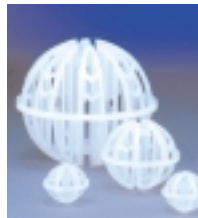
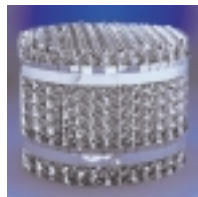


JAEGER

TOWER PACKING · TRAYS · COLUMN INTERNALS



Superior performance by design™
JAEGER PRODUCTS, iNC.



THE COMPANY

Jaeger Products, Inc. is a manufacturer of tower packings, column internals, and specialty trays. Our products are common to many chemical processes and environmental applications where mass transfer equipment is needed. In 1978, Jaeger revolutionized the plastic random packing industry with the introduction of the high performance Jaeger Tri-Packs®. It is still the plastic random packing to which all others are compared. Other performance products include Max-Pak™, a sheet metal structured packing, Cascade Mini-Rings®, and the CoFlo™ Tray, a new high capacity tray. While specializing in performance products, our comprehensive product line includes traditional packing types in plastic, metal, and ceramic. No other company offers such a diverse array of products to meet the mass transfer needs of the chemical and environmental industries. Jaeger has the product to meet your most demanding application.

Technical Experience

Of course, with such a comprehensive product line comes the need to design and build the many associated internals required to make mass transfer systems work effectively. Jaeger's capable engineering staff has the knowledge and experience to recognize the nuances of each system and offer the design that best fits the application. Each internal is custom made and matched exactly with the appropriate packing and operating conditions. Our vast database of experience will work for you. Ask about our written process guarantees.

Customer Service

A huge factor in the success of any company is their commitment to customer service. Our professional sales and customer service staff will provide competitive quotations promptly without having to wait weeks. Our commitment to quality products, ample inventories, same day air shipments, just in time delivery scheduling, and no minimum order quantities is partly why Jaeger has the best customer service ranking in the industry. Jaeger has an able and ready staff to meet your service requests.

Facilities and Plants

Jaeger's corporate offices are located in Houston, TX, just inside the north beltway area. This five acre, multi-use facility houses the sales and engineering departments as well as light manufacturing and limited inventory. Our primary molding facility, Century Plastics, is a corporate-owned subsidiary centrally located in El Dorado, KS for timely shipments anywhere in North America. Additional plant and warehouse facilities are located in Toronto, ONT. Other affiliated offices include locations in Germany and other parts of the world.

The purpose of this brochure is to offer a brief overview of our product line. Should you require additional information on a product, please contact us for a brochure specific to that product or request a complete catalog. The additional information will offer performance curves, data for design use, as well as other information. We look forward to the opportunity to be of service.

PRODUCT APPLICATION

Mass transfer is defined as the transfer of a chemical species from one phase to another, i.e., gas phase to liquid, commonly called scrubbing and liquid phase to gas, commonly called stripping. This process is generally achieved through the use of a column with trays or packing.

Contents of a Packed Column

The contents of a packed tower will vary based on application and performance requirements. The column at the right illustrates the various components that might be used in typical installations. Generally, the column will contain a gas inlet, a packing support plate, random or structured packing, a bed limiter, a liquid distributor, vapor outlet, and perhaps a mist eliminator. Most column internals are custom designed for the intended application and therefore vary in description and performance. Many process columns utilize multiple liquid feed inlets and draw trays requiring careful and detailed design.

What does the Packing do?

The purpose of the packing is to provide surface area to enhance contact mixing of a gas and liquid usually flowing counter current to one another. Generally, there are two types of packing: structured and random dumped. Structured packing is made from corrugated sheet material. It is installed in bulk sections with a specific layout and thickness. Random dumped packing gets its name from its installation method. It is simply dumped into the tower and allowed to fill in a random manner. Both types are available in a variety of materials; metal alloys, plastic, and ceramic. There are different configurations within each type of packing, especially with random packings.

Packed Column Performance

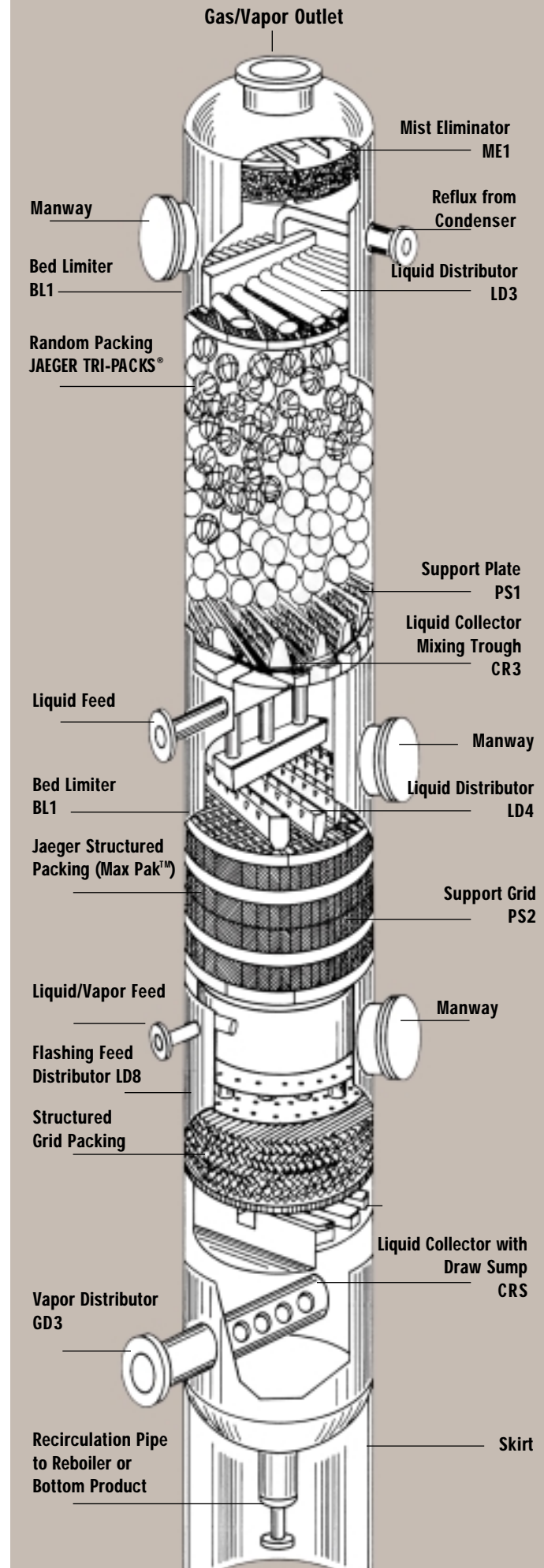
Performance of any packed column is greatly dependent on the type of packing chosen, the specific element configuration, and the design of related internals. Each type of packing may require different design considerations for optimum performance. Care should be taken in making performance comparisons.

Structured packings of comparable crimp size are generally close in performance and, due to similar shape and installation method, comparative data is readily available. Likewise, similar shaped random packings such as rings and saddles have been used for a long time, and published data is available.

Performance packings offer significant benefits which can result in reduced capital and operating costs. However, care should be taken when comparing these unique packings. A column optimized for one packing may not be optimized for another, and comparative data can be misleading. Jaeger has built a solid reputation based on reasonable, yet conservative designs. Contact Jaeger's engineering staff for professional and reliable design assistance.

Typical Applications

Absorption	Mixing	Drying	Desalting
Desorption	Separating	Cooling	Demisting
Distillation	Aerating	Biofiltration	Humidifying
Rectification	Degassing	Scrubbing	Stripping
Extraction	Precipitation	Condensing	Heat Transfer



PLASTIC RANDOM PACKINGS

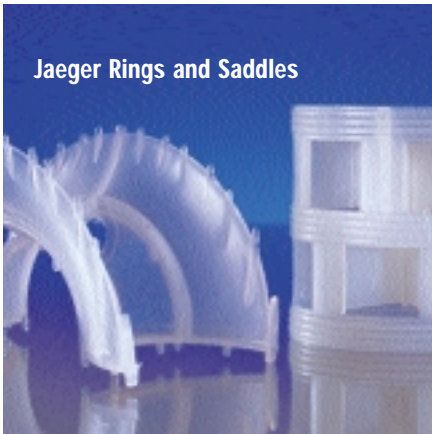


Jaeger
Tri-Packs®

Jaeger Tri-Packs®

Jaeger Tri-Packs® is a spherical, plastic packing constructed with a unique network of ribs, struts, and drip rods. Its superior geometry offers optimum balance between open area and surface area. High mass transfer rates are achieved by excellent wetting of its active surface area and increased capacity through an open, consistent design. Each packing element rolls into its packed position without forming large void areas, common to irregular shaped packings or those with excessive void pins or appendances. There is no need to allow for settling, and nesting is virtually impossible. One can have confidence in the predictable performance offered by the Jaeger Tri-Packs®.

Jaeger Tri-Packs® are available in four nominal sizes, 1", 1½", 2", and 3½" in many different thermoplastic resin choices. There is a size and material to match most any application, from PVC to PFA. Jaeger Tri-Packs-PP® was the first plastic performance packing to be certified to NSF® standard 61 for use in potable water applications. They are used in most mass transfer applications, primarily scrubbing, air stripping, and distillation. They work well in mist elimination, biological treatment, and cooling tower applications. For additional information and design data, please request Brochure 600.



Jaeger Rings and Saddles

Jaeger Rings and Saddles

Jaeger Rings and Saddles are conventional shaped packings that offer an economic choice. They represent the oldest, and perhaps most common, type of plastic packing used over the past 40 years. Jaeger's Rings and Saddles are comparable to most other manufacturer's, as patents on these types of packings have long since expired.

Jaeger Rings are available in 5/8", 1", 1½", 2", and 3½" nominal sizes. Jaeger Saddles are available in 1", 2", and 3" sizes in a variety of injection moldable plastics. Request Brochure 700.



Jaeger Bio-Rings®

Jaeger Bio-Rings®

Jaeger Bio-Ring® is a cylindrical packing with specific design features for use in biological applications. They replace existing rock bed aerobic trickling filters, and offer increased capacity and efficiency to waste water treatment.

Performance is offered by large hexagonal windows that allow passage of solids and their unique external ribs provide additional surface for greater biomass growth. Bio-Rings are available in a UV-stabilized polypropylene or in a weighted polypropylene for specific gravity greater than 1.0. Bio-Rings® are available in 3½" diameter.

Jaeger Cascade Mini-Rings®

Jaeger Cascade Mini-Rings® have a unique geometry made of ridged cylindrical surfaces and linear internal braces which provide large surface areas for thin-film liquid formations and a multiplicity of drip points. When randomly installed, the bed forms an integral reticulated structure with excellent resistance to deformation to allow higher bed heights than other types of packing. Cascade Mini-Rings® have a low aspect (height/diameter) ratio of 0.3 compared to 1.0 for standard cylindrical ring packings. The low aspect ratio offers opportunity for efficient gas and liquid contact and increased performance. Cascade Mini-Rings® have no protruding edges which minimizes chance of nesting and offers more uniform liquid distribution. Cascade Mini-Rings® allow increased hydraulic capacity while maintaining a low pressure drop.

Cascade Mini-Rings® are available in three nominal sizes, 1", 2", and 3½" in most common injection moldable plastics. Additional information is available in Brochure 800.



Cascade
Mini-Rings®

JAEGER

METAL RANDOM PACKINGS



Top-Pak®

Metal Top-Pak® offers a unique design that includes characteristics of cylindrical and spherical geometry. This almost symmetrical shape with its regular latticework construction allows for uniform filling across the center section of the column. This even distribution of individual elements lowers the pressure drop since extreme changes in gas-flow direction are eliminated. The narrow section surfaces ensure that each element is thoroughly wetted even in low-liquid flow applications. Top-Pak® is ideal for vacuum distillation, direct gas/liquid heat transfer applications or other processes with low liquid and high gas rates. 75mm is stocked in 304 & 316 stainless steel grades, other alloys are available. Technical and performance details can be found in Brochure 200.



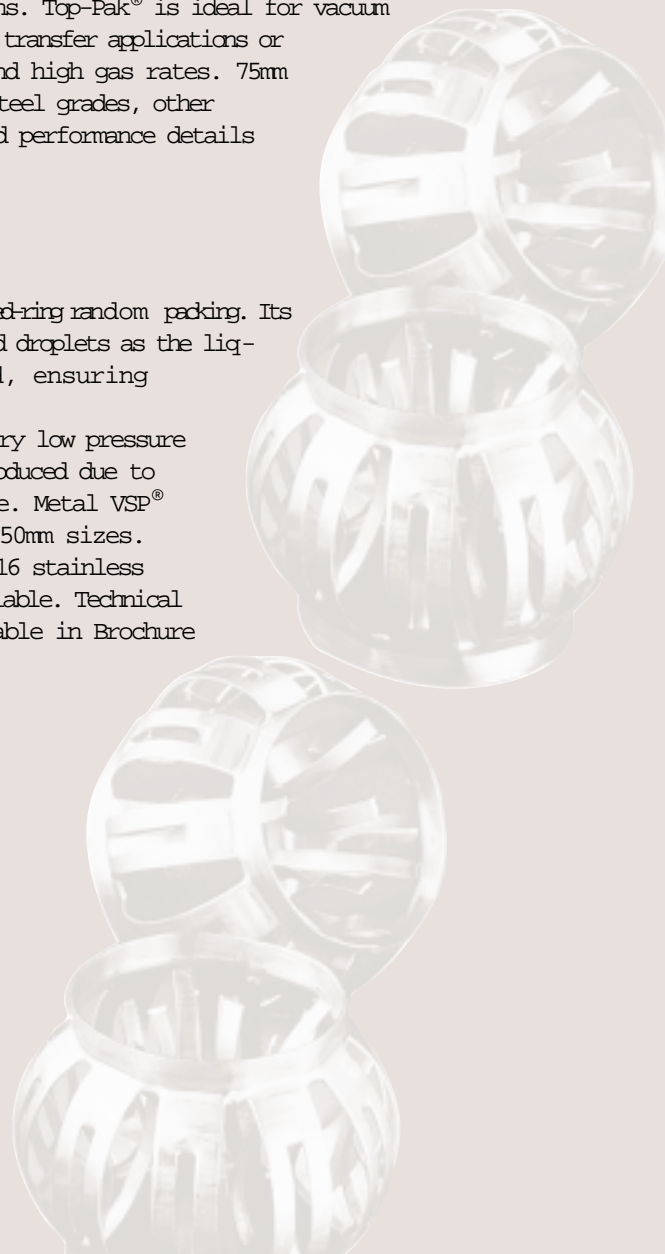
VSP®

Metal VSP® is a cylindrical, slotted-ring random packing. Its design promotes the formation of liquid droplets as the liquid cascades down the packed bed, ensuring good liquid mixing and uniform liquid distribution. Very low pressure drops and high efficiencies are produced due to its open and non-nesting structure. Metal VSP® is available in 25mm, 40mm, and 50mm sizes. Typically inventoried in 304 and 316 stainless steel grades, other alloys are available. Technical and performance details are available in Brochure 200.



Interpack®

Metal Interpack® is different from Jaeger Tri-Packs®, metal VSP®, and most other packings. It is a two-sided, pillow shaped, slotted packing requiring many pieces to fill a given area. Metal Interpack® is used primarily in small quantities for laboratory or pilot scale applications. It is available in 10 mm, 15mm, and 20mm sizes in 316 stainless steel.



STRUCTURED PACKINGS

METAL MAX-PAK™

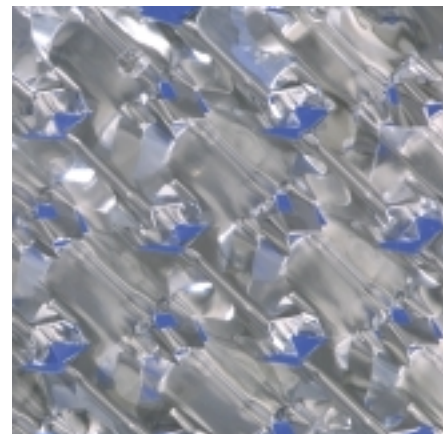
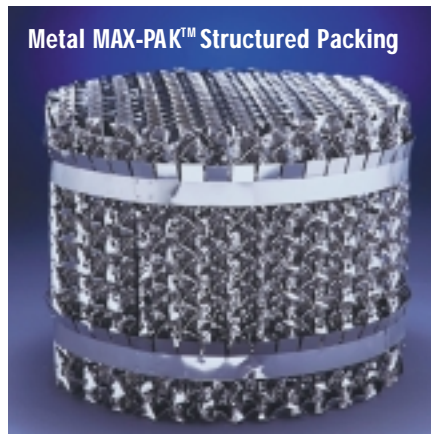
Jaeger Metal MAX-PAK™ is the most efficient and economical structured packing in the industry today. MAX-PAK™ structured packing is ideal for difficult separations requiring a large number of theoretical stages, in low liquid rate absorption/ stripping systems, or applications that require a wide operating range (turn down). MAX-PAK™ offers very low pressure drop across the bed and superior liquid spreading characteristics over the packing surface.

MAX-PAK™'s performance benefits are attributed to its method of manufacture. Most structured packing manufacturers punch holes in the sheet metal disposing of up to 10% of material surface area and potential efficiency. MAX-PAK™ structured packing is manufactured using a patented process incorporating pressure drop reducing, liquid diversion openings that are strategically located, resulting in a higher volume throughput capacity with no dead space. The shapes of the openings are specially designed for guiding and directing gas and liquid flows for full integration of gas/liquid contacting. The unique design of these openings and tabs favor communication between the back and front of each layer of sheet metal thus providing maximum surface area and liquid/gas distribution.

These unique tabs also make it possible for MAX-PAK™ to effectively handle a wide operating range. In a typical application, the fluid flowing down the column drips off the downward facing tabs and spreads on the surface of the sheets. In high liquid loading applications where the liquid may have a tendency to bridge the opening, an upward bent tab directs the liquid to the underside of the corresponding sheet.

MAX-PAK™ has been thoroughly tested by Fractionation Research, Inc. (FRI) and by the Separation Research Program (SRP) at the University of Texas Center for Energy Studies. Copies of these tests are available.

MAX-PAK™ is currently available in 1/2" crimp in most common alloys. Future sizes will become available to include 1" and 1/4" crimp. Please contact our sales offices for copies of test reports, pricing and availability, or other specific details. Additional information is available in Brochure 500.



JAEGER

TRAYS

Metal CoFlo™ Tray

The CoFlo™ Tray is a gas-liquid contacting device for use in distillation, absorption and stripping columns. Each tray consists of a liquid distributor, a contacting zone, and a liquid collector.

The device operates on the principle that entering vapor and liquid are contacted such that all of the liquid is entrained upward with the vapor. The dispersion process takes place in the contacting stage, and integral with this stage is a vapor-liquid separator. Collected liquid is returned to the tray below via an alternating side downcomer.

The net result of this configuration is that vapor flows from bottom to top, as in a traditional countercurrent contacting device, but the liquid travels down in loops, being entrained up one tray and then falling to the tray below in the downcomer. The CoFlo™ Tray has been tested at the Separations Research Program (SRP) at the University of Texas. Test results indicate the CoFlo™ Tray provides up to a 100% capacity increase over sieve trays without sacrificing efficiency. For additional information and test results, please refer to Brochure 400.



CERAMIC PACKINGS

Novalox® Saddle

Ceramic Novalox® saddles are a traditional packing shape produced from porcelain or stoneware. Our use of high quality clay in a proven manufacturing process ensures smooth, beveled, and longitudinally ribbed bodies that are consistent and uniform in shape. It is fired to a precise and controlled temperature ensuring excellent mechanical, abrasion, and heat resistance properties. Typical applications indicate temperature ratings to 2000°F. The quality and uniformity of the Novalox® Saddle ensure reliable performance through the entire packed bed, an important factor in both thermal and mass transfer applications.

Novalox® Saddles are available in 1/2", 1", 1 1/2", 2", and 3" nominal sizes. Additional information is available in Brochure 1000.

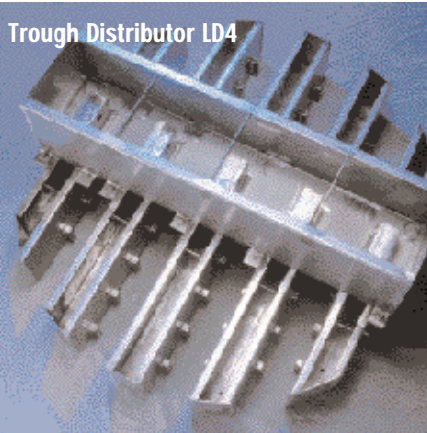


INTERNALS

General Features

The performance of a packed column is greatly dependent upon the type of packing chosen and the design of related internals. Design and performance of internals is especially important when used with high performance packings such as Jaeger Tri-Packs® and Metal MAX-PAK™. Packed columns work as a unit and careful selection and design of each internal is crucial to performance. Also important is the column layout, the location of each internal in relation to others and the peripheral equipment that might be supplied by others. Jaeger's engineering staff can assist with choosing a type, design, and choice of material whether your need is based on performance, operation flexibility, cost, or a combination of factors.

Jaeger's internals can be manufactured of metal, plastics, ceramic, or fiberglass. The following information will offer brief descriptions on some of the more common types of internals. Additional details can be obtained by requesting Brochure 1100.



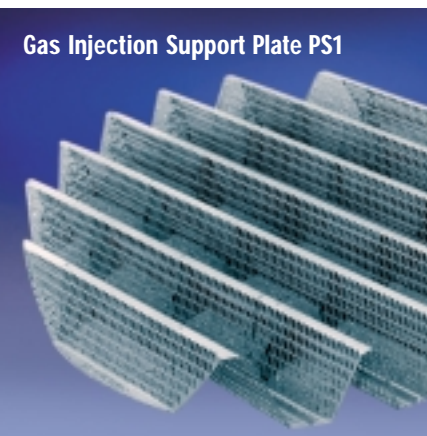
Trough Distributor – LD4

A Trough type liquid distributor is used in towers with variable or high liquid rates or in a fouling service. Liquid is first introduced to the larger parting box(es) which distributes liquid to the troughs below. The troughs then distribute liquid to the the packing. Turndown (reduce or increase flow) is accommodated through V-notches offering different liquid levels. The number of parting boxes and troughs are determined by the diameter of the tower, liquid flow, and desired liquid distribution pattern. Trough type distributors can be a very economical distribution device with simple notches and a limited number of troughs. They can also be enhanced to offer significant performance benefits by adding troughs, drip tubes, or other features.



Orifice Pan/Plate Distributor – LD1

Orifice Pan/Plate type distributors are used where the liquid service is relatively clean. Its features include a flat deck with holes for liquid flow and risers for gas flow. The liquid collects on the deck to a determined minimum level and then flows through holes. Turndown is regulated by the amount of head provided by the liquid level. The gas flows through round or rectangular chimneys. Orifice pan distributors must be sealed at the support ledge or positioned between flanges, typical for small diameters. In larger diameters they are sectioned to pass through a manway and have gasketed joints.



Gas Injection Support Plate – PS1

The gas injection support plate's primary function is to support the packing and aid in liquid distribution. It is designed to do so without impeding the capacity of gas flowing through the tower. This is accomplished by providing separate passageways for the gas and liquid. A slotted or perforated beam offers openings for gas flow at a higher level of the packed bed than the liquid flow towards the base of the beam. The height and amount of perforation of this beam determine the open area offered to the gas flow. Typically, this type of support plate will offer an open area equal to 95%-110% of the cross sectional area of the tower. The support plate is typically installed on an annular support ledge requiring additional structural support as the diameter increases.

Packing Support Plate PS2



Packing Support Plate –PS2

This packing support uses a grid or grate style design. This is a fairly simple support and a commonly utilized standard grating. It must be designed so that the packing will not fall through the opening size. This support is typically used in low gas flow applications. The grate style support is installed on an annular support ledge and requires additional structural support and sectioning as the diameter increases. The approximate open area for the PS2 is 50%-70% depending upon material and packing required.

Collector/ Redistributor CR1



Collector/Redistributor – CR1

Collector/Re-distributor is very similar to the LD1 distributor in that it will contain a deck and chimneys. The collector is placed under a packed bed section to collect, mix and redistribute the liquid to another packed bed below. The differences between the LD1 and CR1, is that the CR1 will contain caps or hats on the chimneys to prevent liquid falling from the packing above, bypassing the collector. Typically, collectors are required when a packed bed exceeds 10-25 linear feet depending on packing size or when multiple feeds are present.

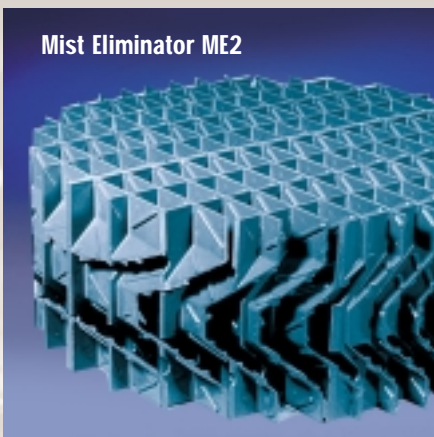
Mist Eliminator ME1



Mist Eliminator – ME1

Mist eliminators are exactly what their name implies—they remove mist from the gas stream. The ME1 mist eliminator consists of layers or coils of knitted wire mesh held together by support grids on top and bottom. The mesh is available in plastic or metal alloys. Grid material choices include plastic, alloys, or fiberglass. Typical removal efficiency for common mesh type mist eliminators is 99% of 10 micron droplets and 90% of 3-10 micron droplets which is adequate for many applications. Special design and material considerations can offer removal to 1-2 microns. Mist eliminators require a support ledge and additional supports as their diameters increase.

Mist Eliminator ME2



Mist Eliminator – ME2

The ME2 mist eliminator is sometimes called a vane type or chevron style unit. It is typically used in towers with high capacity demands or in dirty service conditions. The unit will not offer the efficiency of the mesh units, removing droplets to 30-40 microns. ME2 units can be provided for vertical or horizontal flow equipment and are available in several different plastic compounds and metal alloys. The ME2 units require a support ledge and additional support as their diameters increase.

OTHER PRODUCTS AND SERVICES



JP-7

Jaeger is the only packing supplier to offer products to enhance the longevity and use of your packing. Fouling can be detrimental to any system and Jaeger has options for many applications. Our pretreatment product, called JP-7 is a proven technology using inorganic polyphosphates. The non-toxic formulation specifically sequesters soluble iron, manganese, calcium, magnesium, and silica in the process water. JP-7 also acts as a corrosion inhibitor, laying down a microscopic film to lower the corrosion rates of iron, copper, lead, stainless steel, and other piping components.

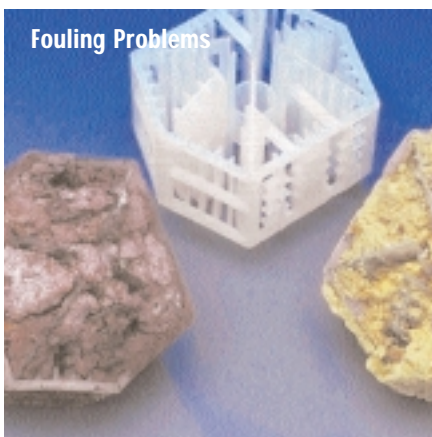
JP-7 is introduced to the process stream through a common chemical feed pump. It can be supplied in 5, 15, 30, and 55-gallon drums, or delivered in bulk form. JP-7 is thermally stabilized which offers enhanced shelf life and use. Call Jaeger with your water analysis for prompt dosage calculations and quotation. For additional information on this product, request Brochure 900.



Bio-Technology Products

Through a national distribution agreement with Bio-Systems Corporation, Jaeger now offers a broad range of bio-augmentation products for municipal, industrial, and commercial applications. Our products are used world-wide to reduce wastewater treatment, spill cleanup, soil remediation and solid waste disposal problems. Our products enhance and stabilize the existing biomass by making available a selected range of high performance microbial strains leading to higher efficiency and fewer plant management problems. Produced in an ISO 9002 certified facility, each biological product is formulated and packaged for your specific need. Our microorganisms are blended with potent nutrients and stimulants to assure optimal performance under the toughest of conditions.

Technical services include consultation, product recommendation, assistance with toxicity testing, treatability studies, chemical and bacterial analysis, and microscopic photography. For additional information on Jaeger's bio-technology products, call our corporate office or request Brochure 900.



Getting The Most From Your Packing

Fouling problems can cause packed towers to perform below expectations and design. Fouling is caused by solids in the process liquid, precipitation of minerals during the process, or bacterial deposition that eventually build up on internal surfaces of the tower and packing elements. Problems associated with fouling are generally not present immediately after startup, but typically will build and degrade performance over a period of time. The result is a loss in efficiency, capacity, and increased pressure drop. The added weight of entrapped solids can also have detrimental effects on other internals as well as the structural integrity of the tower shell.

Claims have been made that a particular shape of packing element is more resistant to plugging than others. These claims are based on "tests" in the field where variables are anything but controlled. Unfortunately, there is no single "truly non-plugging" packing type.

Over the years, Jaeger Tri-Packs® have become the standard by which plastic random packings are measured. In the laboratory, as well as in the field, Jaeger has accumulated a wealth of knowledge on how to deal with fouling problems while optimizing your stripping and absorption efficiencies. Additional information is available in Brochure 600-FP.

PHYSICAL PROPERTIES OF JAEGER PACKINGS

	Size (nominal)	Packing Factor (1/ft)	Weight (lb/ft ³)	Surface Area (ft ² /ft ³)	Void Space (%)
Plastic Packing					
Jaeger Tri-Packs®	1"	28	6.2	85	90
	1 1/4"	25	5.6	70	92
	2"	16	4.2	48	93.5
	3 1/2"	12	3.3	38	95
Cascade Mini-Rings®	1"	26	4.0	85	92
	2"	16	3.5	50	93
	3 1/2"	12	3.2	40	94
Jaeger Rings	5/8"	97	7.8	108	86
	1"	52	5.9	64	90
	1 1/2 "	32	4.8	44	91
	2"	25	4.3	33	92
	3 1/2"	16	3.8	26	93
Jaeger Saddles	1"	33	4.7	60	91
	2"	21	3.3	30	94
	3"	16	2.8	20	95
Bio-Ring™	3 1/2"	NA	2.8	32	95
Cascade Bio-Ring™	7"	NA	2.2	30	95
Metal Random Packing					
VSP®	25 mm	32	11.9	62.5	97.5
	40 mm	21	10.6	40.2	98
	50 mm	20	10.0	33.5	98
Top-Pak®	75 mm	16	10.0	24.4	98
Interpack®	10 mm	246	40.5	189	90
	15 mm	122	21.5	110	94
	20 mm	73	21.8	79.5	96
Metal Structured Packing					
Max-Pak™	1/2"	19-22	12.8	77	97
Ceramic Packing					
Novalox® Saddles	1/2"	201	43.0	190	73
	3/4 "	131	41.0	102	74
	1"	97	40.3	78	74
	1 1/2 "	52	40.3	61	75
	2"	40	36.8	37	77
	3"	22	35.9	28	77

weights of plastic based on polypropylene

weights of metal based on 300 series stainless steel

all weights are dry weights

For More Information:

General Brochure

Series 100

Metal VSP® & Metal Top-Pak®

Series 200

Metal Random Packing

Series 300 - Future Publication

CoFlo™ Trays

Series 400

Fractionation Trays

Series 450 - Future Publication

Metal Max-Pak™

Series 500

Plastic Jaeger Tri-Packs®

Series 600

Plastic Rings & Saddles

Series 700

Plastic Cascade Mini-Rings®

Series 800

Biological Products/Chemicals

Series 900 - Future Publication

Ceramic Packing

Series 1000

Column Internals

Series 1100

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800.678.0345

www.jaeger.com

-- Complete Technical Catalog includes all of the above along with other technical and performance information.

NOTE: The information presented in this brochure is believed to be accurate and reliable. However, it is based on test results which may not apply to your application. Therefore, the data is presented without guarantee or warranty. We recommend that you contact Jaeger's engineering department or your local representative to discuss the details of your specific application.

JAEGER TRI-PACKS® is a Trademark of JAEGER PRODUCTS, INC., U.S. Patent No. 4,203,935. Canadian Patent No. 1,150,621. Tri-Packs have the Trademark "HACKETTEN" in Germany. Further Patents Pending.

JAEGER PRODUCTS, INC. is a member of Fractionation Research, Inc. and Water Environment Federation.

VSP®, TOP-PAK®, Novalox® are trademarks of VFF, Germany.

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Halar®

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Intalox®

Pall®

Raschig®

Tellerette®

Hiflow Rings®

Lanpac®

NSF®

B.F. Goodrich

General Electric Company

Elf Atochem North America, Inc.

Ausimont USA, Inc.

E.I. DuPont de Nemours & Co., Inc.

E.I. DuPont de Nemours & Co., Inc.

Norton Chemical Process Products

Norton Chemical Process Products

Raschig AG

Ceilcote-Air Pollution Control

Rauschert Industries, Inc.

Lantec Products, Inc.

NSF International

Represented by:



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