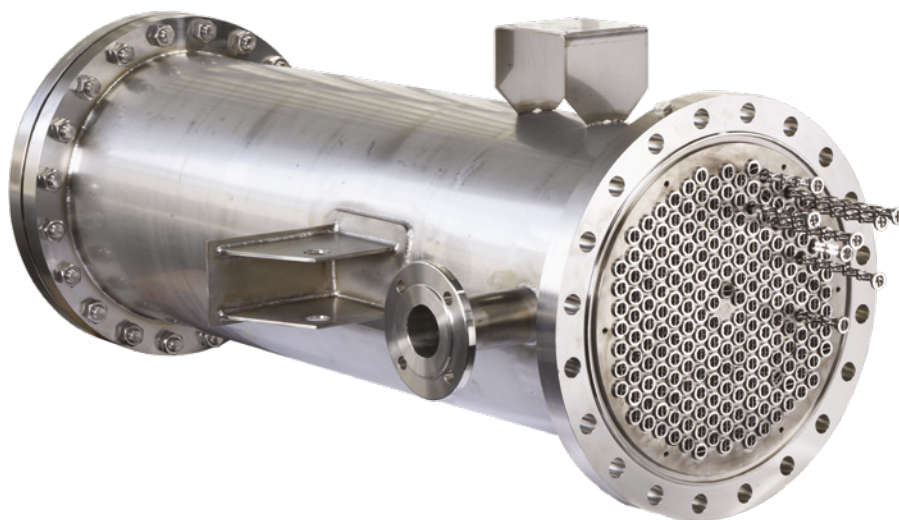


SULZER

Sulzer Chemtech

Heat exchanger SMXL™

Unique integrated
technology features
high heat transfer



Sulzer Chemtech - Heat transfer technology

The SMXL™ monotube heat exchanger is the simplest version of a static mixer / heat exchanger. It can be used as a heat exchanger or reactor for applications requiring continuous mixing. The result is significantly increased heat transfer and a narrow residence time distribution.

In addition to the monotube SMXL, we also offer a multitube mixer-heat exchanger, which improves heating or cooling of viscous media at high throughputs. It is the perfect alternative when the volume becomes too big to be handled in a monotube.

Since the early 1970s, Sulzer Chemtech has pioneered static mixing, heat and mass transfer and reaction technology. Our solutions are backed by the experience of more than 300'000 references and the latest methods in development, client testing, engineering and fabrication to meet the processing challenges of our customers and create long term benefits.

SMXL advantages

- High heat transfer coefficient (in general more than 4-10 times better than that of an empty pipe)
- Uniform temperature and concentration distribution
- High degree of plug flow Bo-Number >100/m
- Gentle treatment due to short residence time
- Low shear rate and pressure drop
- Quick change from one product grade to another
- Switching batch operation to continuous process
- Self-cleaning behavior
- Mixing rods fixed or removable
- Reduce energy consumption

Design features

The Sulzer SMXL mixer is a low intensity design applied whenever a continuous mixing action over a relatively long pipe section is required with low pressure drop. Typical application is heat transfer enhancement when installed as internals in mono-tube and multi-tube heat exchangers and plug flow reactors. Proprietary manufacturing methods enable production of long lengths at low cost relative to other designs.



Principle of the SMR mixer reactor

Features and benefits

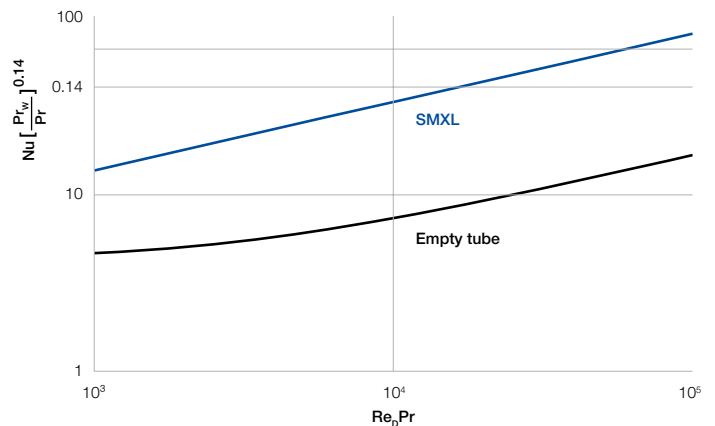
Sulzer SMXL heat exchanger internals

Monotube key characteristics

The product stream flows through the inner pipe. The heat carrier medium for cooling or heating the product circulates between the inner and outer pipe. The inner pipe through which the product flows is filled with static mixing elements, creating a radial mixing effect. The result is considerably increased heat transfer and a narrow residence time distribution. A continuous renewal of the thermal boundary layer on the piping wall prevents thermal damage of heat-sensitive products.

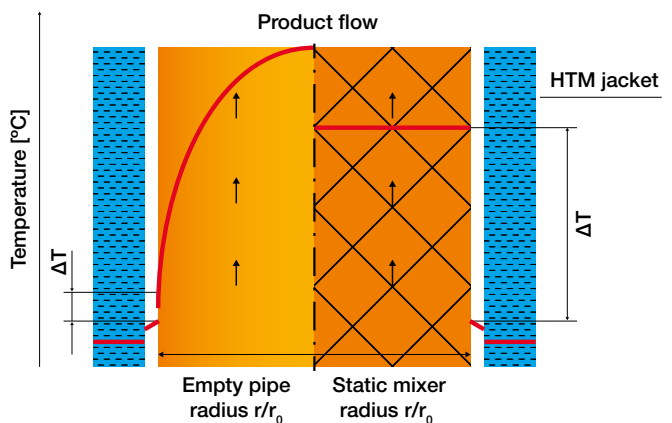
Performance

The heat transfer capacity is high (see figure on left) as a result of a high heat transfer coefficient and a large process side heat transfer surface area in relation to the operating volume (30 to 150 m²/m³). Scale-up is safe and allows a confident transfer of pilot test data to industrial operation. The operational advantages of the Sulzer mixers are retained: high void fraction, low pressure drop and hence low energy consumption, no moving parts leads to minimal maintenance cost. Also, temperature deviations are evened out by intensive radial mixing in static mixers.



Applications

- For pilot units or small industrial plants for cooling, heating, and temperature-controlled reaction applications.
- The flow is often laminar or the products to be handled are of medium or high viscosity, However it has been proven that also processing low viscose media show major improvements and advantages
- Mainly for heating, sterilizing and cooling applications
- Especially for heat-sensitive and/or viscous products
- Uniform tempering of adhesives to adjust the optimum viscosity for processing
- Controlling the viscosity of sealing fluids on robot-controlled plants



Temperature Profile - Empty pipe vs. SMXL

Specifications

Monotube and multitube heat exchanger

Features and benefits

- Excellent mixing and flow characteristics (plug flow with low shear)
- Narrow residence time distribution
- Excellent in-line cleaning and sterilization ability
- Reduced wall effects prevent overheating
- High selectivity for desired product
- Modular design for flexible operation



Applications

- Plug flow reactor for homogenous or dispersed-liquids systems
- Carrying out chemical reactions at controlled temperature e.g sulphonations, nitration, saponifications, diazotizations or polymerizations.
- Loop systems, plug flow systems or combination of both.

Key characteristics

Tube diameters	in general DN 6 – DN 32
Length	up to 6 meters
Standard material	stainless steel
Design pressure	up to 250 bar
Design temperature	up to 350 °C

Different values upon request

Multitube key characteristics

The mainstream is divided into several partial pipe streams with the same operation mode as the monotube design. In contrast to a monotube heat exchanger, the SMXL Multitube heat exchanger has no restrictions with regards to product throughput or heat to be transferred.

The multitube mixer heat exchanger type SMXL is used mainly for heating and partly for cooling applications especially for heat-sensitive and/or viscous products. A special application is preheating of a polymer solution, where part of the product starts to evaporate already in the heat exchanger, for example prior to entering the devolatilization vessel.



Design features

Chemical Industry

Homogeneous and disperse plug flow reactors reactions.

With the various Sulzer mixing elements, it is possible to have reactions within a narrow residence time distribution and with a maximum possible driving force.

The plug flow behavior can be achieved in a laminar or transitional flow regime as well as in a homogeneous and dispersed phase.

Personal care products

Features and benefits

- Predictable performance, constant over time
- Reliable scale-up
- Turndown capability

Applications

- Cooling in processing loops and prior to packaging
 - Heating viscous feed stocks between storage and processing
 - Maintaining temperature to control viscosity
-

Pharmaceutical and Biotech

Features and benefits

- Sanitary design, kilolab to commercial scale
- Precise temperature control
- Plug flow characteristics
- Higher selectivity of product

Applications

- Temperature control – heating and cooling with single and multiphase fluids
 - Control of exotherms
 - Gentle tempering of the pharmaceutical pastes in front of the tube filling stations
-

Reactive resins, adhesives, sealants, paint and coatings

Features and benefits

- Temperature control for process and packaging
 - Cooling in high energy dissipation process loops
 - Post reactor cooling prior to packaging
 - Heating and cooling on roll coating lines
 - Devolatilization to remove solvents and excess monomers
 - Adjusting the viscosity of adhesives to obtain a uniform sheet thickness during processing
 - Stopping the chemical reaction of reactive resins by lowering the temperature
-

Design features

Food processing industry

Static mixers and heat exchangers have been used in the food industry for over 30 years. The Sulzer SMXL mixer heat exchangers are well suited for cooling, heating or sterilization of food products.

The SMXL offers an outstanding mixing performance combined with excellent cleaning and sterilization abilities, an essential requirement for continuous food processes. They are used in various branches in the food industry.

Features and benefits

- Cleaning in place (CIP) design features
- Cost effective, compact and energy efficient

Applications

- Cooling of chocolate, creams, fillers, butter, sauces, or sweet/marzipan masses
- Heating of dough before extrusion
- Heating of coffee extract
- Tempering of chocolate
- Re-melting of chocolate after crystallization
- Crystallization of caramel
- Sterilization of vegetable or fruit concentrates
- Sterilization of creams, curds etc.
- Devolatilization of syrups for coating



Polymer industry

Handling of highly viscous melt is often one of the key tasks in the polymer production industry.

Features and benefits

- Reduce Degradation
- Lowest residual Volatile Contents
- High polymer conversion

Applications

- Cooling polymer melts and solutions
- Dissolving polymer particles in solvent for producing adhesives
- Increasing conversion and/or throughput in continuous bulk polymerization
- Polymerizing styrene, acrylates etc
- Polymerizing different monomers to copolymers

Batch to continuous

Features and benefits

- Simpler process control leading to more constant product quality
- Smaller reactor volume
- Simple automation
- Reduced risk potential

Applications

- Chemicals
- Health Care
- Pharmaceuticals and Bio-Tech
- Food Processing
- Paints

Benefits of applying mixers for heat transfer

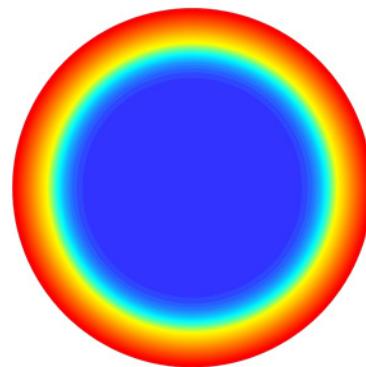
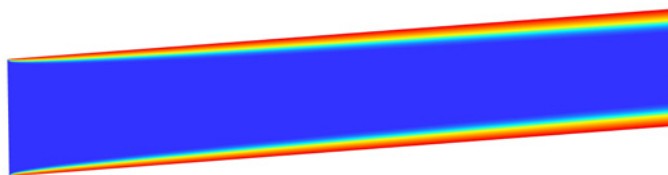
Visualization by CFD

Below pictures show an empty heat exchanger tube vs. a tube filled with mixing elements. In the empty tube the temperature gradient is very high and heat layers at the pipe wall can lead to burnt or deteriorated product.

In the tube with mixing elements, temperature is equalized over the whole cross section, nearly without any hot spots and so product quality remains on a high level while exchanging heat.

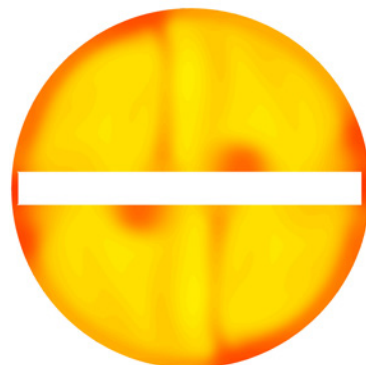
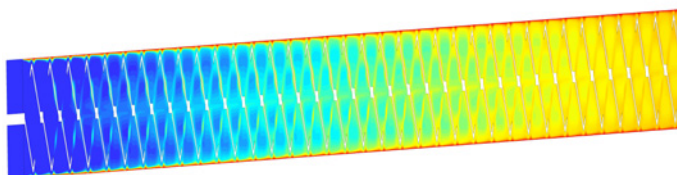
A. Empty Tube

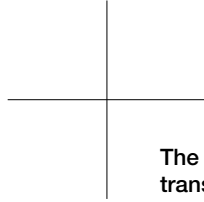
*Hot wall layers are damaging the product



Temperature profile
A. *Empty Tube
B. SMXL

B. SMXL





The 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 bio-polymers 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.

E10888 en 1.2024, Copyright © Sulzer Ltd 2024

This brochure is a general presentation. It does not provide any warranty or guarantee of any kind. Please, contact us for a description of the warranties and guarantees offered with our products. Directions for use and safety will be given separately. All information herein is subject to change without notice.

