increases flow capacity.
- Easy to repack.



DE-BOTTLENECKING

You can avoid the extra cost of a flared or lengthened vessel by using Brink® Concentric Fiber Beds.

GENUINE BRINK® FOR YOUR APPLICATIONS . . .

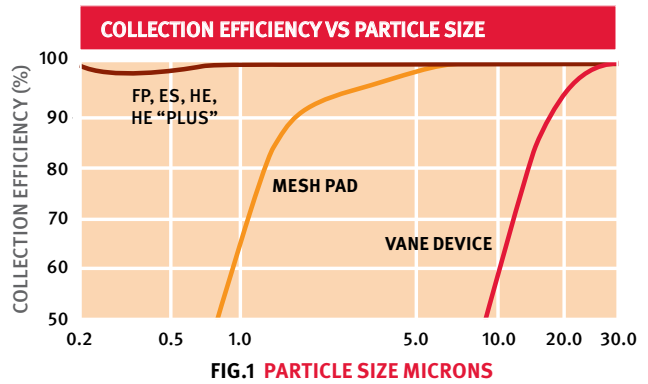
| PROCESS | LOCATION | PROBLEM |
|------------------------------|---|--|
| SULFURIC ACID | Drying Tower | Acid mists foul catalyst and corrode downstream equipment |
| | Interpass Absorption Tower | Acid mists corrode expensive downstream equipment |
| | Final Absorption Tower | Acid mists cause air pollution |
| | Oleum Storage and Loading Area | SO ₃ from vents mixes with moisture in air to form acid mist creating safety, corrosion, and pollution problems |
| | Ammonia and Caustic Scrub | Submicron salts, formed in the scrubber, create an opacity pollution problem |
| CHLORINE | Wet End | Brine mists foul drying tower and increase sulfuric acid consumption in drying gas |
| | Dry End | Acid mists corrode compressor and reduce product quality |
| | Hydrogen | Salt and/or caustic particulates must be removed to allow hydrogen to be used in combustion gas power cycle |
| NITRIC ACID | Ammonia Feed Line | Iron scale and oil particles cause contamination of the platinum gauze |
| | Air Feed Line | Iron scale and oil particles cause contamination of the platinum gauze |
| | Mixed Gas Filter | Line scale and aerosol oil mist causes decomposition of the ammonia and contamination of the platinum gauze |
| | NO _x Compressor Filter | Compressor fouling, increased maintenance and shortened campaign service life |
| | After Converter (Platinum Recovery) | Loss of platinum burned off the gauze during normal operation |
| | Tail Gas | Nitric acid mist that is carried over from the absorption tower corrodes downstream equipment |
| AMMONIUM NITRATE | Neutralizer | AN is carried out by exhaust gas, causing product loss and pollution |
| | Evaporator | Product loss and pollution |
| | Prill Tower | Visible plume caused by AN salts in exhaust gas |
| FUMING ACIDS | Tank Vents | Olem, Liquid SO ₃ and CSA cause a highly corrosive and visible plume when vented to atmosphere |
| TURBINE LUBE OIL VENT | Frame sized, aero-derivative turbines & marine propulsion | Oil used to lubricate bearings evaporates from heat and creates oil smoke |

... THROUGHOUT INDUSTRY

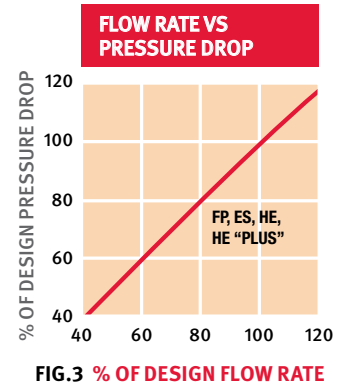
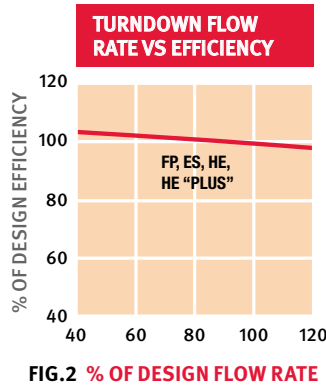
| PROCESS | LOCATION | PROBLEM |
|---|--|--|
| PULP & PAPER | Ammonia Based Sulfite Recovery Exhaust | Particulate formed in the combustion and scrubbing steps creates an opacity pollution problem |
| KRAFT MILLS | Effluent from Digester Off Gas | Totally Reduced Sulfur (TRS) gases are emitted through the process as SO ₂ & SO ₃ gas contaminates The SO ₃ hydrolyzes to a sulfuric acid aerosol mist |
| SULFONATION | Before the Reactor After the Reactor | Entrained acid causes product purity problems Acid mist causes air pollution |
| PHOSPHORIC ACID | Thermal Process Absorber | Acid mist causes air pollution |
| CHEMICAL INCINERATION – ACID GAS SCRUBBING | After Scrubber | Salts and weak acid mist formed in scrubber cause opacity air pollution problem |
| PLASTIC MANUFACTURING | Curing Ovens Extruders and Injection Molding | Plasticizer vapors condense in air causing visible plume and unacceptable hydrocarbon emissions |
| ASPHALT & ROOFING MANUFACTURING | Asphalt Saturator | Asphalt vapors condense in air causing visible plume and unacceptable hydrocarbon emissions |
| | Asphalt Storage and Loading | Asphalt vapors condense in air causing visible plume and a health hazard |
| TEXTILES | Tenter Frames Platisol Fabric Coatings | Plasticizer emissions present as an oil smoke and blue haze |
| COMPRESSED GAS | Compressor Aftercooler | Oil and water mists contaminate product and foul equipment |
| | Plant Air Instrument Air | Oil and water mists foul instruments and damage equipment |
| | Natural Gas Pipelines | Oil and water mists contaminate product and foul equipment |
| METALWORKING | Machining Grinding | High speed machining & grinding cause coolant mist and oil smoke |
| | Cold Heading | High material & die temperatures cause oil to flash off and recondense as oil smoke |
| | Oil Quench | Heat treated parts when immersed in oil for quench causes oil smoke and blue haze |
| ROTATING EQUIPMENT AND PUMPS | Gear Boxes, Speed Reducers And Vacuum Pumps | Heat build up from energy transfer, friction and mechanical shearing causes lubricating oils to create clouds of oil smoke/fog |

HOW SMALL IS MIST?

Brink® collection efficiencies approach 100% for particles 3 microns and larger and elements can be designed to achieve collection efficiencies of 99.95% on particles smaller than 3 microns (*FIG. 1*). For ES, HE, HE "Plus" and FP products, the collection efficiency actually *INCREASES* with reduced flow rates (*FIG. 2*) and pressure drop is linearly proportional to flow rate (*FIG. 3*).



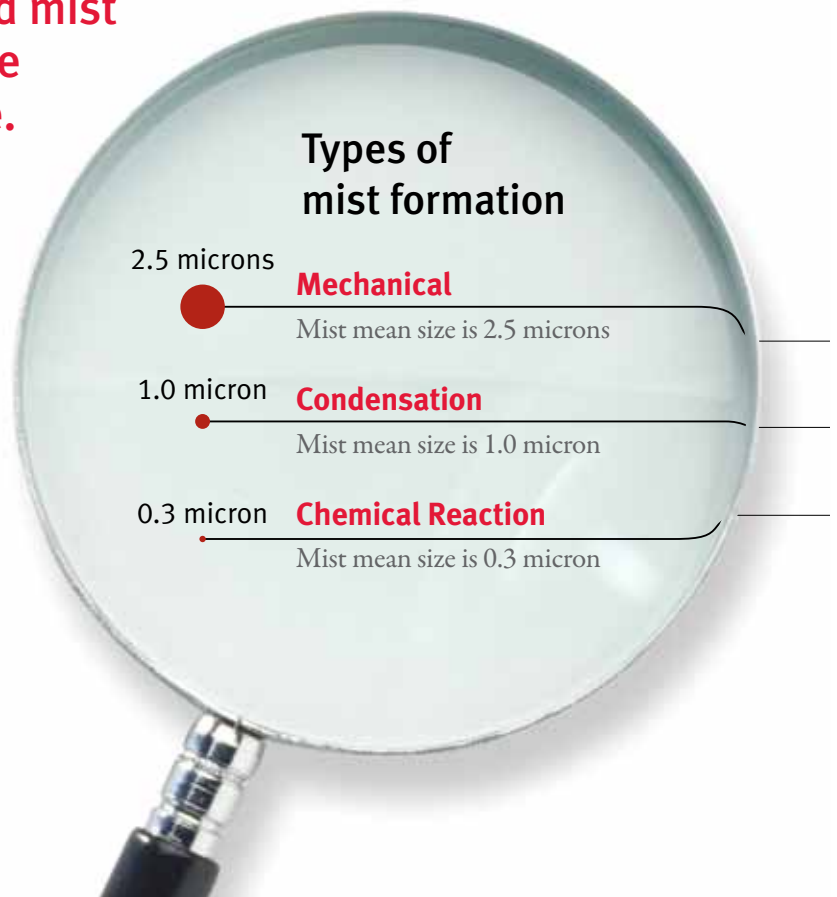
NOTE: data shown is expected performance based on particle specific gravity of 1.8.



If a human hair was this size...

A human hair has a diameter of approximately 100 microns.
1 micron = 0.000039 inch (0.001mm)

...then acid mist would be this size.



BRINK® INDUSTRIAL SYSTEMS . . .

OIL MIST SYSTEMS

Process related – Many industrial processes, such as plastic molding or asphalt coating of roofing materials, require high temperatures to be effective. The Brink® Oil Mist System design is based on capture efficiency, flow rate, type of organic compound and pressure drop/energy efficiency.

Rotating equipment and pumps – Brink® Oil Mist Systems are highly efficient, mist removal devices and integrated packages that are designed to control problems created by condensed machinery lubrication oils that form a “smoke” or “fog” when vented to ambient surroundings.



AVP – ASPHALT VENT PACKAGE

The AVP (Asphalt Vent Package) system controls emissions from asphalt storage and loading operations. The system includes a prefilter, mist eliminator element, blower and motor – a simple robust design for minimum maintenance.



FAVS – FUMING ACID VENT SYSTEM

The Brink® FAVS (Fuming Acid Vent System) by MECS® Inc. (MECS) is an engineered, skid mounted sub micron mist removal device that is designed to control problems created by fuming acids that are vented to the atmosphere. Typically the application is related to these fuming acids being pumped into storage tanks, tank cars or tank trucks.



MISTGARD®

Backed by over 50 years of industry experience, a MistGARD® package system is perfect for collecting straight oil, water soluble, synthetic, and semi-synthetic metalworking fluids. Using Brink® fiber bed technology, MistGARD® combines high performance with low maintenance. These units are ideal for the customer who requires maximum flexibility with limited floor space.



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