



**SEPARATION TECHNOLOGY WITH COLUMNS**  
**DISTILLATION - RECTIFICATION - ABSORPTION -**  
**EXTRACTION**



# BEST IN PROCESS



BE.ST GmbH designs separation towers to deliver the right combination of equipment to meet our customer's needs. Whatever the application, our engineers select the appropriate packings, internals and trays to maximize the performance of the complete system.

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## TYPES OF PACKING

<b>Packing.</b> . . . . .	<b>Spec. Surface</b>
Wire Gauze S500X . . . . .	500 m <sup>2</sup> /m <sup>3</sup>
Wire Gauze S700Y . . . . .	700 m <sup>2</sup> /m <sup>3</sup>
Metal sheet 125X/Y . . . . .	125 m <sup>2</sup> /m <sup>3</sup>
Metal sheet 200X/Y . . . . .	200 m <sup>2</sup> /m <sup>3</sup>
Metal sheet 250X/Y . . . . .	250 m <sup>2</sup> /m <sup>3</sup>
Metal sheet 300X/Y . . . . .	300 m <sup>2</sup> /m <sup>3</sup>
Metal sheet 350X/Y . . . . .	350 m <sup>2</sup> /m <sup>3</sup>
Metal sheet 400X/Y . . . . .	400 m <sup>2</sup> /m <sup>3</sup>
Metal sheet 500X/Y . . . . .	500 m <sup>2</sup> /m <sup>3</sup>
Metal sheet 700X/Y . . . . .	700 m <sup>2</sup> /m <sup>3</sup>
<b>High capacity packing</b>	
H255 . . . . .	250 m <sup>2</sup> /m <sup>3</sup>
H305 . . . . .	300 m <sup>2</sup> /m <sup>3</sup>
H355 . . . . .	350 m <sup>2</sup> /m <sup>3</sup>
H405 . . . . .	400 m <sup>2</sup> /m <sup>3</sup>
H500 . . . . .	500 m <sup>2</sup> /m <sup>3</sup>
H700 . . . . .	700 m <sup>2</sup> /m <sup>3</sup>





## WIRE GAUZE - PACKING

Wire gauze packing are in successful use for more than 40 years. The special wire gauze is designed to provide the best performance and pressure drop per theoretical stage in the vacuum range from 1 mbar. Separation of temperature sensitive substances can be done like with no other packing. Columns up to 6 meter in diameter have been successful equipped.

### Special features

- Very high NTSM
- Very low pressure drop per theoretical stage
- Minimum liquid load ( $< 0.1 \text{ m}^3/\text{m}^2\text{h}$ ) is possible
- Small hold-up

### Preferred applications

- In vacuum from 1 to 100 mbar
- Separation of isomers, vitamins, fragrances and fine chemicals
- Fatty acids, cyclohexanol/one, caprolactame, TDI/MDI
- Pilot columns with confident scale-up



## HIGH CAPACITY PACKING

The impulse sections at the end of each packing layer decrease the local pressure drop at this point. This eliminates the sudden change in flow direction of the liquid and vapour phases at the packing layer interface.

The impulse section in the middle of each layer gives an extra turbulence and a better liquid flow.

With this patented packing the capacity of columns can be enhanced appr. 30%. The efficiency is about 5% higher than traditional corrugated structured packing.

### Preferred Application

- Vacuum to overpressure
- Large scale production
- Increasing throughput on existing packed columns

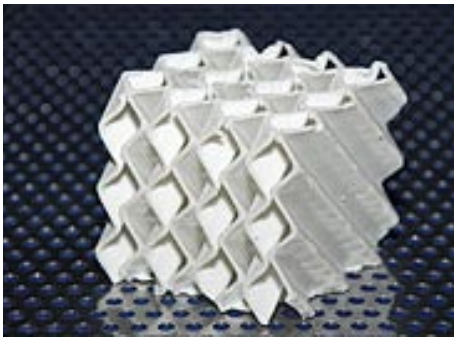
# CERAMIC – PACKING

Structured packing made of ceramic is extremely corrosive resistant to most chemicals. For rectification and absorption you reach almost the performance of a metal structured packing at a reasonable price.



## Applications

- Formic Acid
- Acetic Acid
- Chlorinated Acetic Acid
- Chlorinated Hydrocarbons
- Fatty Acids
- Sulphoric Acid
- Nitric Acid
- Hydrochloric Acid
- Hydrobromid
- Chlorinated Aromas
- Halogenated organic compounds
- Acrylic nitril



## Packing Types

100X	100Y
125X	125Y
250X	250Y
350X	350Y
450X	450Y
600X	600Y

Each type of packing can be manufactured at all diameters. From 40 to 300 mm the packing layer is in one element. Larger diameters do have segmented layers. There is no limit for the diameter of a column equipped with ceramic structured packing.

The internals like liquid distributors, collectors and support grids can be manufactured in ceramic, PTFE/PFA PVDF, Alloy, titanium or other materials.

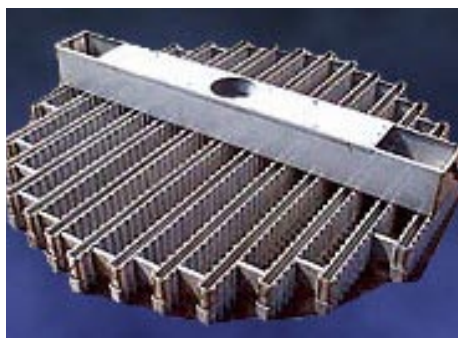
# RANDOM PACKING

Three types of well known random packings are available: Pall Rings, Cascade Rings and Metal-Saddles.



Type	Dimension [mm]	Density [kg/m <sup>3</sup> ]	Spec. Surface [m <sup>2</sup> /m <sup>3</sup> ]
Pall Ring	16x16x0,4	527	371
	25x25x0,5	400	219
	38x38x0,6	305	129
	50x50x0,8	316	112
	76x76x1,0	280	72
Cascade Ring	25x12,5x0,5	422	220
	38x19x0,6	356	150
	50x25x0,8	352	111
	76x38x1,5	410	72
Metal-Saddle	25x13x0,4	310	203
	38x20x0,5	280	151
	50x32x0,7	220	98
	76x50x1,0	172	55

# COLUMN INTERNALS

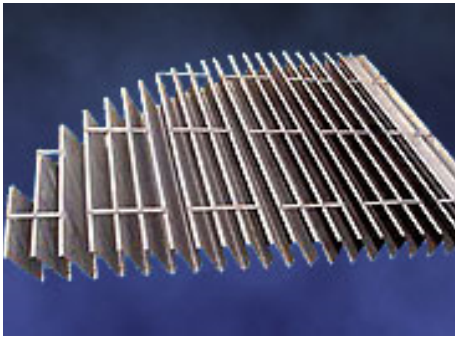


## LIQUID DISTRIBUTORS

From a process standpoint, the most important column internals are the liquid distributors. A liquid distributor is required at all locations in the column where an external liquid stream is introduced. In addition to providing a uniform liquid distribution pattern to the top of the packed bed, the distributor must provide sufficient gas passage area to avoid a high pressure drop or liquid entrainment. The liquid distributor can be manufactured with a high turn-down ratio and are resistant to fouling. Following design data can be achieved:

Drip point density: 50-200 TS/m<sup>2</sup>

Liquid load: 0.1 - 200m<sup>3</sup>/m<sup>2</sup>h

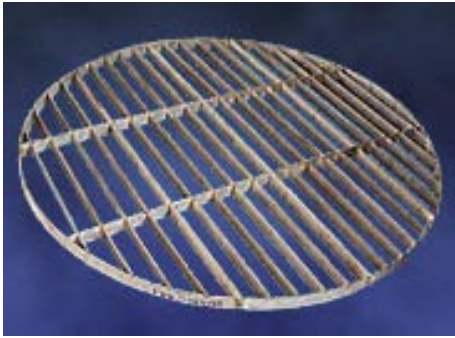


## LIQUID COLLECTORS

Liquid collectors are used to collect all of the liquid flowing down the column.

Vane liquid collectors are widely used because of their low pressure drop.

Chimney trays will be used if a complete collection of all liquid is necessary or for high liquid loads.



## SUPPORT GRIDS

The support grid is the physical support of the packing and the liquid hold-up. In addition, the support grids must permit both the downward liquid as well as the upward gas to pass through to the limit of the capacity of the tower packing itself.

All internals will fit through the existing manhole.

## SUPERVARIO TRAYS

The SuperVario Valve provides the largest turn-down ratio of all known column valve trays. The caged valve has a special designed hole and is very flexible for a wide range of vapour load. The valve tray is well known since many years and is very successful installed in many applications. The mechanical strength of the valve is very good and it is very resistant to fouling.



### Special features of SuperVario valve trays:

- High turn-down ratio of 1:6 and more
- One pass trays or multi downcomer trays.
- Higher efficiency than normal valve trays
- High liquid load application (e.g. high pressure distillation or absorption)





# VALVE TRAYS

A3 and V1 Valve Trays are used since many years in more than 15.000 installations. Most application are in the petrochemical and refinery industry. Because the valves and the processes are so well known the design even for large columns can be done very safe.

Valve Trays can handle loadings up to 10% higher than sieve trays while providing higher efficiency.



A3 Ventil

## Special features of valve trays A3 - V1:

- More than 15.000 installations worldwide
- One pass trays or multi downcomer trays.
- Safe design also for large columns
- Simple installation and reduced maintenance contribute to cost effective projects



V1 Ventil

## Replacement

We do replacement for existing columns during a shut-down or because of a damage in a very short time. We have most of material, valves, clamps, nuts and bolts on stock and can manufacture other parts starting from now.

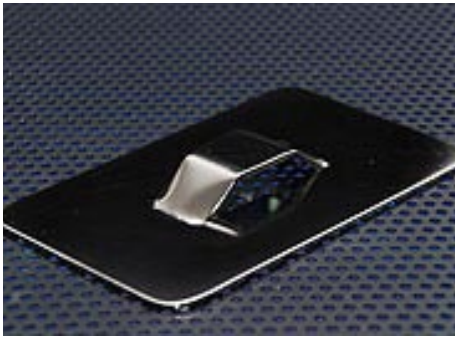
Please contact us for your shut-down cycle or if you have an unexpected turn-down.

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# FIXED-VALVE TRAYS

The fixed valve tray is an improved type of sieve tray, with higher efficiency and lower pressure drop. Because of the limited working range it is perfect for continuous operation at a fixed load.





### Special features Fix-Valve Trays

- Easy Installation
- One or multi pass design
- High resistance to fouling
- High liquid loads possible
- Medium tray efficiency at medium pressure drop
- Good for corrosive applications
- Low costs

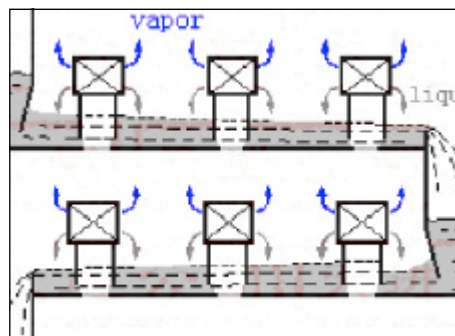
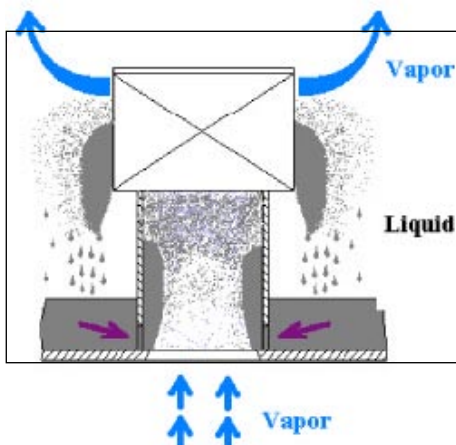
## JCPT HIGH CAPACITY TRAYS

The Jet-Coflow-Packing-Tray (JCPT) is a combination of packing and tray. The mass transfer mechanism of JCPT is demonstrated below. The liquid is coming through jet holes into the chimney and forced upwards with the vapour. In the packing section an intensive contact between vapour and liquid is provided and the gas and liquid will be separated at the outlet of the packing.



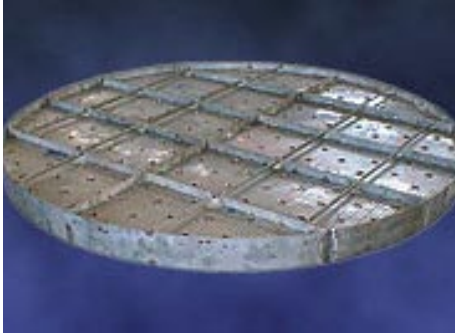
### Special features and Applications

- Very high throughput - at least 50% higher than valve trays
- The liquid on the trays contains less gas, so the downcomer is not easy to flood
- High efficiency. The efficiency of JCPT is 15% higher than valve trays
- Tray pressure drop is 30% lower than valve trays
- High turn-down ratio - about 1:4 or larger
- Atmospheric pressure to overpressure
- Column revampings for increasing efficiency and energy conservation or for increasing capacity



# ALL ACTIVE AREA EXTRACTION TRAY (4A TRAY)

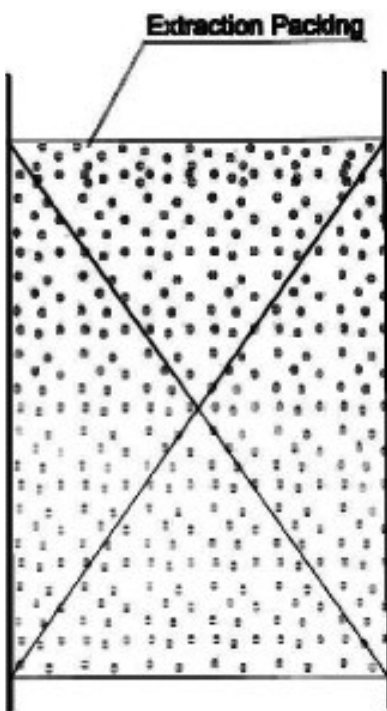
4A-Tray is a combination of packed extraction column and tray type extraction column.



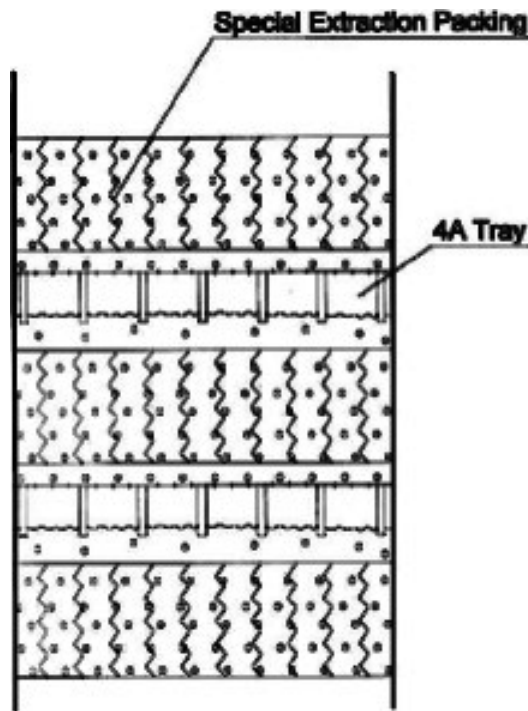
## Special Features and Applications

- No independent downcomer area
- No cross movement on the tray
- Increasing about 10% tray efficiency
- Increasing more than 30% capacity
- High interface tension systems
- Revamping packed or sieve tray columns for increasing capacity

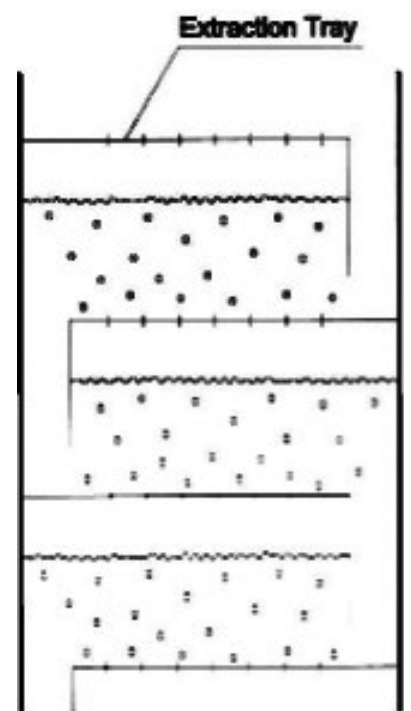
The mass transfer mechanism of 4A tray is demonstrated below.



**Packed Extraction Column**



**4A Extraction Column**



**Tray type Extraction Column**

# DEMISTER

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## HIGH CAPACITY DEMISTER

High capacity demister with operating range about twice of traditional mist eliminators. The efficiency is up to 99,8 % for droplets of 5my.

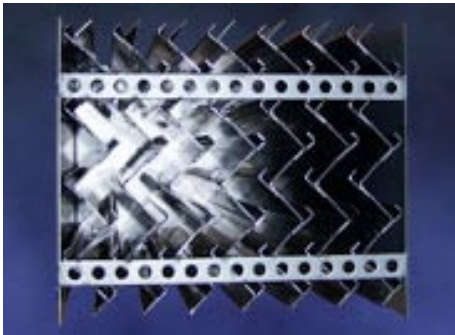
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## WIRE MESH DEMISTER

Wire mesh demister is a simple and low cost demister, which can be designed for vertical or horizontal flow. It's easy to install.

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## VANE DEMISTER

Vane Demister are used for a low pressure drop and a flow with solids. Many materials can be chosen and the modular design allows a safe and easy design for the asked application.

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## SERVICE

- Thermodynamic und hydraulics calculation of columns
- Installation and supervising of installation
- Studies for column systems
- Revamp of columns as general contractor