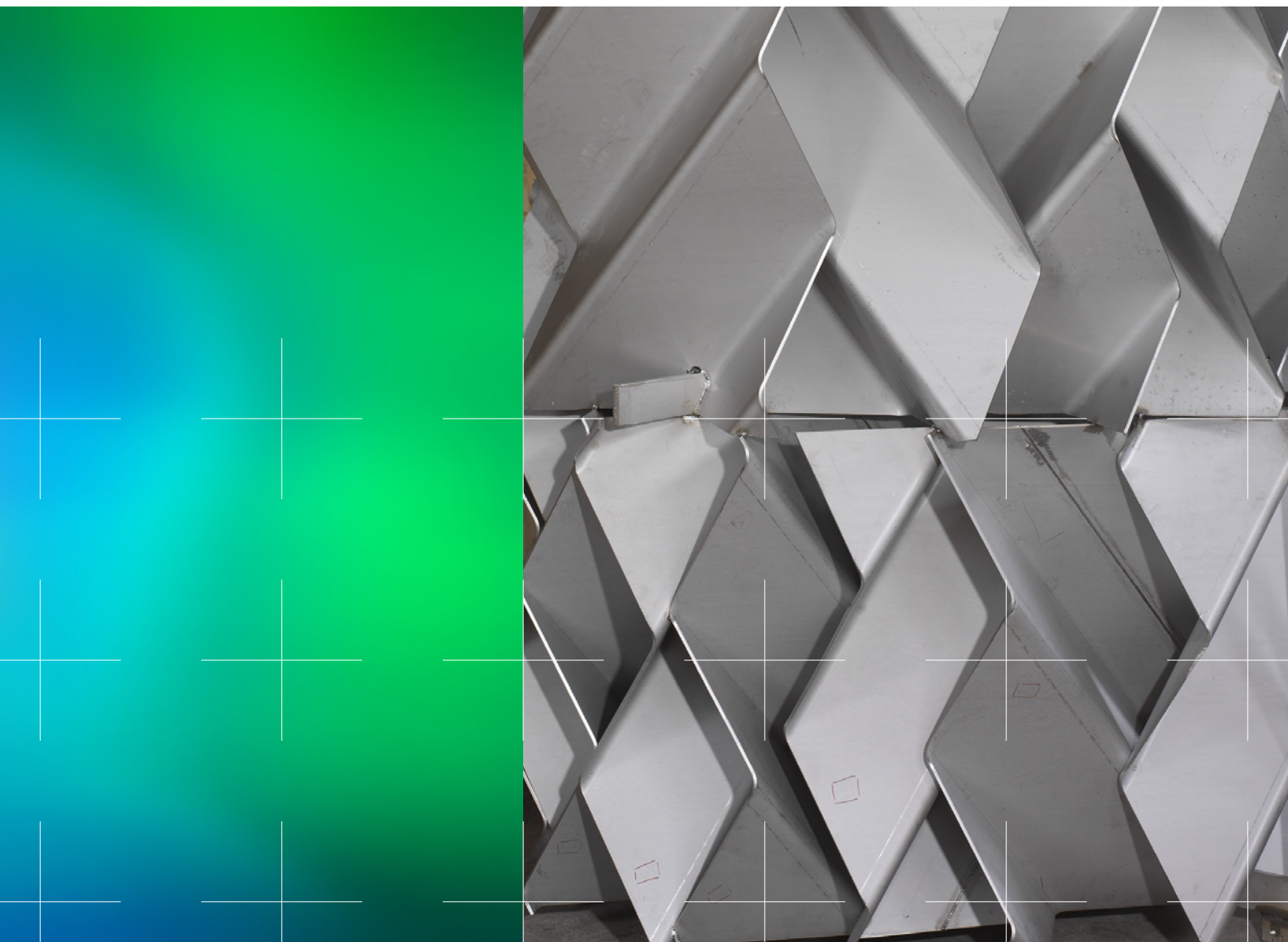


SULZER

Static mixer heat exchangers

Leading technology
for the conditioning
of fluids



Sulzer Chemtech – Heat and mass transfer technology

Your partner in separation and mixing technology

The highest level of application know-how

Our team provides state-of-the-art expert know-how for more than 500 applications in 100 processes. This enables us to optimize the performance of your installation.



Fast and reliable turnaround services

We don't shut down, when you shut down. You can rely on Sulzer's professionals, expertise and procedures to get you back up and running in the shortest possible time.



Comprehensive engineering and technology services

We provide a full scope of associated engineering and technology services to optimize or trouble-shoot your installation.



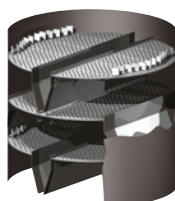
MellapakPlus™ packing

Often copied, never equaled



VGPlus™ trays

One of the best high performance trays ever tested at FRI



NeXRing™

The next big thing in random packing



SMV™ static mixer

High mixing efficiency combined with large turn-down processing capabilities



Dusec Plus™ coalescer

High performance liquid/liquid coalescer



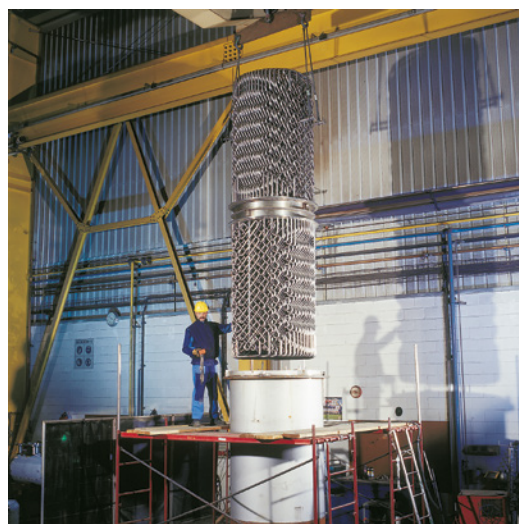
Static mixer heat exchanger portfolio

Sulzer Chemtech has been delivering state-of-the-art static mixer heat exchangers for mass and heat transfer for over 50 years. Our solutions have been helping a wide variety of industries efficiently create homogeneous mixtures and dispersions of liquids and/or gases.

One of the most effective methods to mix fluids is by the use of apparatus with mounted internal elements. The absence of moving parts reduces energy usage, wear and tear as well as the manufacturing footprint, slashing costs, maintenance activities and downtime.

These are the reasons why our portfolio features a broad and continuously expanding range of well-established static mixer heat exchangers. Each technology is designed and customized to support distinct processing conditions and requirements, delivering uniform dispersion drop size, intensive radial mixing for homogeneous heat transfer and narrow residence time distribution in every setup.

This level of specificity and flexibility in our offering means that we can offer the right solution for your intended application. Whether you need to purify polymers, mix highly reactive chemicals, combine additives, heat or cool down food ingredients, we have the right solution for you. Our static mixer heat exchanger assortment includes Sulzer Mixer Reactor (SMR™), SMX™ SMXPlus™ and SMXL™ internals used for monotube or multitube apparatus.



A broad range of innovative and high-performing products

Our wide range of more than 200 products cover your needs in the field of separation and mixing technology.

They have proven their performance in more than 1'000'000 columns, 40'000 gas/liquid separators and 300'000 mixers in operation worldwide.

Identify the right solution for you – processing aspects

By leveraging the most diverse geometries, we can handle processes and feedstocks with very different characteristics, such as flow regimes, viscosity, temperature and enthalpy. Our guide will help you find the right solution. Our experts can provide further assistance as well as offering you with a customized setup to address your needs.

For limited volumes and gradients:

Monotube mixer-heat exchangers

Companies that process limited volumes of feedstocks, and where heating or cooling gradients are minimal, need compact yet effective solutions. The SMX and SMXPlus monotube static mixer heat exchangers developed by Sulzer Chemtech were created to address these exact needs.

Our monotube technologies are characterized by two pipes. The product flows through the inner pipe, while the heat carrier medium for cooling or heating the product circulates between the inner and outer pipes. The product-conveying inner pipe is filled with static mixing elements, which provide specific flow effects, delivering improved hydraulic characteristics.

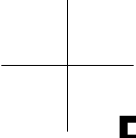
The arrangement and configuration of the mixing elements in the flow pipe superimposes the lateral flow components on the liquid flowing in the longitudinal direction. Through the lateral flow components, layers are formed and spread out over the pipe cross-section. The number of layers increases exponentially with the mixer length or number of mixing elements. At the same time, the layer thickness decreases, resulting in an increased homogeneity over the mixer length.

When looking at the specifics of Sulzer Chemtech's SMX and SMXPlus mixers, they are composed of a matrix of intersecting mixing elements, with each successive one offset 90° against the previous. Thus, there is a continuous temperature equalization by forced convective heat transport due to the radial product exchange. Moreover, the



radial mixing effect significantly increases the heat transfer at the tube wall.

The SMX mixer has been the industry standard for demanding mixing applications – especially those characterized by laminar flow regimes – for more than 30 years. In applications where pressure drop is an issue, the SMXPlus is ideal, as it reduces this phenomenon while maintaining optimum product homogenization and dispersion as well as maximizing energy efficiency. This solution is also an attractive option for turbulent flow, especially when there are differences in component viscosity.



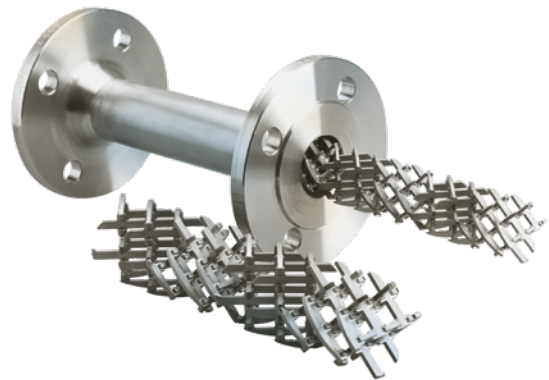
For highly viscous materials: Multitube heat exchangers

When processing high volumes of materials with high viscosities, multitube systems offer a more effective setup than monotube static mixer heat exchangers. Developed precisely for these applications in laminar flows, the mixing elements of Sulzer Chemtech's SMXL offer unmatched performance.

Sulzer Chemtech's multitube designs, such as the SMXL, are characterized by multiple conduits with mixing elements, where the product flow is split, while heating media surrounds these tubes on the shell side. As a result, it is possible to maximize volume-related heat transfer capacities.

The SMXL multitube mixers are composed of guide vanes. These are formed by intersecting bars at 30° to the pipe axis. This design offers a continuous mixing action over a relatively long pipe section that also leads to low pressure drops. To maximize the end result, the precise layout is custom-made to perfectly match customers' specifications.

SMX plus mixing elements installed in a flanged housing



Multi-tube heat exchanger equipped with SMXL mixing elements



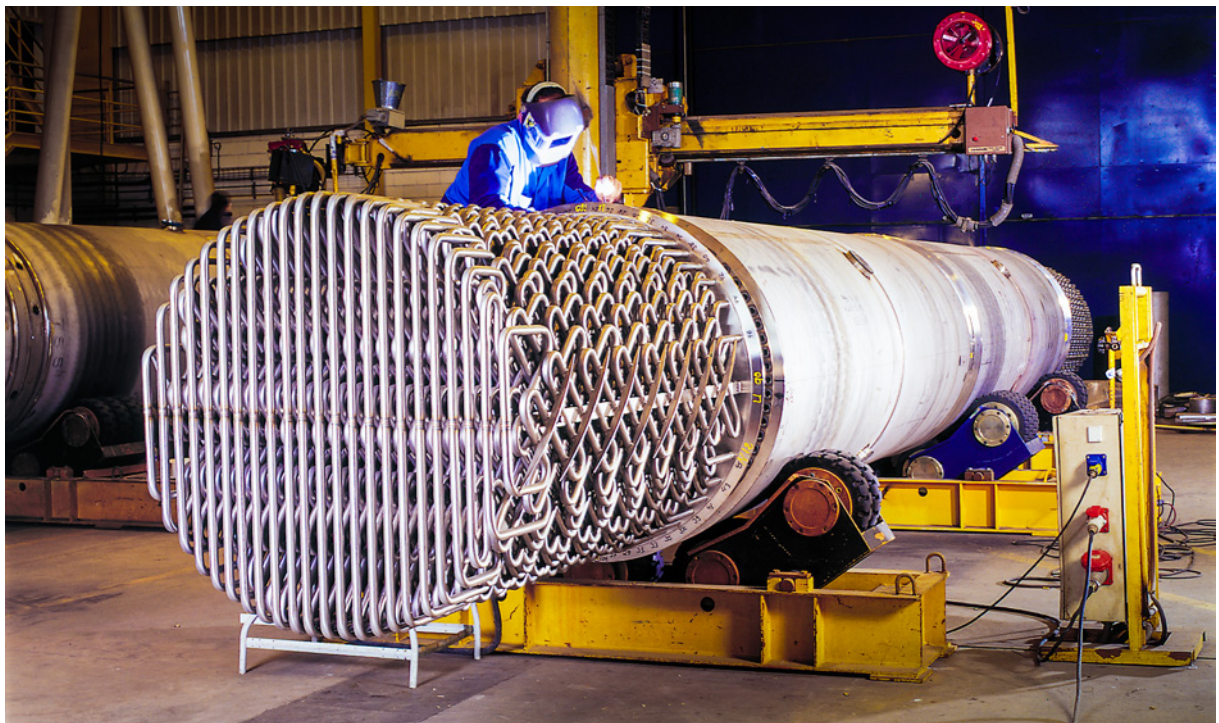
For exothermic reactions: Static mixing reactors

Exothermic reactions, such as polymerizations, can greatly increase the heat duty of an application. To make the process efficient and economical, it is convenient to run the reaction in the shell of the static mixer heat exchanger, while the cooling medium stays in the tubes. Within this setup, the tubes should also act as static mixing elements to ensure homogeneous distribution of the feedstock.

Sulzer Chemtech supports manufacturing activities that involve exothermic reactions with its SMR. The mixing elements are analogous to the SMX mixers, but the intersecting webs consist of tubes that carry the heat transfer medium, thus creating a mixing element with temperature-controlled surfaces. The mixing tubes are interconnected by bends and join each other in common distributors or headers for the supply and discharge of the heat transfer medium. In the flow duct, the successive mixing elements are offset 90° to each other. This design provides a very high specific heat transfer area, intensive radial mixing, and a narrow residence time distribution.

As no product stream split is possible, maldistribution effects are eliminated. This solution also leads to a high volume-related heat transfer capacity due to the surface area ranging from 50 to 90 m²/m³ as well as a low shear rate and uniform shear distribution over the cross-section. In addition to this, the efficient mixing leads to a high heat transfer rate and the pressure drop is low.

Finally, the structure of the SMR can limit the heat generation during exothermic reactions by efficiently removing the heat produced, thanks to a high volume-related heat transfer capacity. As a result, exothermic reactions can be performed safely and economically. Additionally the relative small liquid inventory on the shell side helps to reduce the risk and allows a safe process.





Identify the right solution for you – industrial applications

Sulzer Chemtech's static mixer heat exchangers have been offering a reliable solution for a wide variety of applications, including chemical, pharmaceutical as well as food and beverage production. By leveraging our technologies, manufacturers worldwide have been able to advance heat and mass transfer processes, maximizing cost- and energy efficiency, yield, product quality and consistency.

Plastics and polymers

The purification of plastics and other polymers can greatly benefit from advanced static mixer heat exchangers for preprocessing. Our SMX and SMR equipment can homogeneously increase the temperature of the melt, even if viscosity changes, without causing unwanted thermal degradation of cross-linking.

Having served the chemical sector for decades, we know what the key challenges are. One of these is certainly heating polymer melts before purification to remove volatiles, such as solvents and/or unreacted monomers, prior to pelletization.

Our SMX, SMXL and SMR static mixer heat exchangers can help companies handle the presence of reactive components in the melt as well as thermally sensitive polymers. By maintaining a short residence time, leveraging radial mixing and preventing local thermal overloading, uniform heat exchange without degradation can be achieved.

In addition, this equipment can be coupled with our state-of-the-art devolatilization units for effective separation. The rapid removal of reactive monomers via this process further prevents any unwanted reaction from taking place.

For improved temperature control in applications where a large amount of reaction heat is released, multiple SMRs can be combined to create loop reactors, as they can deliver high product yield and quality. In addition, this solution also allows businesses to increase plant productivity.



For example, one key installation can reduce its reaction and cooling times by a factor of more than seven while enhancing homogeneity and the prevention of hotspots, ultimately preventing the creation of concentration and temperature gradients. Even more, companies can also slash maintenance requirements while minimizing waste.

Bioplastics

The market for bioplastics, which use renewable resources as feedstock, is skyrocketing. Companies that want to deliver high-quality products at highly competitive prices need cutting-edge static mixer heat exchangers for a variety of processes, such as polymerization and formulation. Thanks to its industry leading expertise in bioplastic processing, Sulzer can offer the right technology to drive your success.



Sulzer Chemtech has been delivering innovative solutions for the production of polylactic acid (PLA), one of the most promising and sought-after bioplastics, for many years, with our equipment installed in many PLA manufacturing facilities globally. To support the conversion of lactide monomers to PLA polymers, we offer a series of SMR loop and plug-flow reactors as well as mixers to add coloring agents or additives to the melt.

Our technology is also able to deliver the level of flexibility that these applications require, as the settings utilized influence the relative amounts of D- and L-lactides. These define the biodegradability of PLA-based products and ultimately determine the most suitable uses for the bioplastic produced. Manufacturers can adjust their operating conditions to deliver products with specific properties. More precisely, we offer smart measurement control and precise heat settings to easily modify the amount of L-, D- as well as meso-lactides in the PLA pellets, delivering high-quality materials for a range of applications.

Resins, adhesives and sealants

The production of resins, adhesives and sealants involves cooling stages, during which static mixer heat exchangers need to effectively handle products whose viscosity can change tremendously. The features of Sulzer Chemtech's SMR are ideal to prevent heterogeneities and maldistributions while ensuring optimum processing and end-product quality.

Sulzer Chemtech's SMR is ideal for the manufacture of resins, adhesives and sealants. This solution prevents the product stream maldistribution issue that can occur over different parallel tubes in conventional multitube designs, which could practically freeze tubes and their contents.

By using a single cooling duct, our technology eliminates the possibility of having a higher flow resistance in one of the tubes, which could lead to excessive cooling of the product and higher mean integrated viscosity in a particular tube. By preventing this, the SMR can also optimize residence time and pressure drop.

Moreover, the absence of parallel channels in the SMR makes in-line cleaning with solvents easier, despite the high product viscosity. Therefore, it is possible to maximize equipment uptime.



Food and beverage

Preventing the degradation of key ingredients during processing is a must for the food industry. The SMR is the ideal solution to overcome these challenges and deliver delicious, quality products with a high nutritional value.

By leveraging our SMR technology, food processors can take advantage of the low shear rate and uniform shear distribution, minimizing the risk of destroying the structure and texture of the products. You can also benefit from homogeneous residence time distribution, ensuring consistency in the product's critical quality attributes, such as color and flavor. These elements are even more important when sterilizing foods, as each part of the batch should reach the necessary temperature with an extremely narrow tolerance band.

In addition, the SMR is compatible with clean-in-place (CIP), wash-in-place (WIP) and sterilization-in-place (SIP) requirements. The system can also be designed with removable components to support accessibility and inspections.



Comprehensive engineering services markets

Development and technology

Sulzer makes every effort to support our customers and continuously improve our design tools. Engineers in the R&D lab develop new and improved products, analyze and optimize processes.

We maintain close relationships with universities and independent research organizations to support these efforts.

Engineering and manufacturing

Sulzer has a long-standing manufacturing tradition. Sulzer owns dedicated factories in every region to produce mixers, columns, reactors, and heat exchangers.

For certain sizes and certain countries, we work with well-known and proven subcontractors who are bound by Sulzer manufacturing policies and quality standards.

Capabilities

Manufacturing according to PED 2014/68/EU, ASME VIII Div.1, and ASME B31.3/U-Stamp, Gost (TR), China Stamp, Norsok, or NACE

Design codes acc. to AD2000, EN 13445, ASME Broad selection of material for construction available

Non-destructive testing (LPT, X-ray, pressure testing up to 500 bar, PMI, MT, UT etc. acc. EN and ASME)

Designing with SolidWorks

Strength calculations, FEM analysis, nozzle loads etc.

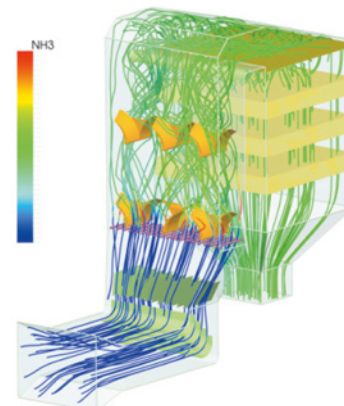
Certification for ISO 9001, ISO 14001 and ISO 18001

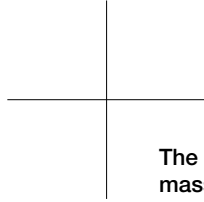
Experienced project management team



CFD Analysis

CFD calculations done in advance of fabrication can support the decision to go for a particular technology, and can save on the time required for commissioning and testing later. Sulzer uses CFD technology both for the modeling of existing and the development of new products.





The Sulzer Chemtech division is the global market leader in innovative mass transfer, static mixing and polymer solutions for petrochemicals, refining and LNG.

Chemtech is also leading the way in ecological solutions such as biopolymers as well as textile and plastic recycling, contributing to a circular economy. Our product offering ranges from technology licensing to process components all the way to complete separation process plants. Customer support ranges from engineering and field services to tray and packing installation, tower maintenance, welding and plant turnaround projects – ensuring minimal downtime.

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