



Elessent™
MECS® TECHNOLOGIES

**INDUSTRIAL SOLUTIONS
FOR PROCESS GAS
CLEANING AND CLEAN AIR**



**OPACITY/SUBMICRON MIST
BEFORE BRINK®**



**OPACITY/SUBMICRON
MIST AFTER BRINK®**

Brink® gas cleaning technologies provide results you can clearly see.

Elessent Clean Technologies
MECS® Technologies
MECS.ElessentCT.com

GENUINE BRINK® FIBER BEDS FOR YOUR MIST COLLECTION NEEDS

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 have led to over 6,000 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. 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 that 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:

1. Mechanical forces may break up or “atomize” a liquid to form a mist
2. Cooling of a gas stream may result in the condensation of vapor to form a mist
3. 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® SYSTEMS?

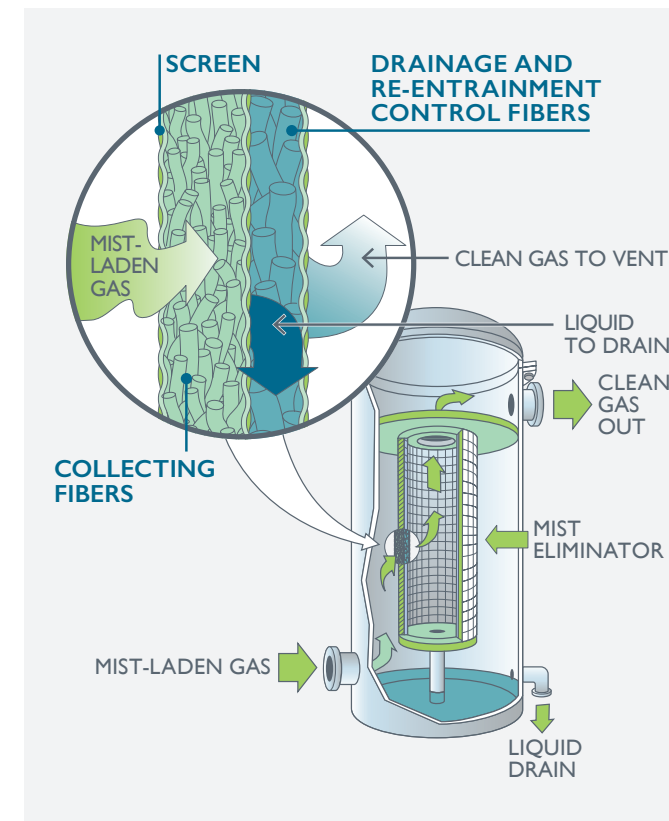
- Broadest selection of mist elimination designs and products
- Best technical support in the industry
- Worldwide manufacturing and availability
- Over 50 years’ experience with mist collection
- Thousands of installations in hundreds of applications worldwide
- Unique solutions for any application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

BRINK® SYSTEMS FACILITATE DRAINAGE AND CONTROLS RE-ENTRAINMENT

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 that are moved through the bed by the gas flow, and 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.

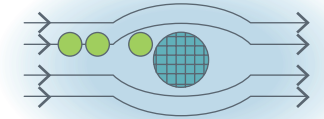
One of the Brink® design innovations is the addition of a second coarse fiber layer on the downstream side to facilitate drainage and control re-entrainment.



PARTICLES ARE COLLECTED IN THREE DIFFERENT WAYS

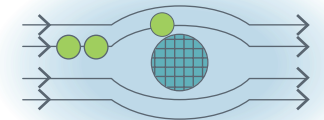
Inertial impaction

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.



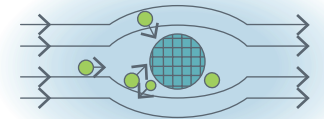
Direct interception

Particles between 1.0 and 3.0 microns tend to follow the gas streamlines as they flow relatively close to fibers. A 1.0-micron particle, for example, passing within 0.5 microns 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.



BRINK® ENERGY SAVER MIST ELIMINATION

ENERGY SAVER-ES

The ES fiber bed mist eliminator incorporates a special wound fiber, computer-controlled quality and a bicomponent design.

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

Additionally, 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 BICOMPONENT FIBER BED DESIGN

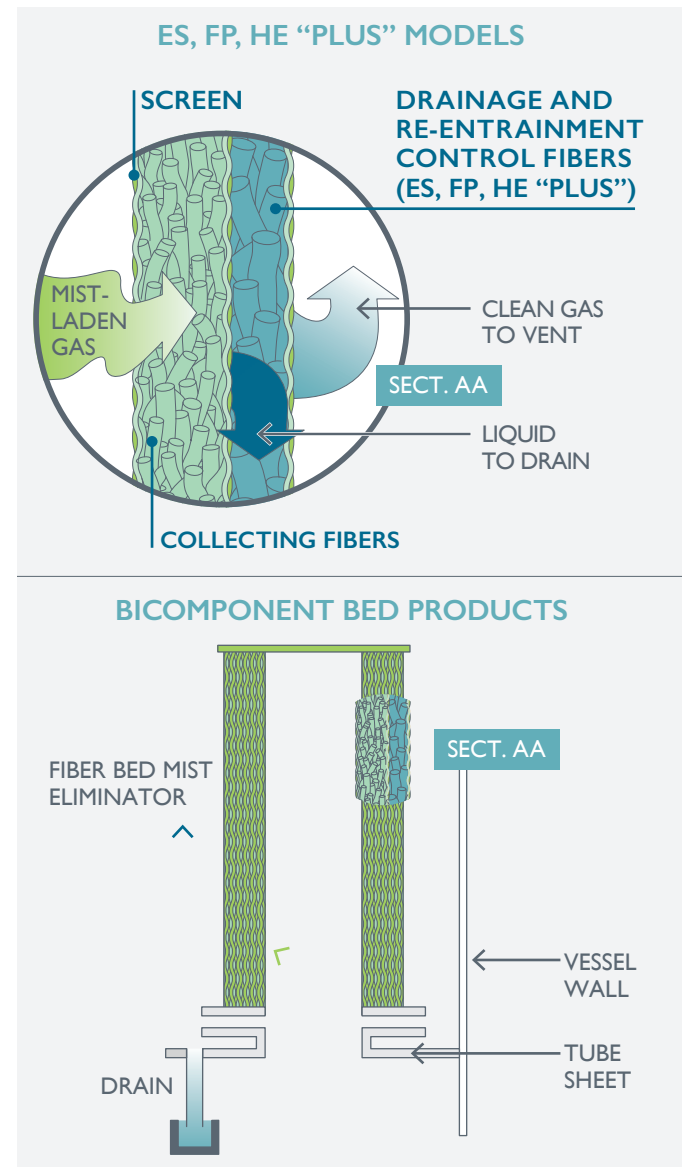
In a conventional fiber bed, liquid draining on the downstream face of the fiber bed is sometimes re-entrained in the exiting clean gas. This re-entrainment becomes worse with higher loadings of mist and/or higher flow velocities.

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 ft. (610 mm), and elements are available in lengths from 6ft. to 24 ft. (1829 mm 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 incorporates a computer-controlled angle wrap.



BRINK® HIGH EFFICIENCY AND FIELD PACK MIST ELIMINATION

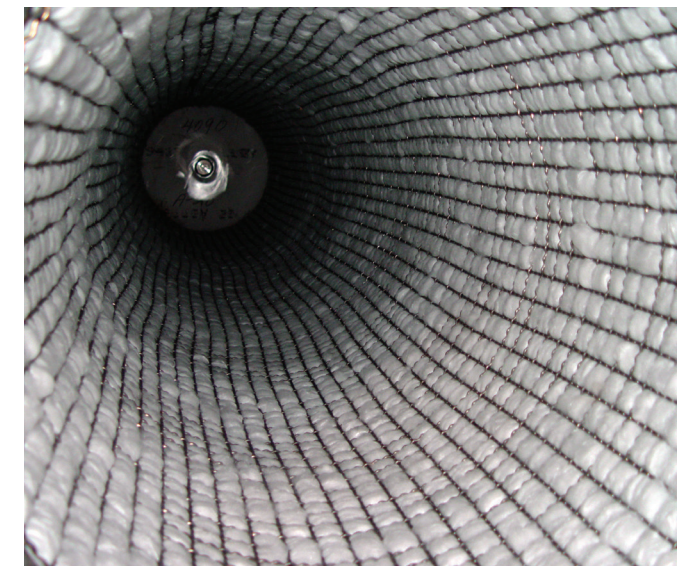
HIGH EFFICIENCY-HE

The HE 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 that are packed between two concentric cylindrical screens. HE elements vary in diameter from 8.5 in. to 24+ in. (216 mm to 610+ mm) and are available in lengths up to 288 in. (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.

FIELD PACK-FP

The patented FP 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.

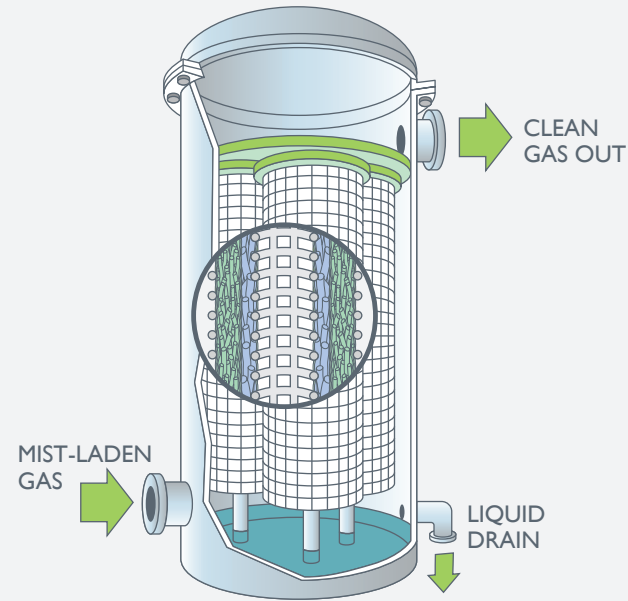
This makes them a perfect fit for applications that require a large amount of fiber bed area in a small vessel.

(See page 6 for more details)

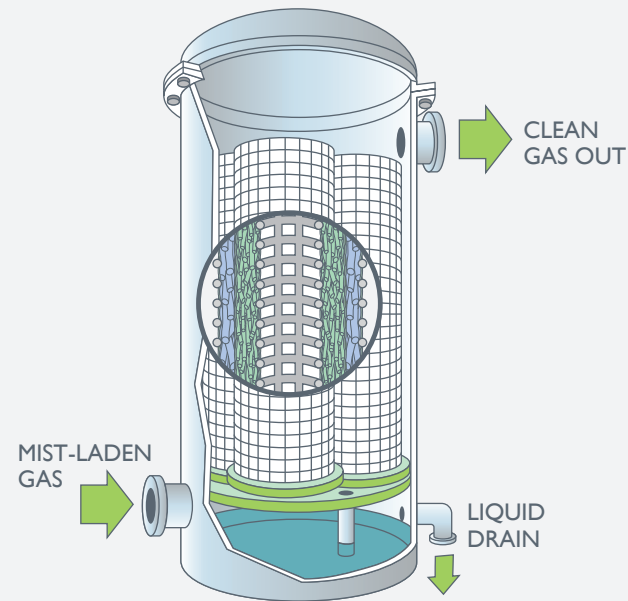


FORWARD FLOW AND REVERSE FLOW INSTALLATION

HANGING-STYLE ELEMENTS



STANDING-STYLE ELEMENTS



INSTALLATION CONFIGURATION

Hanging-style Brink® elements, also called Forward Flow

These 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

These 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.

GENUINE BRINK® FIBER BEDS WHEN PRESSURE DROP IS AT A PREMIUM

BRINK® SYSTEMS HAVE PRODUCTS AVAILABLE THAT CAN LOWER PRESSURE DROP, INCREASE CAPACITY, IMPROVE EFFICIENCY OR REDUCE VESSEL SIZE.

Concentric elements:

- Increase the element surface area without requiring tubesheet modifications
- Lower pressure drop or increases flow capacity
- Available in all element types

Small-diameter beds:

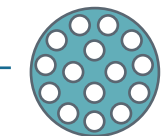
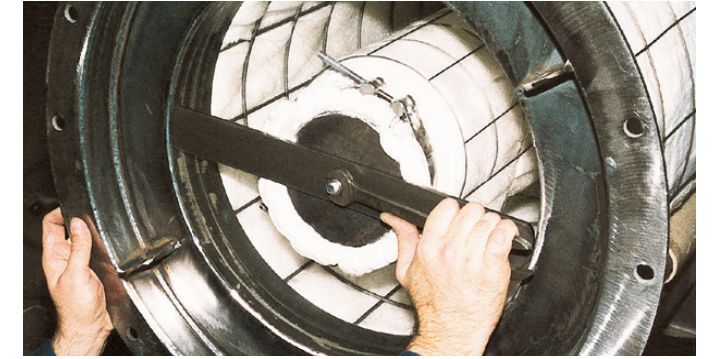
- Increase the flow area without increasing vessel size
- Lower pressure drop or increases flow capacity
- Lighter elements are easier to handle
- Fewer attachment points required

Quad beds:

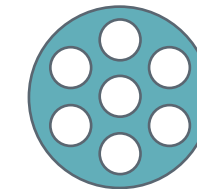
- Retrofitting increases the area with conventional bolting
- Lower pressure drop or increases flow capacity
- Easy to repack

De-bottlenecking:

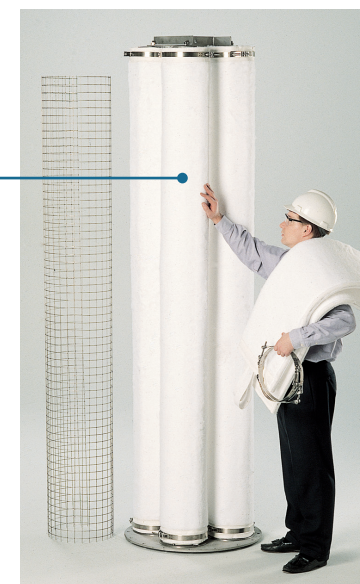
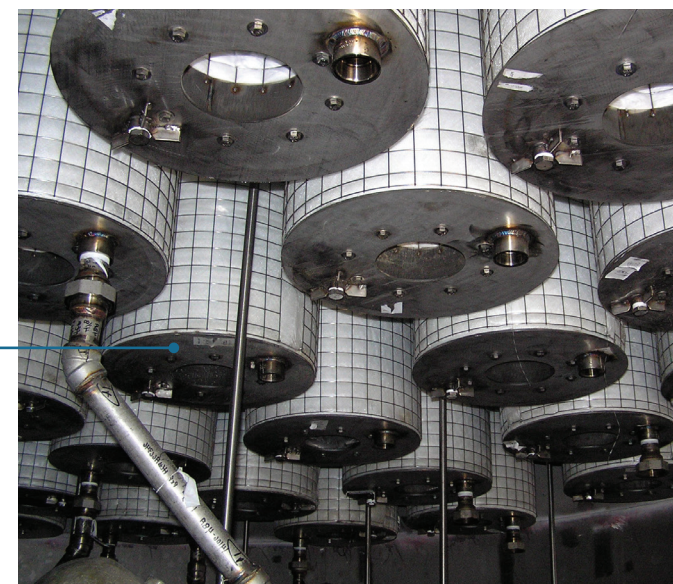
- You can avoid the extra cost of a flared or lengthened vessel by using Brink® concentric fiber beds



8 in. (204 mm) DIAMETER ELEMENTS



CONVENTIONAL 24 in. (610 mm) DIAMETER ELEMENTS



GENUINE BRINK® SYSTEMS FOR YOUR APPLICATIONS THROUGHOUT INDUSTRY

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 cause decomposition of the ammonia and contamination of the platinum gauze
	NOx 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 acid	Tank vents	Oleum, 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 and marine propulsion	Oil used to lubricate bearings evaporates from heat and creates oil smoke

PROCESS	LOCATION	PROBLEM
Pulp and 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 oven 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 plastisol 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 and instrument air	Oil and water mists foul instruments and damage equipment
	Natural gas pipelines	Oil and water mists contaminate product and foul equipment
Metalworking	Machine 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 cause oil smoke and blue haze
Rotating equipment & pumps	Gear boxes, speed reducers and vacuum pumps	Heat buildup from energy transfer, friction and mechanical shearing cause lubricating oils to create clouds of oil smoke/fog

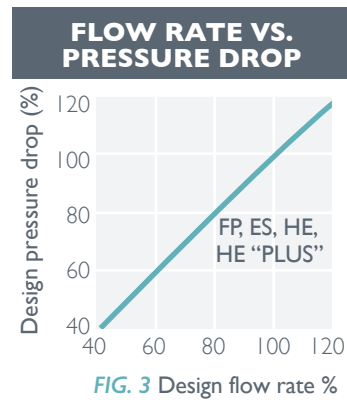
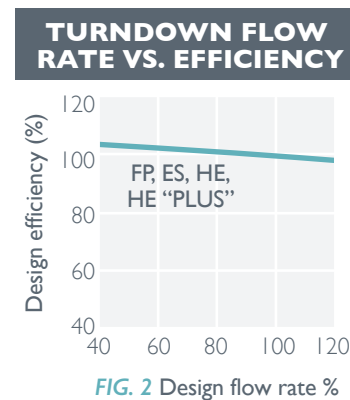
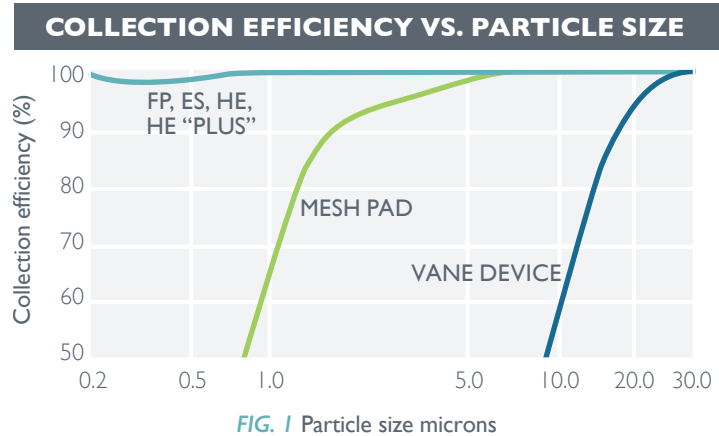


THE SCIENCE BEHIND BRINK® INDUSTRIAL SYSTEMS

HOW SMALL IS MIST?

Brink® collection efficiencies approach 100% for particles three microns and larger, and elements can be designed to achieve collection efficiencies of 99.95% on particles smaller than three 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).



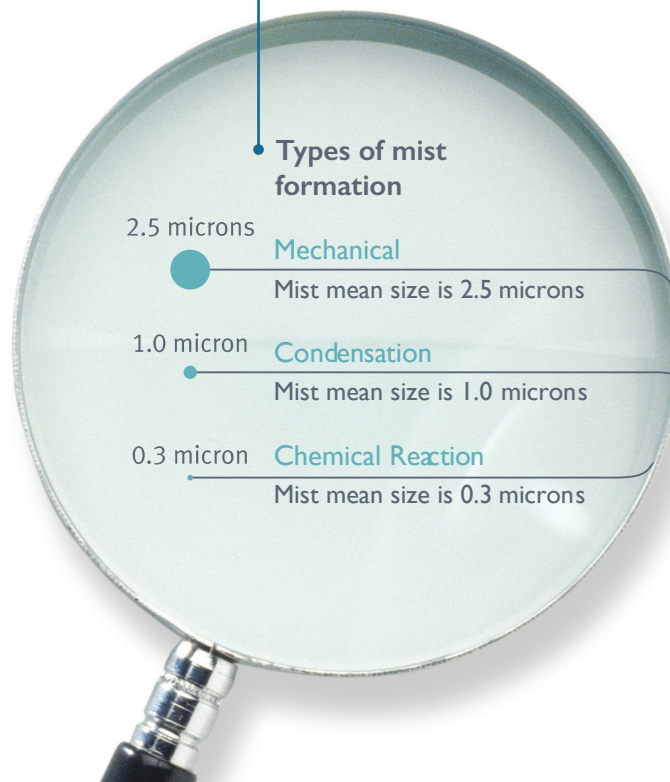
NOTE: Data shown is expected performance based on particle specific gravity of 1.8.

IF A HUMAN HAIR WAS THIS SIZE ...

A human hair has a diameter of approximately 100 microns.

1 micron = 0.000039 in. (0.001mm)

... THEN ACID MIST WOULD BE THIS SIZE.



EFFICIENCY AND INTEGRATION HIGH PERFORMANCE, LOW MAINTENANCE

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.



FUMING ACID VENT SYSTEM-FAVS

The Brink® FAVS by MECS, Inc. (MECS) is an engineered, skid-mounted submicron 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.



ASPHALT VENT PACKAGE-AVP

The AVP 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.



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.



WORLD-CLASS TECHNOLOGY. WORLD-CLASS SERVICE. AVAILABLE WORLDWIDE.

ELESSENT CLEAN TECHNOLOGIES is a leading source of solutions for decarbonizing the industrial manufacturing sector and transitioning the industry to a sustainable future. Our clean technology solutions minimize environmental impact and optimize productivity while remaining cost competitive. As a responsible supplier and partner to the metal, fertilizer, chemical, petrochemical and oil refining industries, our technology portfolio includes MECS® sulfuric acid production, STRATCO® alkylation, BELCO® wet scrubbing and IsoTherming® hydroprocessing. Offering critical process equipment, products, technology and services, we are dedicated to helping our customers produce high-quality, cleaner products for the world.



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