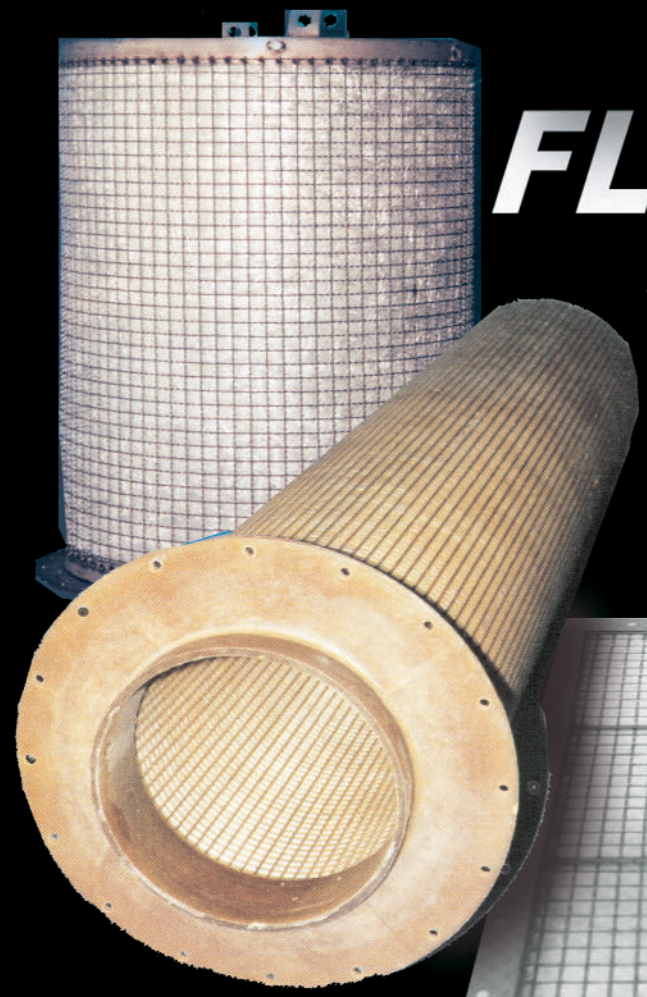
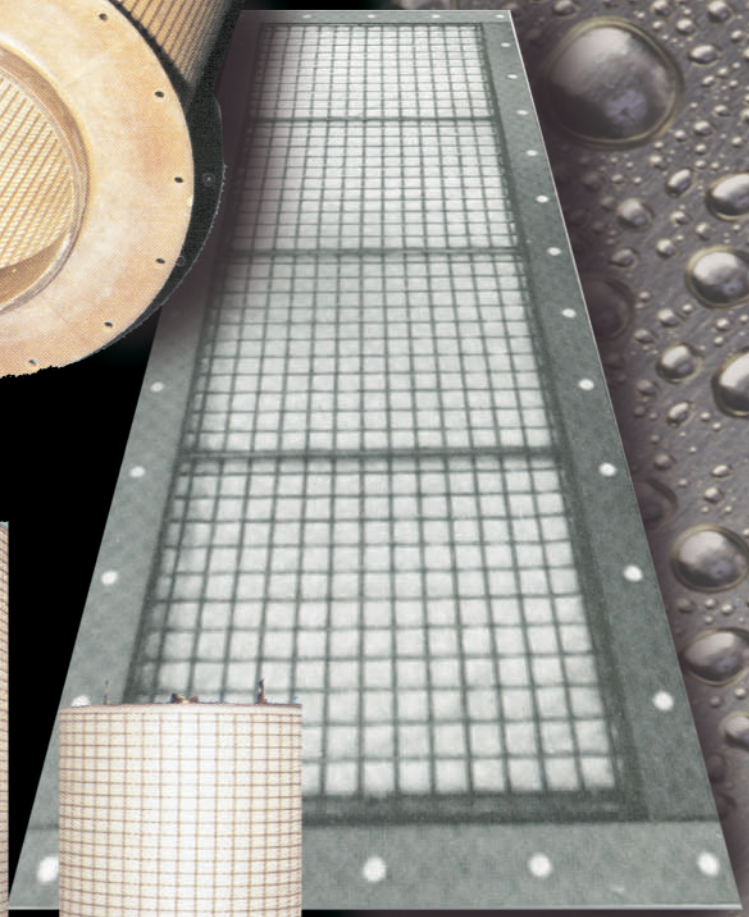
FLEXIFIBER®
Mist Eliminators





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What is a FLEXIFIBER® Mist Eliminator?

A FLEXIFIBER® mist eliminator is a fiber bed into which mist laden gases enter, and out of which emerges a clean gas stream and a separated liquid stream. Fiber packing in the bed is engineered to provide extremely high separation efficiencies. Figure 1 shows schematically a FLEXIFIBER mist eliminator. As indicated, the bed consists of special fibers, which are densely packed between two screens. Mist-laden gases enter from the side of the bed and pass in a horizontal direction through the bed. Clean gases emerge from the bed and rise to exit from the mist eliminator. Separated liquids are directed downwards and towards the outer screen, and ultimately drain down the outer edge of the bed.

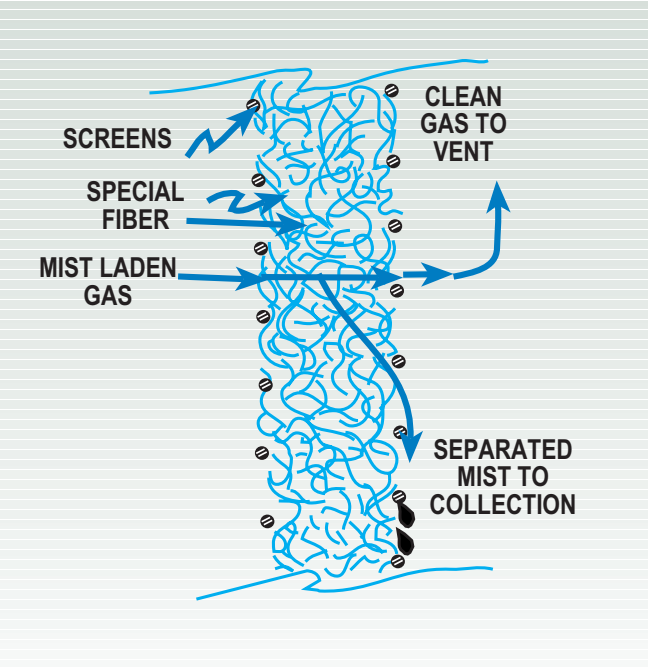
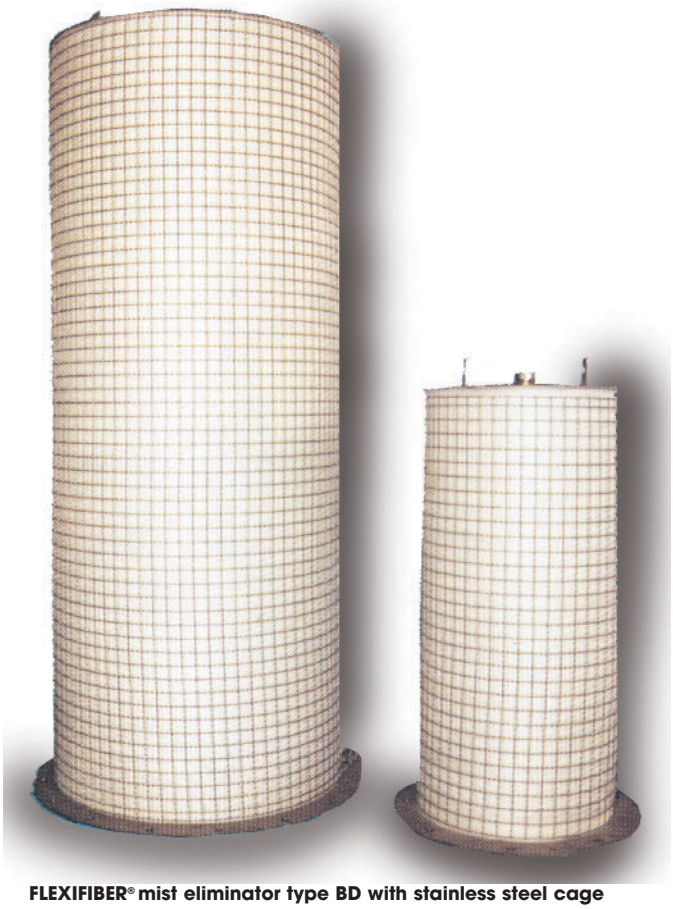


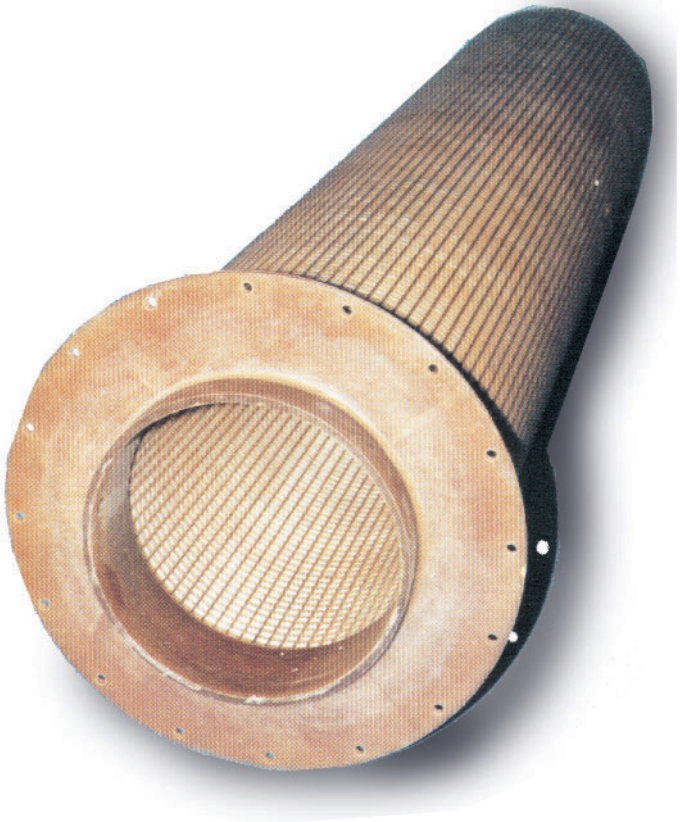
Figure 1. Single stage vertical FLEXIFIBER® mist eliminator



FLEXIFIBER® mist eliminator type BD with stainless steel cage

Typical FLEXIFIBER® Mist Eliminator Installations

Figures 3. and 4. show typical FLEXIFIBER mist eliminator installations. Basic components of this system are the FLEXIFIBER element and the vessel. The element consists of two concentrically oriented cylindrical screens containing packed fibers in the annular area. The screens are connected to a flange at the top of the element, and the flange in turn is bolted to the tank tube sheet. Mist-laden gases commonly enter the tank at the base and pass through the bed towards the element core. Separated liquids drain downwards through the bed, through the drain leg, and are collected at the base of the tank. Clean gases exit at the top of the vessel.



FLEXIFIBER® mist eliminator type BD with FRP cage

Basic Mechanism of Mist Separation

The three basic mechanisms for mist separation can best be described by considering the following. A gas stream containing mist particles moves towards a fiber which is perpendicular to the direction of flow. As depicted in figure 2, the gas streamlines around the fiber. The momentum of larger particles, greater than about 1 micron, makes them deviate from the gas streamline and head for the fiber. The larger particles are thus separated through the principle of inertial impaction.

Smaller particles, generally smaller than one micron in diameter, tend to follow the gas streamline around obstacles. However, as shown in figure 2, they show considerable Brownian movement and thus diffuse from the gas to the surface of the fiber. A particle having a 0.1 micron diameter will have approximately five times the Brownian displacement of a 1.0 micron particle and about 15 times the Brownian displacement of a 5.0 micron particle. Through proper fiber bed design, submicron particles can thus be effectively collected. With Brownian diffusion, the collection efficiency increases as the particle size decreases because the Brownian displacement actually increases with smaller particle size.

Particles may also be collected by direct interception. The particle may follow a gas streamline and be collected without inertial impaction or Brownian diffusion if the streamline is relatively close to the fiber. Consider a particle with a diameter of 1 micron. If it follows a gas streamline which passes within 0.5 microns of the fiber, the particle will touch the fiber and be collected.

The three mechanisms previously discussed make FLEXIFIBER mist eliminators highly efficient mechanical type liquid entrainment separators. While their primary purpose is to remove low micron and submicron liquid particles, they will also handle large particles at higher efficiencies. They can also handle either large quantities of soluble solids or small quantities of insoluble solids providing the particles are very small and there is sufficient liquid in the gas stream to flush the solids through the fiber beds. Small quantities of very large particles can be handled by collection on the surface of the bed.

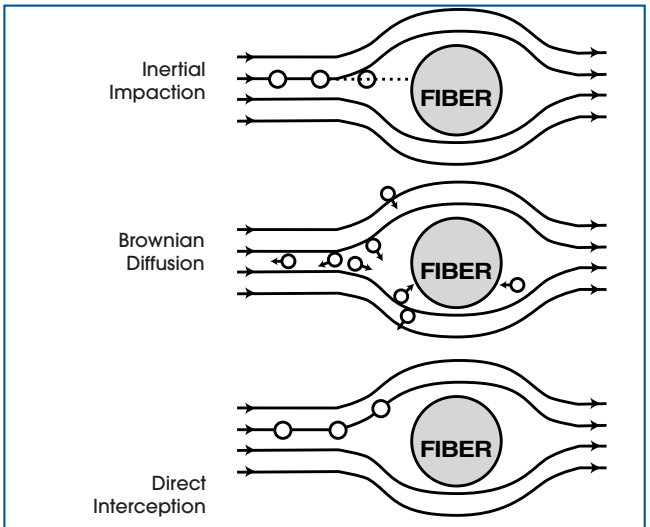


Figure 2. Mechanisms for mist collection on fibers

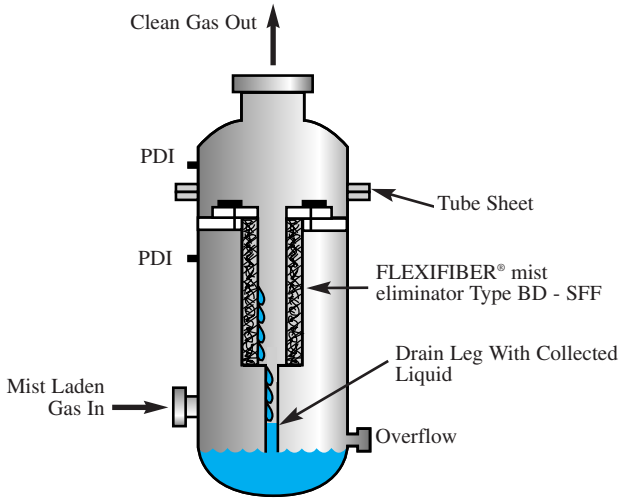


Figure 3. Typical FLEXIFIBER® mist eliminator assembly (forward flow installation).

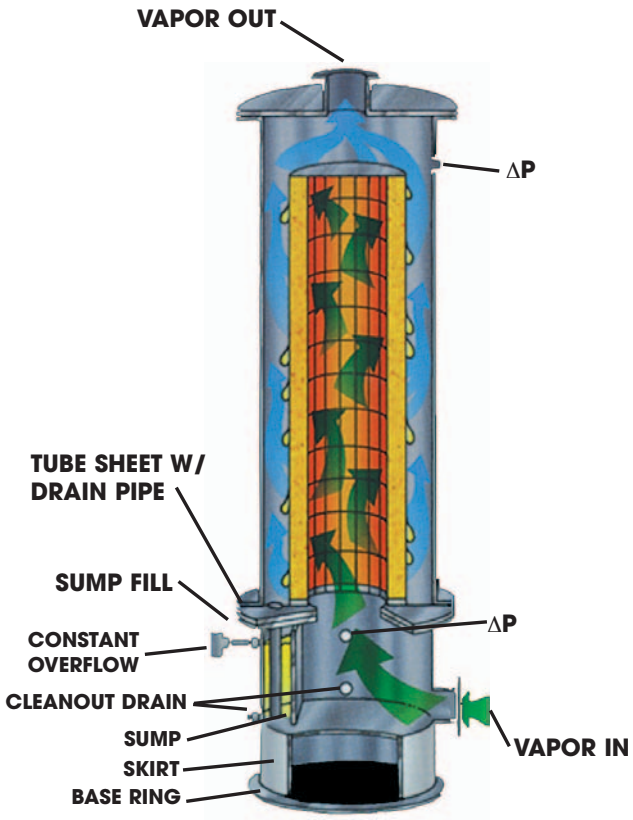
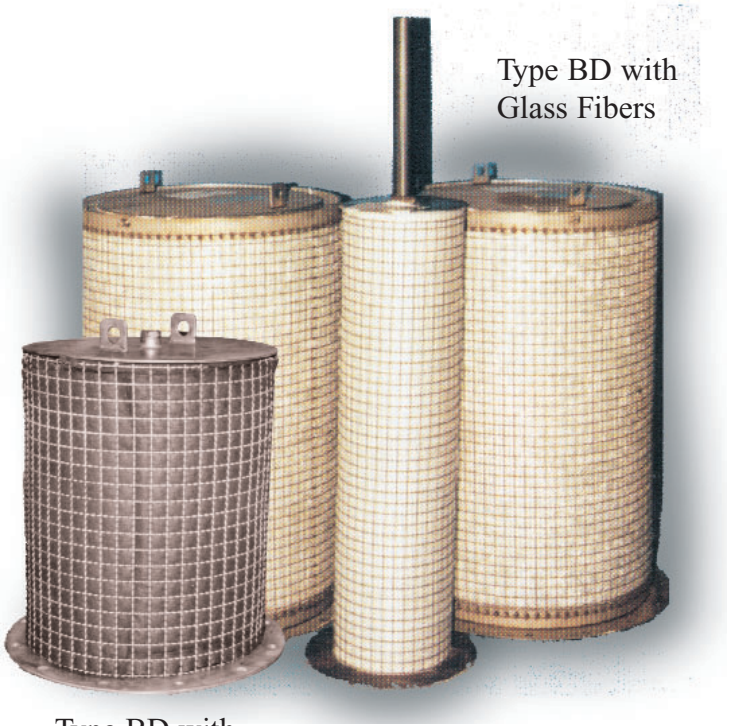


Figure 4. FLEXIFIBER® mist eliminator for lube oil tank vents on gas or steam turbines.

FLEXIFIBER® Mist Eliminator type BD (Brownian Diffusion)

Utilizing the Brownian Diffusion mechanism, Type BD is able to achieve collection efficiencies of up to 99.95% on all submicron liquid or soluble solid particles. Type BD elements are normally cylindrical in shape, and are available in a wide variety of materials and sizes. Operating pressure drops are normally designed in the range of 50 to 500 mm (2-20 inch) W.G.
An interesting feature of the Flexifiber bed system is that, with submicron particles, the collection efficiencies are actually increased slightly as the gas flow rate through the bed is reduced. This occurs because at reduced flow rates there is a greater exposure time to the fibers. Probability of contact of the particles with the individual fibers through Brownian Movement is thus increased.

The type BD fiber beds are also constructed using carbon fibers for applications that involve fluoride concentrations, high pH service (typically greater than 9-10 depending on temperature), and for some applications that involve the hydroxyl group. Carbon fibers resist corrosion for these applications that typically attack glass fibers. Many times one will see this type of situation in metallurgical acid plants, spent acid plants, ammonia scrubbing applications, and the digesting of wood pulp.



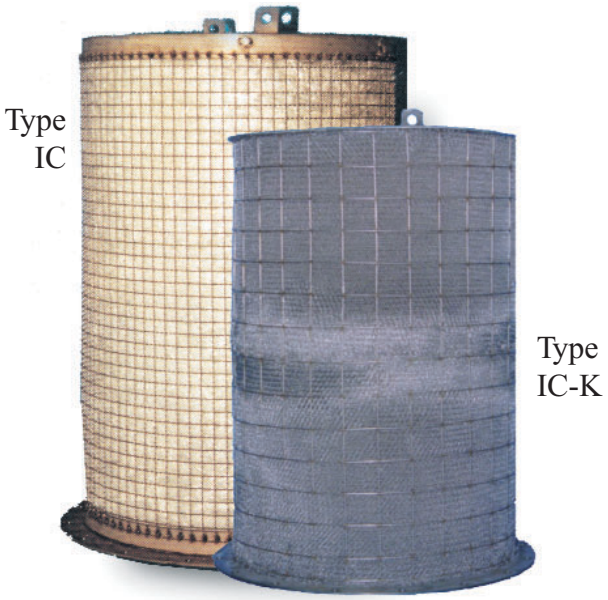
Type BD with Glass Fibers

Type BD with Carbon Fibers

FLEXIFIBER® Mist Eliminator type IC (Impaction Cylinder)

Utilizing primarily the impaction mechanism, Type IC fiber beds are designed to capture and collect particles in the 1 to 3 micron range economically. Collection efficiencies on 1 micron particles will vary from 90% on liquid mists with a specific gravity of 1.0 to 97% on liquid mists with a specific gravity of 1.8. Operating pressure drops are in the range of 100 to 220 mm (4-9 inch) W.G. Elements are normally cylindrical in shape and available in a variety of materials and sizes.

The type IC-K fiber beds are constructed with a co-knit wire mesh interior consisting of alloy 20 and fiberglass. The type IC-M fiber beds are constructed with a glass fiber interior. The exterior of both elements are wrapped with additional alloy mesh to control liquid reintrainment and promote drainage. Using this type of construction allows maximum operating time between washing of sulfates in sulfuric acid drying towers or absorption towers which are its primary applications.



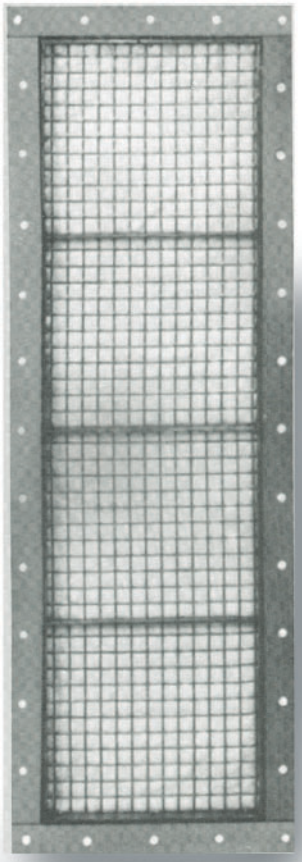
Type IC

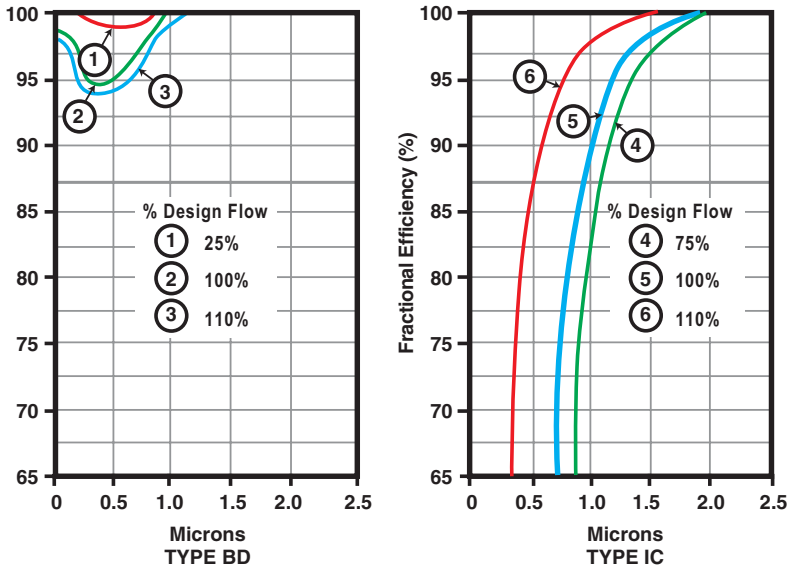
Type IC-K

Type	Primary Collection Mechanism	Collection Efficiency		Element Pressure Drop mm W.G. (inches W.G.)	Bed Velocity m/sec (ft./min.)
		Particle Size (Microns)	Efficiency* (%)		
BD	Brownian Diffusion	>3 <3	Essentially 100 Up to 99.95+	50 - 500 (2-20)	0.03 - 0.2 (5 - 40)
IC	Impaction Cylinder	>3	Essentially 100	100 - 250 (4 - 10)	1.3 - 1.8 (250 - 350)
		1 - 3	95 - 99+		
IP	Impaction Panel	1 - 3	85 - 97	125 - 180 (5 - 7)	2.03 - 2.54 (400 - 500)
		0.5 - 1	50 - 85		

* In H_2SO_4 Service

Table 1. Comparison of FLEXIFIBER® Element Types.





Typical performance curves for FLEXIFIBER® mist eliminators

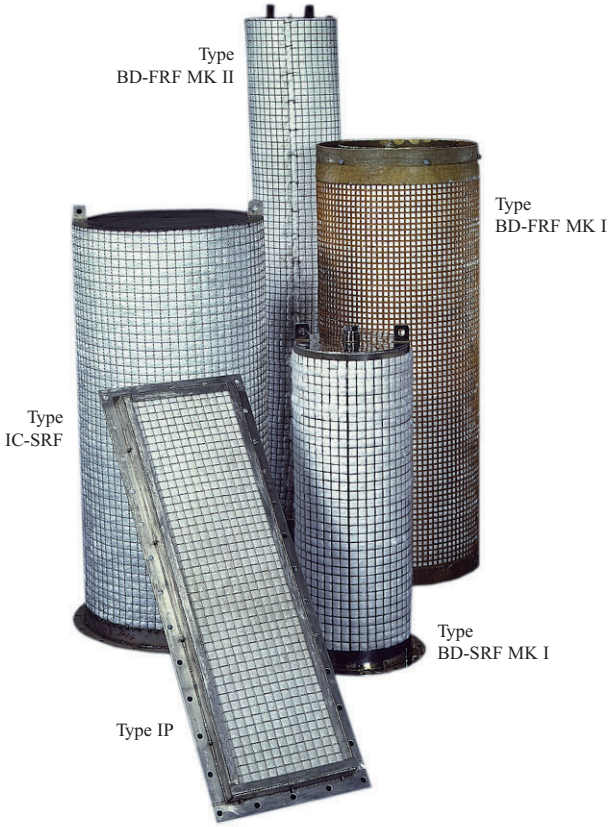
FLEXIFIBER® Mist Eliminator type IP (Impaction Panel)

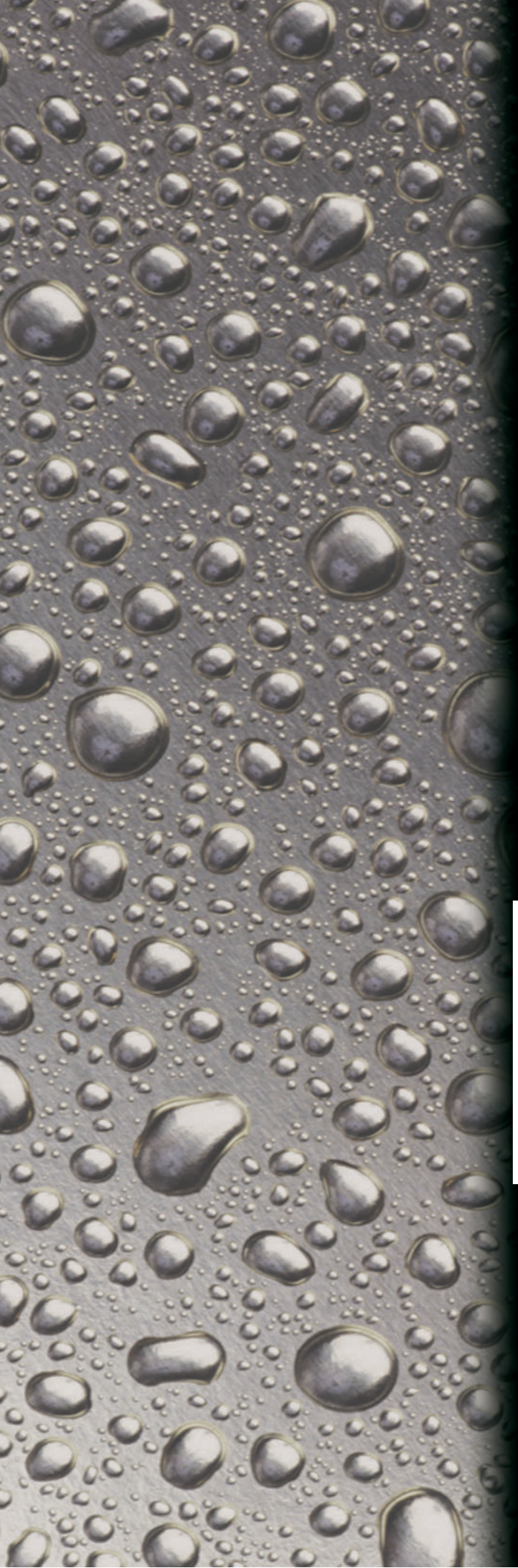
Type IP fiber beds are most commonly used in sulfuric acid plants. Utilizing primarily the impaction mechanism, collec-tion efficiencies on 98% sulfuric acid mist are essentially 100% on all particles greater than 3 microns, 85 to 99% on all particles 1 to 3 microns, and 55 to 85% on all particles 0.5 to 1.0 microns. Operating pressure drops are normally 50 to 170 mm (2-7 inch) W.G. Elements are normally rectangular in shape and are available in various metals.

The FLEXIFIBER mist eliminator elements cages are available in the following materials:

- Carbon steel
- Stainless steel
- Special alloy steel
- FRP
- Polypropylene
- PVDF
- PTFE

We use a large variety of special fibers to suit the chemistry of various chemical processes. The pH of collected liquid and its chemical aggressiveness are parameters taken into consideration to determine the proper fiber to be used in FLEXIFIBER mist eliminator elements.





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