Heat Exchangers

Custom designed & constructed to save energy

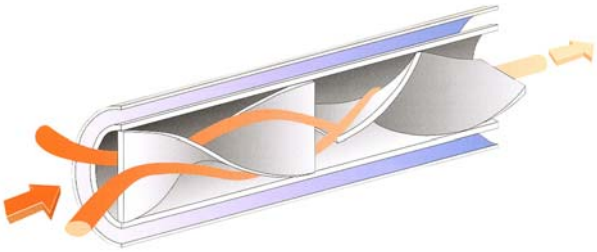
euromixers PRIMIX

Brochure E-0502

Heat Exchanger Principal

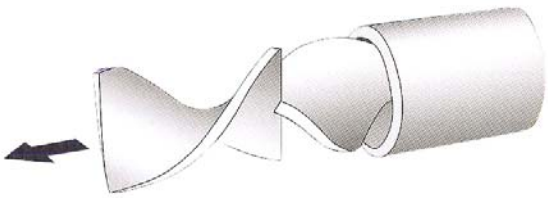
Advanced design and construction technology of the Primix spiral shaped mixer elements and process tube results in a 20 – 100% better heat transfer in comparison to conventional heat exchangers.

Highly efficient heat transfer is achieved due to the increased radial then linear velocity and connection technology between the process tube and mixer elements which act as an additional heat transfer area.

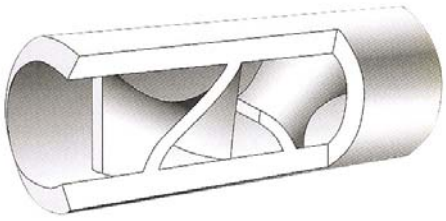


The same advanced technology is applied to meet clients specific needs, all Euromixers Primixer heat exchangers are designed and constructed to Stoomwezen, ASME or other appropriate design codes.

Design Features.



Rapid refreshment - Increased radial than linear velocity, generated by the spiral-shaped mixer elements creates a rapid refreshment and mixing of product at the inner wall of the process tube.



Highly efficient heat transfer - Advanced connection technology between process tube and mixer elements results in a heat exchange transfer rate equal to the base material of the process tube and mixer elements, each spiral shaped mixer element acts as additional heat transfer area, resulting in a 20 – 100% improvement in heat transfer compared to conventional heat exchangers.

Applications

- General chemicals – agri-chemicals, paint, slurries.
- Polymers – polyesters, nylons, ethylenes, silicones adhesives, sealants
- Food & Beverages - sauces, chocolates, dairy products, salad dressing, sugar syrups.
- Energy – petrochemicals, fuel oil
- Pulp & Paper – kraft soaps, black liquor, oils.
- Waste water treatment applications

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Reliability & Performance

Compared to other types of heat exchanger the Primixer static mixer heat exchangers have a considerable advantages by reducing temperature differential over the cross sectional area of the process tubes, resulting in uniform product quality and a broad acceptance for heat exchange applications with higher viscosity process media .

Pumping problems can occur as a result of the relatively high pressure drop through heat exchangers, to resolve this problem Primixer Heat Exchangers utilises a number of process tubes placed in parallel resulting in low-pressure drop at equal heat exchange capacity the performance of a parallel system improves with product viscosities over 400 Pa.s and capacities higher than 1,000 kg/hr. The inlet manifold design ensures a smooth product flow without any dead spots.

The high operational reliability of static mixers and heat exchangers has proved invaluable in a number of crucial applications in the chemical, petrochemical, pharmaceutical and food industry's.

Food Industry Applications – Brief case studies.

Improved C.I.P cleaning.

Within the food, beverages and pharmaceutical industry's effective C.I.P. cleaning, smooth and /or polished surfaces and sanitary connections are of major importance to maintain a sterile environment.
The use of static mixer elements leads to considerably better cleaning compared to an empty pipe due to the forced refreshment and higher cleaning fluid velocities at the inner wall of the process pipe.

Cooling of chocolate spread (identical to the cooling process of peanut butter and hazelnut spread)

Product temperature reduction from 50 to 30°C using glycol at approximately 5°c
Laboratory scale tests with a 15mm tube can be scaled to 100 l/hr resulting in 5 m3/hr production.

Re-working Margarine.

On a number of installations in Europe Heat Exchangers are installed in the feed pipeline to the packing installation, a small quantity of product is fed back to the storage tank. In this way the installation is maintained in stand-by mode.
In the event of a sudden drop out of the down stream packing installation, the full flow of margarine (6°C) is fed to the rework installation, heated up to liquid phase and fed back to the up stream storage tank.

Pasteurisation and cooling of sauces

Oil, water and starch, either mixed or separated can be pasteurised using a steam heated jacket. The temperature hold phase can be reduced by one third of the time required in conventional processes due to the turbulence created by the static mixer, which ensures a uniform temperature throughout the product.

Cooling down to packing temperature takes place using cold water. The system is closed to the atmosphere, easy to sterilize and C.I.P. clean.

Pasteurisation of slaughterhouse waste.

Liquid slaughterhouse waste is a valuable by-product due to its high content of protein, fat and minerals, the product is temperature treated after separating the larger particles.
The process operates continuously and incorporates an automatic C.I.P. cleaning system.
Further developments are taking place reach sterilization temperatures during this process.

Pasteurisation of concentrated fruit

The product is heated-up quickly, using steam at low temperature, from a Euromixers – Primix steam cooler, efficient mixing with the static mixer elements results in a compact design.
Cooling to room temperature takes place before product packaging under sterile conditions.

Polymer chemistry

Within this application area, where high viscosities, process pressures and temperatures are typical, a number of elements adversely effecting heat transfer are important

- Thick process pipe walls due to the high process pressures.
- Low heat transfer coefficients of the polymer.
- Laminar flow as a result of high product viscosities.
- Small acceptable mean temperature differences, as result of the strong dependence of viscosity on temperature.

During the development stage of the static mixer heat exchanger, special attention was paid to the technology for the connection between process tube and static mixer element. The high vacuum braze connection is not an amorphous layer of material, but forms as a result of the applied braze material together with the base material one piece of identical material. The heat transfer resistance of the connection material is equal to that of process pipe and mixer element.
Mechanical strength is about 70% of the base material, this connection method's advantage is that the surface of each mixer element will be acting as additional heat transfer area, which results, as compared to conventional heat exchangers, in a smaller design at equal heat exchange capacity.

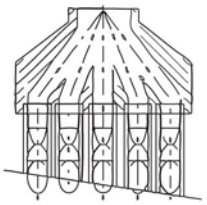
Brazed elements improve the capacity by a factor 10.

Improved heat transfer, reduced residence time is of major importance. During the cooling process, the polymer flow reacts as well and polymer flowing through the system at a longer residence time than foreseen can harm the product quality. To solve this problem a unique manifold design has been developed which produces a perfect spread of product over the process tubes, dead spots are completely eliminated. Product side's inner walls are finished at a roughness better than 0,5 micron.

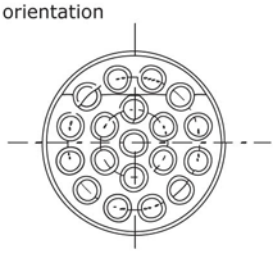
Cooling is achieved by a counter current flow of thermal oil, flowing around the polymer containing process tubes. Flow reversing partition plates create an optimal contact between oil and process tube.
The above-described design has resulted in a heat exchanger that due to its relative small measurements - can be applied economically for cooling of high viscous products. It has almost ideal plug-flow characteristics.

The design is recognized as standard in the polymer industry.

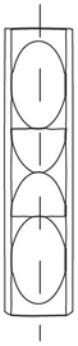
Manifold



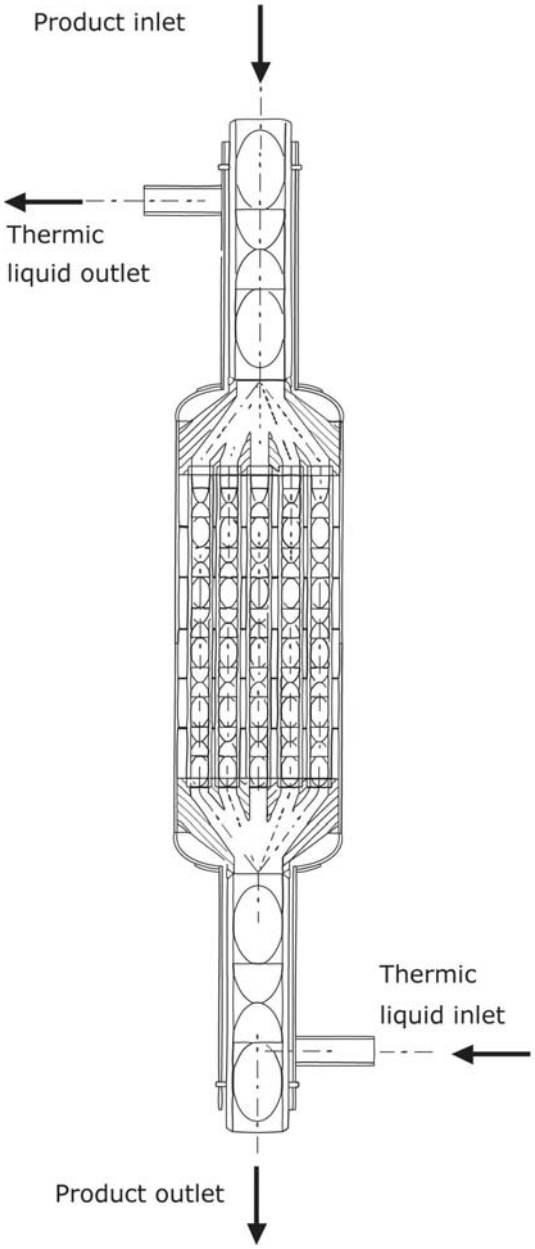
Tube orientation



Outlet mixer



Heat exchanger section showing the inlet manifold and tube configuration.



Chemical Industry

Within this application area, figures of major importance are pressure drop, residence time, plug-flow, corrosion and heat transfer our application engineers will be pleased to help with your application and have available calculation programs, partly based on empirical data, in which all of these parameters are variables and can be set independently.

For information on Euromixers-Primix Heat Exchangers, or technical assistance evaluating your application please call or email – we will be pleased to help.

References

Dow
Shell BP Exxon
Uniliver
Akzo Nobel
DSM
Krupp Uhde
Barmag
Lurgi Zimmer
Inventa-Fischer
Quaker Chemical
Bayer
BASF
Hoechst
Philips
Gist-brocades

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