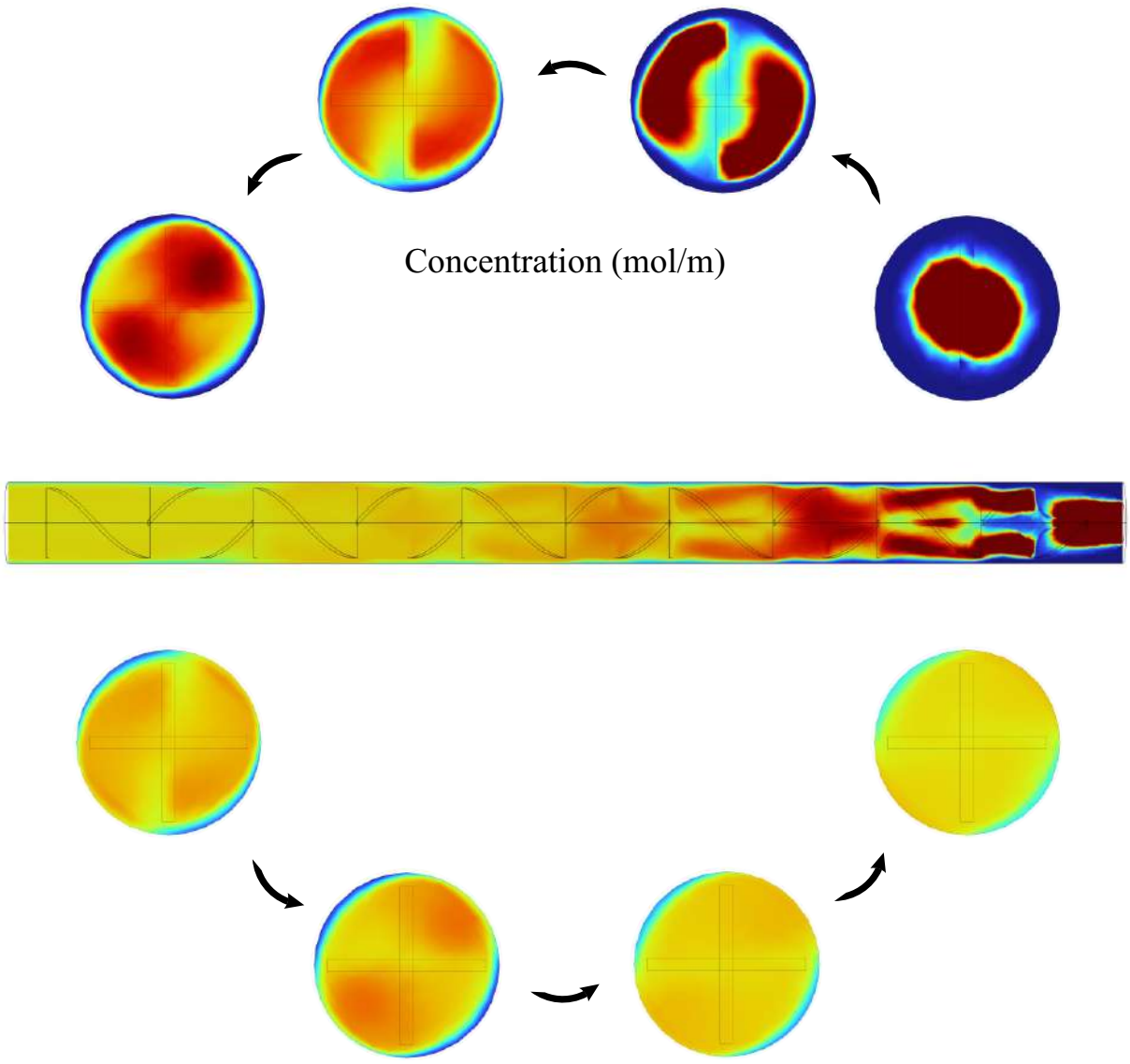
Introduction to Static Mixers



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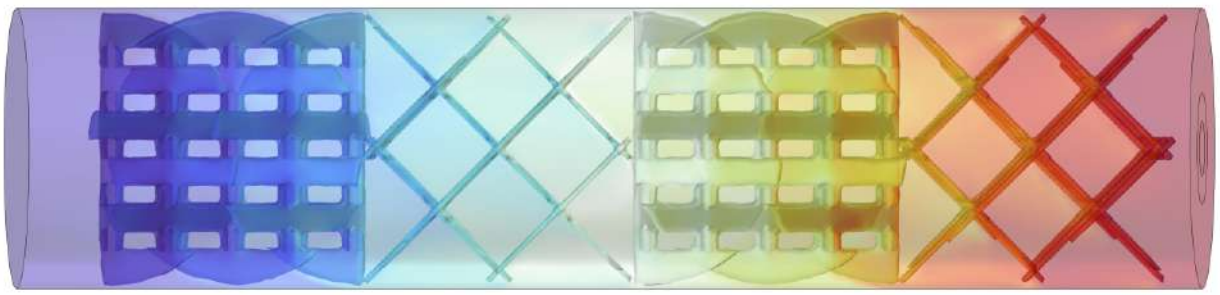
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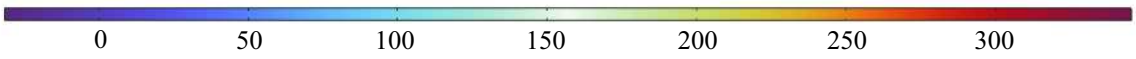
Static Mixers

In process engineering, static systems are defined in contrast to dynamic systems.

In mixing technology, static mixers are devices in which the mixing elements remain completely stationary, while the fluid passes through them driven solely by its own flow energy, resulting in efficient mixing and homogenization.

The required energy is provided by the pressure drop generated along the mixer. Depending on design and operating conditions, this pressure drop may range from a few millibars (mbar) to several tens of bars (bar).





Pressure (mbar)

In many industries, mixing operations are conventionally carried out in vessels, reactors, and tanks. However, in certain applications, mixing and even chemical reactions can take place within pipelines, effectively allowing the pipeline to function as a reactor under specific conditions.

In such cases, static mixers provide a highly efficient and cost-effective solution for chemical processing. This is particularly important in applications requiring rapid mixing and low residence time, such as molten polymer processes where time directly influences final product properties.

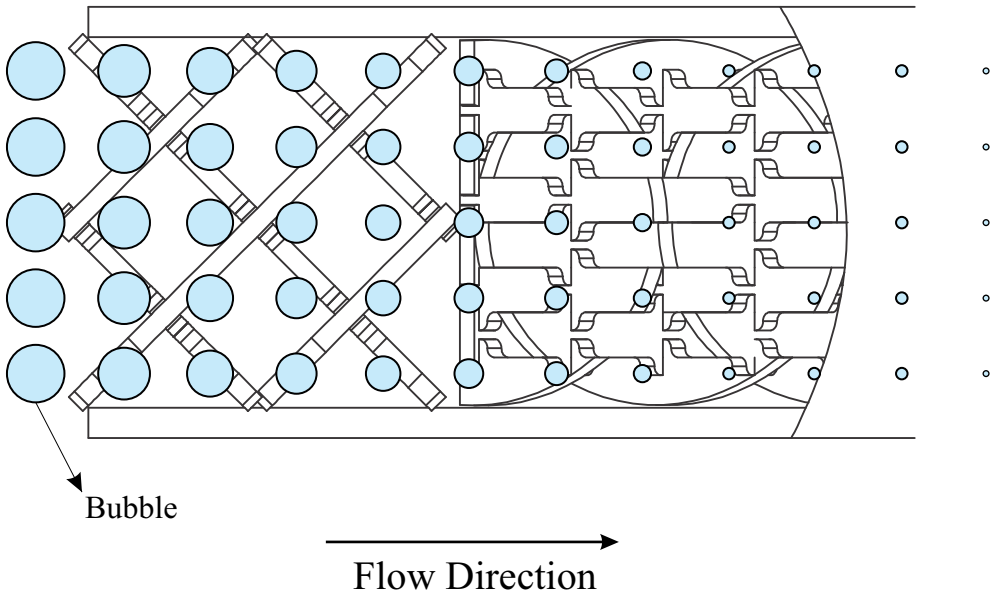
Key Applications of Static Mixers:

- **Continuous processes.** Static mixers are widely used in continuous mixing operations such as chlorine-water blending. In these applications, both streams enter the mixer simultaneously, resulting in a fully homogeneous outlet mixture..

- **Vacuum applications.** In processes such as paint and adhesive production, mixing must be performed in the absence of oxygen or other unwanted gases. Static mixers ensure stable and uniform mixing under such conditions.

- **Plug flow generation.** In heat transfer applications involving high-viscosity fluids, static mixers promote plug flow behavior and eliminate back mixing. This significantly improves heat transfer efficiency and reduces mixing time.

- **Gas–liquid processes.** In gas-related chemical processes such as carbonated beverage production, carbon dioxide is uniformly dispersed into the liquid phase, resulting in a stable and homogeneous solution.



Key Applications of Static Mixers

- **High-pressure processes.** Static mixers are used in high-pressure applications such as blending different polyethylene grades in pipe production industries. Operating pressures in these processes can reach several hundred bar, while maintaining stable and uniform mixing performance.

- **Space-limited applications.** In processes such as crude oil sweetening, mixing of crude oil and sulfuric acid is carried out in pipelines at large capacities. Performing such operations in tanks would require significant space and equipment volume. Static mixers provide a compact and cost-effective solution.

- **Highly corrosive processes.** In chemical industries such as sulfuric acid production, high temperatures and aggressive chemical environments significantly increase corrosion rates. The use of polymeric or corrosion-resistant static mixers enables efficient mixing without corrosion issues and with extended service life.

