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### TABLE OF CONTENTS

Raschig USA Technologies	2
Raschig USA Column Internals	3
Raschig USA Internals/Standard Models	4
Design and Application Considerations for Raschig USA Internals Selection	5
Raschig USA Liquid Distributor And Various Internals Application Guide	6
Raschig USA Internals – Examples	7-10
Raschig USA Internals - Description	11-20



### Raschig USA Inc. History

In order to establish a new alliance in the mass transfer business RASCHIG GmbH and its parent company PMC GLOBAL INC acquired JAEGER PRODUCTS INC. in 2006. JAEGER PRODUCTS, a Houston Texas based company, which was a major manufacturer of tower packings, column internals and specialty trays and very active in the Mass Transfer and Environmental Business.

RASCHIG/JAEGER TECHNOLOGIES was the name first given to this new entity. In 2012 the firm was renamed to RASCHIG USA Inc.

### **Synergies**

This strategic acquisition combining RASCHIG and JAEGER into one larger group gives a great advantage to our customers giving them access to products of both entities in Europe, The Americas and in other parts of the world. It will create new dimensions in mass transfer technology. The advantages of our process engineering know-how and our technologies benefit even more the planning, modernization and construction of our clients' processes. And: saving energy and investment cost is part of it.

The new alliance offers a diverse array of products to meet the mass transfer needs of the industries. While specializing in high performance products, the comprehensive products line of RASCHIG and JAEGER also includes traditional fractional trays as well as structured and random packing types that best fit the application.

### Leading In-house distributor test-facility at Raschig GmbH in Germany

The company operates one of the largest in-house distributor test-facilities worldwide. Liquid distributors can be tested up to 12m (~40 ft) in diameter at a maximum liquid load of 2400m3 per hour (~10,560 US gpm).

All products of RASCHIG USA are the result of consistent development work long years of experience. Comprehensive quality management in all stages of production and the principle of offering complete solutions are the basis of our excellent reputation – worldwide.



### **RASCHIG USA COLUMN INTERNALS**

### FEATURES

The performance of packed columns that use modern high efficiency packings is closely related to the performance of the other internals such as liquid distributors and collectors. Packed towers work as a unit so careful selection and design of the proper internals is crucial.

Raschig USA offers a complete line of tower internals to be used with random or structured packings. These internals are specifically designed and selected to maximize the performance of the packings and can be used effectively in many different combinations. Jaeger internals are available in metal, plastic, ceramic or fiberglass for applications in corrosive, hot, and/or pressurized chemical systems as well as for hydrocarbon applications and ambient air-water systems

### 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.

### **Typical Applications**

Absorption
Desorption
Distillation
Rectification
Extraction
Precipitation
Biofiltration
Humidification
Condensation
Particulate Removing

Mixing Demisting Aerating Degassing Desalting Stripping Scrubbing Drying Cooling **Oil-Water Separations** 



Raschig USA Inc. (R)

## Product Bulletin-1100

RASCHIG USA INTERNALS STANDARD MODELS

Liquid Distributors/ Weir Riser (Small Column) DR-3 Redistributors Orifice Pan DR-2 Orifice Deck w/ Chimnevs RP-2 Orifice Deck w/ Chimneys & Drip Tube RP-2 Special Design Lateral Pipe Pressurized Flow DP-1 Trough w/ Orifices or Drip Tubes DT-1 Weir / Trough DT-2 High Quality Trough w/ Drip Tubes DT-S High Quality Multi-Flow DT-MF Spray Nozzle DP-S High Quality Trough Special Design DT-S **Packing Supports** Multibeam Gas Injection SP-1 Multibeam Gas Injection (Small Column) SP-2, SP-3 Flat Bar Support Grid (Structured) SP-P Hexa-Grid Support Plate SP-HG Cross-Flow-Grid Support Plate SP-CF Plastic Support Grid SP-RSG **Bed Limiters** Expanded Metal/Screen (Random) HP-1 Hold-Down Grating (Structured) HP-P Liquid Collectors/ Tray/ Round Vapor Stacks CP-1 Product Draw Tray/ Rectangular Vapor Stacks CP-2 Chevron – Vane Type CV-1 Chordal Troughs w/ Overlapping Hoods CV-2 GV-1 Gas Distributors Sparger Pipe Vane-Type GV-2 Tray with Gas Risers GV-3 **Gas-Liquid Phase** Two-Phase Double Shell Flash Box FB-1 Separators Two-Phase Centrifugal Flashbox FB-2 Two-Phase Flash Gallery FB-3 Combinations Packing Support / Orifice Deck w/ Chimneys SP-1/RP-2 Flash Gallery / Orifice Deck w/ Chimneys FB-3/RP-2 Mist Eliminators Mesh Pad ME1 Chevron ME2 Combination ME3 Packed Bed ME4 Liq-Liq Extraction Feed Pipe for Dispersed Phase DP-1 Packing Support/Disperser - light phase Internals DSP-1 Packing Support/Disperser - heavy phase DSP-2



### DESIGN AND APPLICATION CONSIDERATIONS FOR RASCHIG USA INTERNALS SELECTION

Raschig USA offers a wide variety of internals for a given function. The selection among different types of internals (i.e., liquid distributors) is made based on the characteristics of the application. Some internals operate better at high loads, some at low. Some exhibit better turndown than others. The following list summarizes the points to be considered in the selection of the proper internal

#### **Liquid Distributors**

- tower diameter
- · pourpoint density
- geometric coverage
- turndown
- · presence of solids
- pressure drop
- liquid pressure

### **Packing Supports**

- · tower diameter
- · pressure drop and capacity
- · packing type and size
- · combinations with collector/redistributors
- load limitations
- · material selection

#### **Mist Eliminators**

- efficiency/capacity presence of solids
- pressure drop
- liquid load
- · gas velocity and properties · mist size and properties



liquid condition

- entrainment
- $\cdot$  type and size of packing
- feed inlets
- space to top of packing
- material selection

### Liquid Collector/Redistributors

- $\cdot$  same as for liquid distributors
- · total and effective mixing
- · gas redistribution

### **Gas Distributors**

- column size
- $\cdot$  inlet nozzle design
- · available pressure drop
- turndown
- · space availability
- material selection

LIQUID DISTRIBUTOR APPLICATION GUIDE									
Standard	Column	Standard	Liquid load		Gas Capacity Factor		Sensitivity		
Distributor	diameter	Working	u gpm/ft		Cs - ft/sec		to fouling		
		range	U_ < 2.05	2.05 < [J< 32.]	7U_ > 32.7	′ Cs < 0.1	80.16 < Cs < 0.	2 <b>16</b> s>0.2	6
DT-1	> 2'-7.5"	2:1		х		х	х		Yes
DT-2	> 4'-0"	10:1		х	х	х	х		No
DR-2	< 4'-0"	2:1		х	х	х	х		Yes
DR-3	< 4'-0"	10:1		х	х	х			No
DP-1	> 4"	2:1		х	х	х	х	х	Yes
RP-1	> 4'-0"	2:1		х	х	х	х		Yes
RP-2	> 1'-0"	2:1		х	х	х	х		Yes
DP-S	> 1'-8"	3:1		х		х	х		No
High Quality Lic	quid Distributo	r							
DT-MF	> 1'-8"	2:1 - 5:1	х	x (< 4.09)		х	х	х	No
DT-S	> 1'-0"	2:1 - 5:1	х	х		х	х	х	No
RP-2 Special D	es. > 1'-0"	2:1 - 5:1		х		х	х		Yes

### 

### VARIOUS INTERNALS APPLICATION GUIDE

Packing Support Model #	Material	Type of Packing	Free Area Range
SP-1*	M, P, C	Random	70-120%
SP-P	M, P, C	Structured	70-95 %
SP-2, SP-3	M, P, C	Random	70-120%
SP-HG	M, P	Random	70-100%
SP-CF	M, P	Random	70-100%
SP-RSG	Р	Random	70-100%
Gas Distributors Model #	Material	Typical Pressure Drop	Tower Diameter Range
GV-2	M. P.M.	0.5-5" water	10"- >20ʻ
GV-3	P, C M,	0.5-5" water	10"- >20ʻ
GV-1	Р	0.5-30' water	10"- >20'
Bed Limiters Model #	Material	Type of Packing	Free Area Range
HP-1	M, P	Random	70-95 %
HP-P	Μ	Structured	70-95 %
*Normally for 8" to 20' diam	eter units		**Light Duty

### **MIST ELIMINATOR APPLICATION GUIDE**

Mist Eliminator** Model #	Material	Minimum Droplet Size	Typical Pressure Drop
ME1	M, P	1□*	5"-5" water
ME2	M, P	10□*	0.5"-1.0" water
ME3	M, P	1□*	"-5" water
ME4	M, P, C	5□*	2"-05" water

\*1 droplet removal is possible but requires special design considerations.

Consult Raschig USA for more details. \*\*Diameters may range from 4" to > 20'.

P = Plastic C = Ceramic \*M= Metal \*\*Ceramic internals have a maximum diameter of 3







Product Bulletin-1100 Page 9



**RP-2 Special Design-SS** 

**RP-2 SS Divided Wall Col** 

RP-2-SS



RP-2 – Round Risers & Hoods SS

RP-2- w/ Hoods SS

DT-1 - SS



FB-3 Gallery / RP-2

DT-2 SS

DT-MF - SS



# Product Bulletin-1100 **RASCHIG USA INTERNALS** Page 10 78" CPVC LIQUIE RP-2 SS Co-Flow Appl. DT-MF - SS CP-1-CPVC DT-S - PVDF DT-S - SS DT-S – SS Water Test RP-2 - SS DR-3 - SS DT-S –SS Large Diameter RASCHIĞ

Raschig USA Inc. (R)

Product Bulletin-1100 Page 11



DR-2



Orifice pan liquid distributors, type DR-2 by Raschig USA are manufactured in various sizes and designs . Typically all sizes have round or rectangular chimneys. The distributor floor of both the pan and plate distributors consists of liquid discharge holes on a square or triangular pitch and circular chimney risers for the gas flow. For small column diameters where pan type distributors are utilized, gas can pass through the annular space between the outer perimeter of the pan and inner wall of the column. The annular space is formed by elevating the pan above the support ring with support feet or lugs evenly distributed around the perimeter of the pan. DR-2 distributors can also act as bed limiters by locating anti-migration bars/rods on the bottom end of chimney risers that form open areas. These devices can sometimes be used as redistributors with the addition of Hoods over the vapor risers. Orifice pan liquid distributors can be made in plastics, metals or ceramics.



DR-3 w/ Parting Box

#### WEIR-RISER PAN LIQUID DISTRIBUTORS DR-3

This type of liquid distributor/redistributor is used when great variations of liquid flow need to be handled. They are suited for diameters up to 48". The DR-3 Pan distributor consists of notched or V-Weir shaped gas risers such that the vapor-liquid traffic share the same flow area. The vapor or gas velocity through the risers typically limits the maximum flow rate for this style of distributor. Compared to other distributors, the DR-3 provides a low distribution quality. The DR-3 is suitable when the fouling tendency is high. Additionally a wide turn-down range is possible due to the weirs which allow greater flow rates as liquid head increases.

Like the DR-2 gas can pass through the annular space between the outer perimeter of the pan and inner wall of the column. The annular space is formed by elevating the pan above the support ring with support feet or lugs evenly distributed around the perimeter of the pan.



DP-1

### LATERAL PIPE DISTRIBUTORS WITH PRESSURIZED FLOW DP-1

The DP-1 model distributor is a pipe-ladder type which can be designed for a wide variety of applications. It is a pressure driven distributor where the liquid is delivered through metering orifices in the branch pipes. Typical pressure drop is 1 - 5 psi (68.95 - 344.7 mbar). DP-1 distributors are commonly utilized in scrubber and stripper services with moderate-to-high liquid rates. The DP-1 is not recommended for low liquid rates or fouling systems or ones with suspended solids due to the potential for plugging of the metering orifices. Conditions which favor the use of a DP-1 include high vapor velocities and limited space availability. DP-1 distributors can be made in a variety of plastics and alloys.



**Product Bulletin-1100** Page 12



**RP-2 Standard** 



RP-2 Special Design w/ **Drip Tubes** 



RP-2 Special Design w/ Parting Box

### **ORIFICE PLATE DISTRIBUTORS/REDISTRIBUTORS** RP-2

Orifice plate liquid redistributors, type RP-2, are manufactured in various sizes and designs. Typically all sizes have round or rectangular chimneys with a flat floor sealed to the vessel support ring. The liquid redistributor type RP-2 typically consists of a flat or an integral truss tray deck with liquid discharge holes on a square or triangular pitch, and rectangular chimneys for the gas flow at column diameters > 47 inches. The chimneys are covered with hoods. For large diameter columns, liquid is evenly distributed to the orifice deck by using one or more main Parting Boxes which are usually fed by a feed pipe pre-distribution system. Liquid is fed to the parting boxes from the feed pipe discharge outlets. To dampen the impulse of liquid entering the liquid distributor and ensure uniform distribution, a Parting Box is fitted with a perforated splash guide calming device filled with Raschig Super-Rings. Super rings are held in place with an expanded metal screen cover plate. Alternatively if column space is limiting, the parting box forms a central channel in which the height is the same as the troughs. Troughs are usually bolted on the parting box central channel and gasketed to ensure tight liquid seal.

To accommodate an operating range greater than 1:2, the RP 2 special design contains liquid discharge tubes that extend from the orifice deck. Each liquid discharge drip tube incorporates lateral holes of appropriate size to handle the different liquid loads.

The RP2 special design is employed for a high liquid rate service, in which there are 2 key design features. First, the parting box described above is made taller to accommodate the high liquid flow rate from the external feed and liquid falling from a packed bed above. Uniform liquid distribution is achieved and any flashing resulting from the mix is isolated from the main distributor liquid pool. Second, the distributor is designed with tall vapor chimneys to maximize liquid volume holdup and residence time. High residence time allows better liquid-vapor separation in the liquid pool and reduces the impact of such on the metering orifices on the drip tubes.

The liquid redistributor type RP 2 is similar to that described above except that the gas chimney risers are covered with hoods to prevent the liquid from raining through the distributor.

RP-2 liquid distributors/redistributors are available in plastics, metals or ceramics.





Product Bulletin-1100 Page 13



DT-1 Standard

#### TROUGH LIQUID DISTRIBUTORS DT-1

DT-1 Trough Distributors are Raschig-Jaeger's most versatile model. Their applications range from low liquid rate and high purity distillation systems to high liquid rate and fouling services, depending on specific design features. The DT-1 is a narrow trough type distributor with each trough consisting of ground holes, or drip tubes or lateral holes on the walls of each trough. Liquid flow into the troughs occurs with one or more main Parting Boxes (depending on column size) that are typically fed by a feed pipe pre-distribution system. To dampen the impulse of liquid entering the liquid distributor and ensure uniform distribution, the Parting Box is fitted with a perforated splash guide calming device filled with Raschig Super-Rings. Super rings are held in place with an expanded metal screen cover plate. Alternatively if column space is limiting, the parting box forms a central channel in which the height is the same as the troughs. Troughs are usually bolted on the parting box central channel and gasketed to ensure tight liquid seal.

When a large Turndown is required, two or more rows of holes are located on each drip tube or both walls of each trough to handle the wide liquid flow rate range. The Turndown specifically is 2:1 for single orifice design and up to 10:1 for multi-orifice and/or slot, V-notch design.



DT-2 Weir Trough

#### WEIR-TROUGH LIQUID DISTRIBUTOR DT-2

The liquid distributor DT 2 is suitable for handling liquids with solid particles. It consists of troughs with lateral V-shaped notches as discharge orifices. The lateral notches are covered with L shaped guide channels to minimize gas interference with the descending liquid and to communicate liquid directly on to the packing. The main predistribution box also consists of larger rectangular slots that are covered with U-shaped guide channels. They communicate liquid to each of the distribution troughs. To dampen the impulse of liquid entering the predistribution box, the two discharge openings of the feed pipe are enclosed with impingement plates. These plates effectively reduce the predistribution box width at the point of liquid entry by attachment to the predistribution box wall with bolts and spacers.



DT-S



**DT-S Large Diameter** 

### HIGH QUALITY LIQUID DISTRIBUTOR DT-S

The liquid distributor type DT-S is a trough type distributor with each trough consisting of liquid discharge drip tubes and/or lateral holes in the wall of each trough. In the drip tubes, lateral holes are positioned a short distance above the trough floor, thus allowing for the settling of some solid particles. The liquid discharge flow drip tubes will each contain slots at the top to account for any liquid overflow. Liquid flow from the lateral holes on the trough walls is guided directly on to the packing by means of enclosed narrow vertical liquid U-shape guide channels. The discharge point of the U-shaped guide channels are typically positioned approx 0.75 inches (20 mm) above the top of the packing, thus minimizing any potential liquid entrainment at high gas rates. Liquid flow into the troughs occurs with one or more main Parting Boxes that are typically fed by a feed pipe pre-distribution system. To dampen the impulse of liquid entering the liquid distributor and ensure uniform distribution, the Parting Box is fitted with a perforated splash guide calming device filled with Raschig Super-Rings. Super-rings are held in place with an expanded metal screen cover plate. Alternatively if column space is limiting, the parting box forms a central channel in which the height is the same as the troughs. Troughs are usually bolted on the parting box central channel and gasketed to ensure tight liquid seal.

When a large Turndown is required, two or more rows of holes are located on both walls of each trough to handle the wide liquid flow rate range. The Turndown specifically is 2:1 for single orifice design and up to 10:1 for multi-orifice and/or lateral holes in the walls of each trough.



DT-MF



DT-MF Small Col. Dia.

### HIGH QUALITY MULTI-FLOW LIQUID DISTRIBUTOR DT-MF

The high quality liquid distributor DT-MF is a trough type distributor that is ideal for handling extremely low liquid loads 2.05 gpm/ft<sup>2</sup> (< 5 m<sup>3</sup>/m<sup>2</sup>/h). It consists of narrow distributor troughs fitted with regularly spaced small side boxes. Each small side box contains the Multi-Flow MF drip pipes. There are lateral holes located on the walls of the DT troughs that communicate liquid to the side boxes and into the MF drip flow tubes. The lateral holes are positioned a short distance above the trough floor, thus allowing for the settling of some solid particles. The centre DT-MF trough requires the middle row of MF devices to be preinstalled prior to entering the column.

The narrow troughs are fed by a main parting box. It is located above the troughs and typically fed by a feed pipe pre-distribution system. To dampen the impulse of liquid entering the liquid distributor and ensure uniform distribution, the Parting Box is fitted with a perforated splash guide calming device filled with Raschig Super-Rings. Super-rings are held in place with an expanded metal screen cover plate. The DT-MF can be leveled with a set screw leveling device.



Product Bulletin-1100 Page 14

### SPRAY NOZZLE DISTRIBUTOR DP-S

Model DP-S liquid distributors are similar to the pipe-ladder DP-1 design except that the liquid is delivered to the packing through pressure driven spray nozzles. Typical pressure drop for this design is 5 - 20 psi (345 - 1379 mbar) and turndown is typically limited to 2:1. The piping and spray nozzle layout depends upon parameters such as tower size, liquid flow rates, fouling potential, and available space. The preferred application for the DP-S is direct contact heat transfer; however, they have been successfully employed in many scrubbing and stripping applications as well. They are not recommended for most distillation services. DP-S distributors can be made in a variety of plastics and alloys.

### LIQUID COLLECTOR

The liquid collector CP2 is derived form the liquid-redistributor RP2. It consists of integral truss solid decks with round or rectangular gaschimneys and includes a draw-off sump. The gas-chimneys are covered by hoods that prevent the liquid from raining through the risers. It serves as a liquid collector / mixing tray in between packed beds and a liquid draw. It contains short downcomer pipe(s) to conduct liquid into the Parting Box of a CR2 liquid distributor. To prevent liquid leakage, adjacent liquid collector tray decks can be fitted with gasketing or seal welded.



DP-S



CP-2

#### CHIMNEY COLLECTOR/VAPOUR DISTRIBUTOR TRAY CP2

The liquid collector/vapour distributor is similar to that described above. For designs with tall chimney risers, the risers are manufactured in modules and welded together either in the Raschig-Jaeger Workshop or at site prior to welding on to the distributor/collector deck. It serves as a liquid collector / vapour distributor tray in between packed beds and a liquid draw. The CP2 consists of downcomer pipe(s) to conduct liquid into the Parting Box or Boxes of a trough-type liquid distributor (DT-1, DT-2, DT-S). To prevent liquid leakage, adjacent liquid collector tray decks can be fitted with gasketing or seal welded.

#### VANE TYPE LIQUID COLLECTOR CV 1

The vane type liquid collector CV 1 consists of inclined and overlapping lamellas. The channels at the lower end of the lamellas lead the collected liquid into an annular channel which follows the column wall. The liquid collector CV 1 causes an extremely low pressure drop.







#### MULTIBEAM SUPPORT PLATES SP-1

Gas injection or multibeam support plates, are supplied in various sizes and designs. They comprise of corrugated sheets perforated with slots to separate gas and liquid flow paths maximizing total throughput. The uniform pattern of the slots is such that the open area approaches or exceeds the cross-sectional area of the tower. Normally the slots on the top and sides are allocated for gas flow while those on the floor/valleys are designated for liquid flow. The slots are sized to prevent packing elements falling through them. The angle of corrugation, height and width of each beam varies with design and material used. The multibeam support plates are available in various metals, plastics and ceramics. Sometimes in larger diameter towers proper gussets inside the beams as well as support beams (which are usually supplied by the vessel fabricator) are required for greater loads. In plastics, properly encapsulated FRP or steel rods are sometimes provided to add to the structural strength of the beams. Units are normally made either in one piece or sections depending on ease of installation and manway opening size.

### MULTIBEAM SUPPORT PLATES (Small Columns) SP2

The segmented SP 2 support plate is typically used for column diameters < 4 ft (1200 mm). It is characterized by its sinusoidal perforated corrugation design that ensures a high open area and mechanical stability. The free cross section is above 100%.

### MULTIBEAM SUPPORT PLATES (Small Columns) SP3

The segmented SP 2 support tray was especially developed for column diameters < 12 inches (300 mm) and is characterized by its undulatory design that ensures a high stability. The free cross section is above 90%

#### FLTA BAR SUPPORT GRID (STRUCTURED) SP-P

Support Gratings are the simplest and least expensive type of packing supports. They also utilize the least vertical space. They are made of rectangular flat profiles that are dimensioned according to their corresponding mechanical stress. This flat profile support plate is typically used with structured packings. The support grids are available in various materials such as plastic, FRP and metals. They can also be used as bed limiters. Sometimes support beams are required for structural reasons depending on the material and size of the support grate.







SP-2-SS



SP-2 - Plastic



SP-P - SS



#### HEXA-GRID SUPPORT PLATES SP-HG

Hexa-Grid Support Plates are structures that are ideal for fouling applications. They are available for column sizes < 20 inches (500 mm). The SP-HG can be manufactured in Metal and Plastic

#### CROSS-FLOW SUPPORT PLATE SP-CF

Cross-Flow Support Plates are structures that are ideal for fouling application and enhanced gas distribution. They are available for column sizes > 20 inches (500 mm). The SP-CF can be manufactured in Metal and Plastic.

#### SUPER-GRID SUPPORT PLATE IN PLASTIC SP-RSG

The Super-Grid Support Plate is a structure that is ideal for plastic packings. They are available for column sizes > 20 inches (500 mm).

### EXPANDED METAL/SCREEN HOLD-DOWN (RANDOM) HP-1

Hold-downs are used to limit the packing bed from moving or lifting up, thus preventing packing pieces entraining away from the bed. A grating is placed over the packed bed to eliminate this problem. They are usually secured to the wall or clamped to a support ring or loosely placed on the packing in which case their own weight is adequate to prevent any lifting of packings. They are made of rods and bars or in combination with screens or expanded metal depending on the application. The Hold-downs are fabricated in a variety of materials and designs to fit the desired requirements.



SP-RSG









**Product Bulletin-1100** 

Page 17

SP-HG - SS



SP-CF - SS

### HOLD-DOWN GRATING FOR STRUCTURED PACKING HP-P

Hold-downs are used to limit the packing bed from moving or lifting up, thus preventing packing pieces entraining away from the bed. A grating is placed over the packed bed to eliminate this problem. They are usually secured to the wall or clamped to a support ring or loosely placed on the packing in which case their own weight is adequate to prevent any lifting of packings. They are made of rods and bars or in combination with screens or expanded metal depending on the application. The Hold-downs are fabricated in a variety of materials and designs to fit the desired requirements.



#### GAS DISTRIBUTORS

#### PIPE AND SHELL GAS DISTRIBUTOR GV 1

The vapor feed-pipe GV 1 is either perforated or slit on the underside or executed as an open pipe section. The gas exits downwards from the orifices, is deflected and flows into the packed bed.

#### VANE TYPE GAS DISTRIBUTOR GV 2

The GV 2 gas/vapor distribution systems with guides vanes (Schoepentoeter style) are complex structures but efficient with large column diameters. It encourages the distribution of the gas/vapor phase through increased turbulence and reduced pressure drop, promoting the agglomeration of the drops.

## VAPOR DISTRIBUTOR-COLLECTOR GV 3

The gas distributor type GV 3 is a modified liquid redistributor with rectangular gas-chimneys that prevent the liquid from raining through the distributor. The gas distributor is equipped with a downcomer shaft or with drain pipes.

GV-2

GV-1



GV-3



#### **GAS-LIQUID PHASE SEPARATORS**

#### TWO-PHASE DOUBLE-SHELL FLASHBOX FB 1

The Flashing feed device type FB1 is used for two phase-feed streams and consists of a double-shell inlet pipe. The two phase flow is led into the central pipe. The gas enters the interstitial space of the double-shell pipe through a perforation in the upper side while the liquid flows out downwards through discharge holes. The gas is diverted downwards in the double-shell pipe and enters the column axially through discharge openings on the outer pipe shell.



FB-1

### TWO-PHASE CENTRIFUGAL FLASHBOX FB-2

The Two-Phase Centrifugal FlashBox processes a two-phase feed entering the column and FB-2 tangentially. The centrifugal force separates the phases such that vapor ascends to say the next packed bed above. The liquid on the other hand descends to a liquid collection/distributor system by means of perforations along the floor of the FB-2 box.



FB-2

#### TWO-PHASE FLASH GALLERY FB-3

The flash-gallery FB 3 is used for the two phase feed separation in large columns. It consists of an annular channel that lies on a support ring and has discharge holes in the channel floor which usually lead the liquid directly onto the redistributor lying below. The gas can exit the annular channel upward along the entire length of the annular channel. In most cases the liquid distributor lying below the flash-gallery is the type RP 2 to form the FB 3/RP 2 combination.



FB-3



### MESH PAD MIST ELIMINATORS

#### ME1

Raschig USA offers high efficiency wire mesh mist eliminators. These highly reliable and efficient mist eliminators consist of coils or layers of knitted wire mesh. They are usually held together by top and bottom support grids. The complete unit is secured, either from the top or the bottom, to a support ring welded into the column. The mesh and grid material can be metal or plastic depending on the application. Proper support beams are sometimes required to provide structural strength.

The mist is carried upward by the gas flow, impinges on the wire mesh and separates from the gas flow. At the point of separation, the mist starts to flow downward through the wire mesh and unites to form large droplets which then fall down into the vessel. The separation performance is influenced by the wire diameter and specific surface area of the wire mesh and increases with gas flow velocity. A maximum flow velocity is not to be exceeded, however, since it would cause the drops to blow through. Flow velocity, pressure drop and fractional separation efficiency for different droplets' diameters can be calculated in accordance with the gas and liquid operating conditions and properties and the type of mist eliminator selected.



ME1

### CHEVRON MIST ELIMINATORS ME2

Raschig USA can supply chevron or plate type mist eliminators. They are suitable for high liquid load, dirty services and high capacities. They can be applied in horizontal flow or used in vertical up-flow. The chevron units can also be supplied with proper housings. They can be made in sections to be installed through a man-way. Droplet sizes down to 10 microns can be removed. Most specs can be met when these are combined with mesh pad mist eliminators (ME1). The chevron units can be made in plastics or metals.



ME2



100 General Product Information
200 Metal Random - RSR
300 Mist Eliminators – Wire Mesh
400 Fractionation Trays and Hardware
450 High Capacity – Nye Trays
475 High Capacity – CoFlo Trays
500 Metal Structured Packing – RSR
525 Metal Structured Packing – RSP

600 Plastic Random – Jaeger Tri-Pack/Hackentten
625 Plastic Random – RSR
650 Plastic Random – LPR
675 Plastic Random – Nor Pak
700 Plastic Random – Rings and Saddles
800 Ceramic Random Packing
900 Winsorp Software
1000 Process Information
1100 Column Internals
1200 Reactor Internals

### **Locations / Production Sites**

Ludwigshafen and Espenhain, Germany Arlington, Texas Dallas, Texas El Dorado, Kansas Monterrey, Mexico

Furthermore we co-operate with reliable partners all over the world

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