

**SULZER**

Sulzer Chemtech

## **Mass Transfer Technology**

Your Partner in Separation and Mixing Technology





# Sulzer Chemtech - Mass Transfer Technology

## Your Global Partner with Leading Solutions in Separation and Mixing Technology

For more than 50 years we have been serving the Process Industry, delivering innovative yet reliable solutions. From gas-liquid separation at the well-head to separation of vitamins, from petroleum refining to power generation, our products and technologies are employed for varied and demanding applications. Today, we have built the most global service and manufacturing network in the industry, supported by world class experts close to customers!











### **Upstream**

-  Natural Gas Scrubbing
-  Natural Gas Drying
-  Gas Sweetening
-  Gas Fractionation
-  Condensate Stabilizer
-  Gas/Liquid Separation
-  Liquid/Liquid Separation

### **Refinery**

-  Crude Oil Distillation
-  FCC Vacuum Towers
-  Lube Oil Distillation
-  Coking and Visbreaking
-  Hydrotreating
-  Fractional Distillation

### **Petrochemical**

-  Acetic Acid
-  Ammonia
-  Aromatics
-  Ethylene Oxide and Derivatives
-  Olefins
-  Phenol and Derivatives
-  Styrene
-  Diisocyanates (MDI/TDI)

**A Broad Range of Innovative and High-performing Products**

1

**The Highest Level of Application Know-how**

3

**Fast and Reliable Turnaround Services**









5

**Comprehensive Engineering and Technology Services**

7







## **Chemicals**

-  Alcohols
-  Biofuels and Biochemicals
-  Caprolactam
-  Terephthalic Acid
-  Purified Terephthalic Acid
-  Oleochemicals
-  Flavor and Fragrances
-  Vitamins

## **Power Generation**

-  Carbon Capture and Storage
-  Waste Power Generation
-  Heavy Water Upgrading
-  DeNO<sub>x</sub> Plants
-  Flue Gas Treatment

## **Other Industries**

-  Air Separation
-  Silanes
-  Fertilizers
-  Many more...

## A broad Range of Innovative and High-performing Products

Our more than 200 products cover a wide range of needs in the field of separation and mixing technology. They have proven their performance in more than 100,000 columns, 40,000 gas/liquid separators and 100,000 mixers in operation worldwide.

### Structured Packing

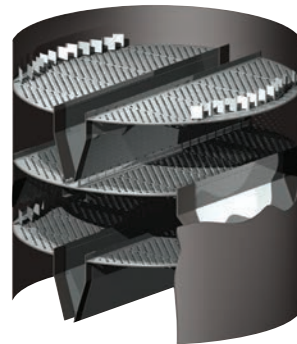
More than 50 years of design and development experience in structured packing makes us the ideal partner for finding the optimum solution for your application.



MellapakPlus™ Packing -  
*Often copied, never equaled*

### Trays

We have the largest tray portfolio on the market. The available trays range from conventional to high performance chordal downcomer, multi-downcomer and to the latest developments of ultra-system limit trays.



VGPlus™ Trays - *One of the best high performance trays ever tested at FRI*

### Internals for Packed Columns

Even the best packing type will never provide its full performance if the related internals are not designed appropriately – be sure to have the perfect design having them delivered by us.



VEP™ liquid distributor -  
*With the revolutionary splash plate*

### Random Packing

We offer traditional and high performance random packing including Nutter Rings™, I-Rings™, C-Rings™, P-Rings™ and R-Rings™, in metal or plastic, which makes us a one stop solution provider.



Nutter Rings™ - *The best known high performance random packing*

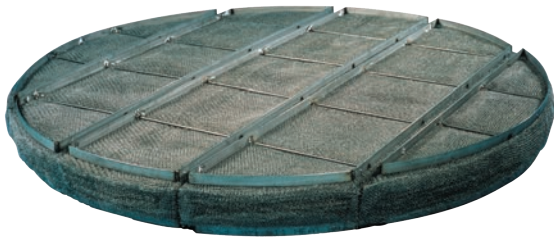
## Shell - Sulzer Alliance of Technology

Sulzer Chemtech is the worldwide designer and supplier of mass transfer and separator equipment of Shell Global Solutions. Sulzer is also Shell's chosen partner for joint development of new products - e.g. Schoepentoeter Plus™.



### Gas-Liquid Separators

Starting with the low cost, highly versatile and efficient KnitMesh Wire Mesh mist eliminators, we have an extensive range of innovative products and services for separation of entrained liquid.



Sulzer KnitMesh™ Wire Mesh Mist Eliminator -  
*Cost effective and versatile solution for most applications*



### Liquid-Liquid Separators

We offer a range of coalescers designed to accelerate the separation of either primary or secondary immiscible liquid dispersions.



Dusec Plus™ Coalescer -  
*High performance with minimum pressure drop*



### Feed Inlet Devices

We design and supply different types of feed inlet devices to provide an effective solution for vapor or gas distribution, solving many different liquid entrainment challenges.



Schoepentoeter Plus™ inlet devices -  
*First choice for efficient de-entrainment*



### Mixers

Sulzer has been pioneering the static mixing business for more than 35 years. Static mixers are tubular internals that produce desired mixing and dispersion effects as the fluid flows around motionless mixer parts.



SMV™ static mixer - *High mixing efficiency combined with large turn-down processing capabilities*



## The highest Level of Application Know-how

Beyond products, our team provides state-of-the-art expert know-how in more than 500 applications within 100 processes. This enables us to optimize the performance and investment of your installation.

### Optimizing Trays for 20% more Efficiency

Optimizing efficiency in a tray design requires that the vapor and liquid contact each other uniformly to maximize the generation of interfacial area.

From the vapor side, this means selecting properly sized orifices or valves and locating them uniformly across the entire tray deck. For example, Sulzer MVG™ small size allows for uniform distribution across the tray deck to maximize efficiency.

As for the liquid phase, ideally it should travel uniformly across the deck in plug flow with no back mixing. In these cases, strategically placed push valves can be used to maintain a uniform liquid flow across the tray deck, thereby maximizing tray efficiency. This proven technology can increase efficiency by 15 - 25%, depending upon the tray design.



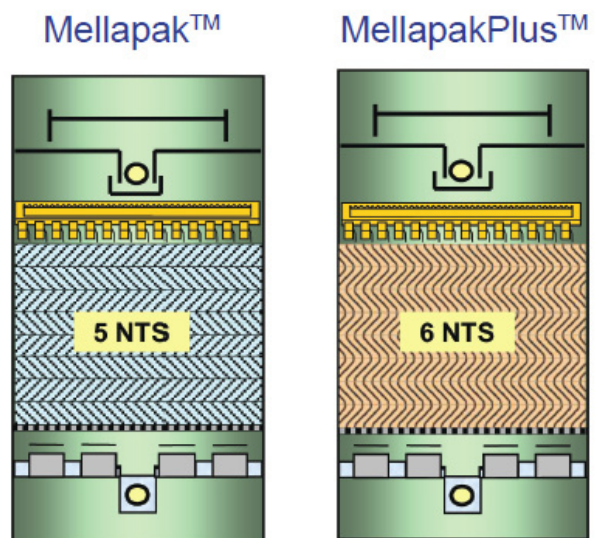
4-pass VGPlus™ Tray equipped with ModArc™ downcomer, MVG™ and Push Valves

### Reducing Energy Consumption of a Packed Column by 20%

With increasing energy costs and the emphasis on greener designs, efficiency is of paramount importance. An excellent way to increase the number of theoretical stages is using high performance packing.

As an example, Sulzer MellapakPlus™ 352.Y high performance structured packing can be used in place of a standard Mellapak 250.Y packing to obtain more than 20% higher efficiency with 20% lower pressure drop. If you thought "it is not possible to increase efficiency and reduce pressure drop"... think again!

The added efficiency and lower pressure drop combine to substantially reduce the overall process energy consumption, especially in vacuum applications where pressure drop is critical.



Typical Application of MellapakPlus™ with 20% more Efficiency

## We work with you to deliver optimum solutions

Contacting us is your first step towards finding the best design for your particular case. Working together in international teams with experts from different areas, combining your and our know-how and using cutting-edge design tools we help you reach the technically and economically optimal solution. We tweak our products to get you more!

### Reducing Glycol Losses to a Minimum

The drying of natural gas in glycol (often TEG) dehydrators is a widely used and well established process. However, the use of modern, high-capacity packing such as Sulzer MellapakPlus™ in absorption columns has increased the demands on ancillary equipment as well.

The patented Sulzer MKS Multi Cassette™ mist eliminator combines axial cyclonic and cross-flow separation technology to create an efficient, high capacity separator. It ideally combines with Sulzer MellapakPlus™ in glycol dehydrators to provide proven performance in natural gas drying columns, reducing the expensive glycol losses to a minimum.



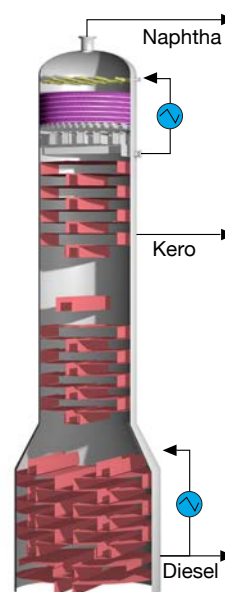
Sulzer MKS Multi Cassette™ Mist Eliminator

### Getting more out of your Refinery

Refiners often face revamp challenges when trying to improve separation within an existing column. Improving diesel recovery from gas oil, splitting benzene precursors from naphtha reformer charge, or simply minimizing product overlaps after capacity creep can all be difficult when limited by the existing tower height.

One direct way to increase efficiency within a column section is to simply increase the number of trays. In a revamp with a fixed section height and column diameter, stage count can be increased by reducing tray spacing and installing a larger number of high capacity trays.

Sulzer VGPlus™ high capacity trays incorporate the use of high capacity valves with an optimized layout, high performance downcomer technology, and additional features like froth promoters that improve distribution across the tray. VGPlus™ trays have larger capacity than conventional trays and can be installed at tray spacings as low as 14".



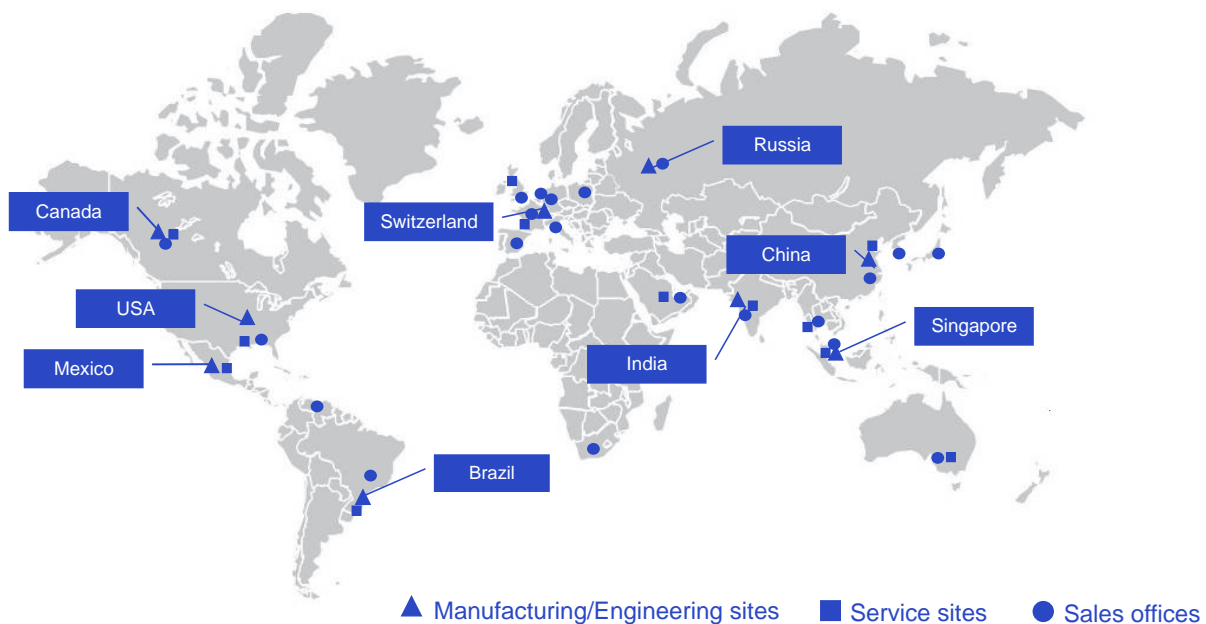
VGPlus™ Trays retrofitting conventional trays for maximizing capacity

## Fast and Reliable Turnaround Services

### We don't shut-down, when you shut-down

When your profitability is being threatened by a shut-down, you can rely on Sulzer professionals, expertise and reliable procedures to get you back and running in the shortest possible time. We understand how important each hour is to your operation and will deliver on the five promises of our Emergency Shut Down Services:

- 1 **Availability, commitment and experience of our teams. Every minute of the day, you can count on us**
  - Ask your contact point for the local emergency number
- 2 **SHaRP Software: Ask for your equipment details to be stored in our database (free of charge)**
  - We can start production right away in case of emergency
- 3 **Hardware stock locations in all corners of the world**
  - We maintain standard hardware inventories so you don't have to think about it
- 4 **A global network of production facilities to reduce delivery times**
  - No matter your location, we have manufacturing and technical support ready to meet your needs
- 5 **Fast and reliable installation**
  - Mobilizing Service teams from our strategically placed facilities, we have the ability and proven track record to execute projects at any location around the world in a record and guaranteed time





## We optimize your planned shut-downs

- We can review and optimize the performance of your equipment
- We build an optimized shut-down plan together with our Field Service team and take ownership from hardware to final inspection
- We deliver equipment prior to shut-down for installation, inspection and repair needs
- We provide hardware on consignment basis in a locker or container next to your column
- On-site technical support is available to aid in installation, start-up, or to capture data for further optimization
- Our goal is to make your turnaround a success, and have you up and running in the minimum amount of time

Part Code	Matl Code	Old SAP	New SAP	Part Desc	U	SW	C	100%	Rec't	Qty	Price	TOTAL	Unlgh	HDG
btca19a10p	411		00222	BT Chang E13 = Bolt 3/8" x 42, C=10, A501 4105	Ea	S		408	20	82	15.00	SFC 1230.00	0.119	25
specialclamp1	411		00281	Special clamp, sec. Comp A501 4105	Ea	S		380	20	76	15.00	SFC 1140.00	0.136	25
val19127	305	106.401.912.430	10000342	Valve Light R01, 2" x 1/2, L=12.7, A501 304L	Ea	F		1100	10	110	0.04	SFC 39.44	0.024	250
val19127	305	106.225.050.009	10002769	Valve Heavy R01, 2" x 1/2, L=12.7, A501 304L	Ea	F		1140	10	114	0.07	SFC 87.78	0.034	250
qpl05050a3	411	106.402.219.029	10000762	Incl plate 15" x 15" x 3/16, A501 4105	Ea	F		400	20	80	0.04	SFC 62.81	0.045	50
bolca16a00	410	106.216.980.070	10005719	New Bolt UMC, 3/8" x 30, A501 410	Ea	F		1400	20	280	0.03	SFC 340.34	0.028	100
nutca221a15	411	106.226.276.070	10002700	Nut UMC, 22 x 11 x 1/2, A501 4105	Ea	F		840	20	84	0.17	SFC 14.36	0.004	100
nutca201a15	411	106.225.076.044	10000759	Nut UMC, 18 x 11 x 1/2, A501 4105	Ea	F		1400	20	280	0.12	SFC 36.86	0.028	100
nutca19	410	106.216.980.076	10005742	New Nut UMC, 3/8" A501 410	Ea	F		3025	20	605	0.15	SFC 96.90	0.011	100
bolca16a00	410	106.216.980.070	10005629	New Bolt UMC, 3/8" x 30, A501 410	Ea	F		1010	20	202	0.28	SFC 480.76	0.020	100

## You stay in control

- Consignment hardware (containers / trailers / lockers) are available to reduce your inventory and costs
- They can be personally delivered and monitored to ensure stocks remain at needed levels
- You have everything needed for the installation at hand
- You only pay for what you use

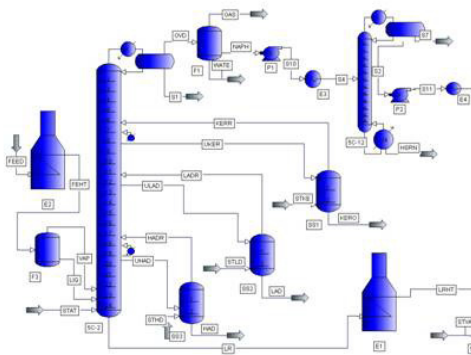


# Comprehensive Engineering and Technology Services

We combine the array of our technologically advanced products with a full scope of associated engineering and technology services. Tell us your need and leave the rest to us!

## Process Studies

- Energy saving
- Moving columns
- Process optimization
- Troubleshooting



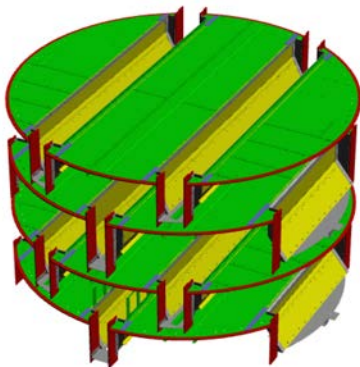
## Hydraulics Analyses

- Hydraulics of internals
- Maldistribution
- Debottlenecking



## Engineering Studies

- Engineering / Re-engineering
- Mechanical strength analysis
- Vibration analysis
- FEM and CFD analysis



## Laboratory and Pilot Tests

- CO<sub>2</sub> absorption
- High pressure testing up to 50bara
- Gas/Liquid and Liquid/Liquid separation





## Customer Hydraulic Design Software SULCOL

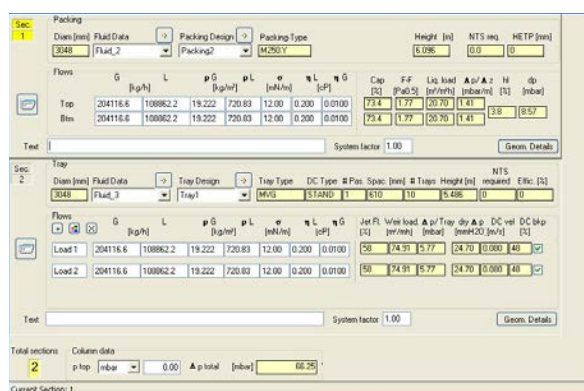
SULCOL 3.0 is the latest development step in our endeavor to provide state-of-the-art tools to our customers for the design of mass transfer columns.

### Structured and random packing hydraulic design and rating

- Default packing efficiency based on standard organic test mixtures
- Efficiency calculation may be suppressed
- Extractive distillation
- Graphical capacity diagram with operating points

### Tray hydraulic design and rating

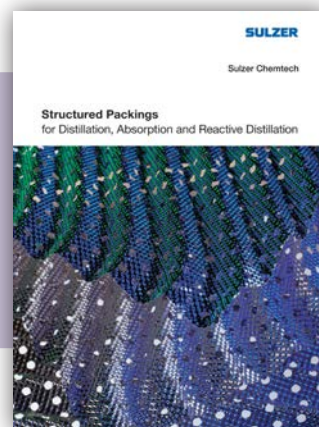
- Fixed and movable valves
- One pass and multipass tray design
- Conventional downcomer design
- Description of Sulzer tray portfolio including Shell tray technology



You may download SULCOL from [www.sulzer.com](http://www.sulzer.com)

## Customer Seminars

We regularly organize customer seminars for you to benefit from our experience, meet our experts and remain at the forefront of separation and mixing technologies.



Find everything and even more information from

- our Product Brochures (Trays, Structured Packing, Random Packing, Internals, Gas/Liquid Separations, Liquid/Liquid Separation, Mixers)
- our Application Brochures (Refinery, Petrochemicals and Chemicals)
- our Website ([www.sulzer.com](http://www.sulzer.com))

**www.sulzer.com**

Please check for your local contact

Sulzer Chemtech Ltd, a member of the Sulzer Corporation, with headquarters in Winterthur, Switzerland, is active in the field of process engineering and employs some 4000 persons worldwide.

Sulzer Chemtech is represented in all important industrial countries and sets standards in the field of mass transfer and static mixing with its advanced and economical solutions.

The activity program comprises:

- Process components such as fractionation trays, structured and random packings, liquid and gas distributors, gas-liquid separators, and internals for separation columns
- Engineering services for separation and reaction technology such as conceptual process design, feasibility studies, plant optimizations including process validation in the test center
- Recovery of virtually any solvents used by the pharmaceutical and chemical industry, or difficult separations requiring the combination of special technologies, such as thin film/short-path evaporation, distillation under high vacuum, liquid-liquid extraction, membrane technology or crystallization.
- Complete separation process plants, in particular modular plants (skids)
- Advanced polymerization technology for the production of PLA and EPS
- Tower field services performing tray and packing installation, tower maintenance, welding, and plant turnaround projects
- Mixing and reaction technology with static mixers
- Cartridge-based metering, mixing and dispensing systems, and disposable mixers for reactive multi-component material

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