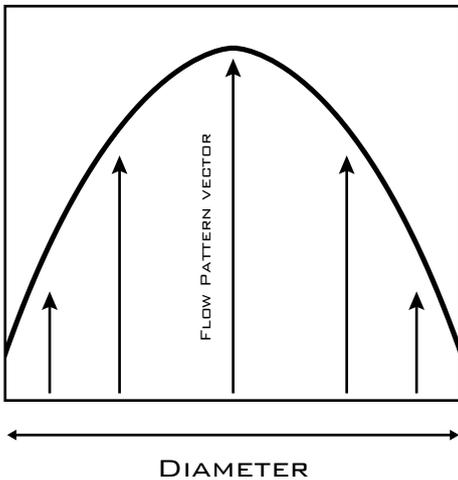


**HEAT TRANSFER
IN LAMINAR FLOW PATTERN**

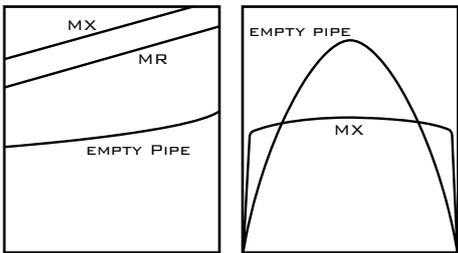


Problem | Based on high friction forces between the pipe inside surface and the first product layers the velocity tends to zero. In the middle of the pipe the velocity increases due an constant through-put capacity. To the middle of the pipe the heat (cool) capacity will be conducted shift by shift. The results are high temperature differences over the crossection of the material with the corresponding viscosity difference.

Heating | The laminar velocity profile results poor heat transfer efficiency due to stagnation phases inside the heat exchanger. Producing of hot spots. Poor product quality.

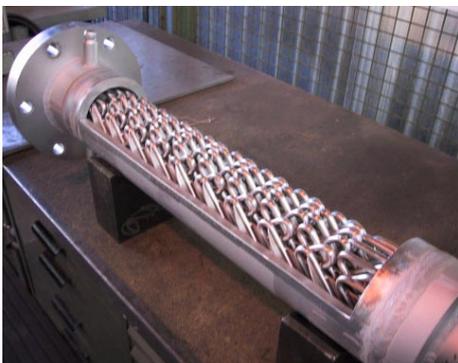
Cooling | The high viscous layer block the low parts of the product due to viscous forces. A multitube HE will be blocked due to mal distribution.

TECHNICAL SOLUTION



Heat distribution in SMX-Structure | The MR heat exchanger geometry consist of a structure of crossing intermeshing pipes which are installed into the flow channel and do mix, cool or heat the high viscous product at the same time. The tubes will be flushed by the service fluid (mostly thermal oil, water or steam) from a chamber. The product flows through these bundles.

The flow is continuously split, stretched, recombined and conveyed. Forced convection and temperature equalization across the tube section are reflected in a rate of heat transfer which is 4 – 10 times higher than in an empty pipe. Additionally these technology allows high throughput capa-cities with low pressure drop.



BENEFITS

- Tube bundles are both: Mixing elements and active heat transfer surface, therefore high heat transfer coefficients. 4-10 times higher as in an empty pipe.
- High heat transfer capacities with single flow channel – no maldistribution.
- High degree of plug flow, therefore uniform time, temperature and shear history.
- Very low pressure drop
- 100 % scale-up capability (scale up of test data is accurate, ratio 1:100)
- Large process side volumetric heat transfer area of 90 – 150 m² area /m³ heat exchanger