Side Entry Mixers



Power Transmission Solutions

PTS Process Engineering Co

Side Entry Mixers

These mixers, also known as Side Entry Mixers or horizontal mixers, are recognized as one of the most efficient and cost-effective solutions in various industries due to their short shaft design, high rotational speed, and high-efficiency axial flow impellers.

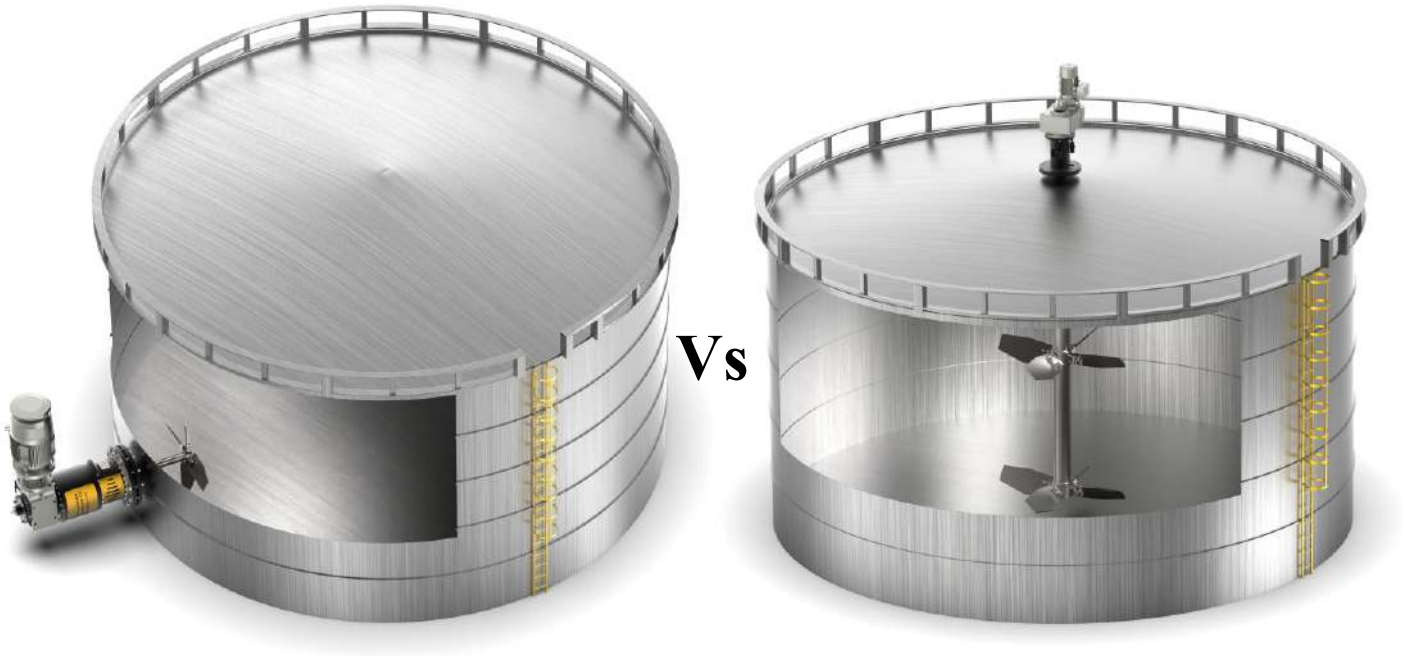


Side Entry Mixers

Side Entry Mixers are mainly used in applications requiring mixing in very large storage tanks.

1-Very Large Tanks

In many industries, particularly oil & gas, petrochemical, and food industries, storage tanks may reach diameters of up to 80 meters and heights of up to 20 meters. In such cases, the use of vertical agitators is associated with significant technical and economic limitations.



In these conditions, vertical mixing systems present the following challenges:

- **Large Impeller Diameter:**
  For optimal mixing, the impeller-to-tank diameter ratio is typically around 0.3, resulting in high inertia and increased power demand in large tanks.

- **Large shaft diameter and length:**
  Increased tank height leads to longer shafts, making deflection control and resonance avoidance more critical, often requiring larger shaft diameters or auxiliary bearings.

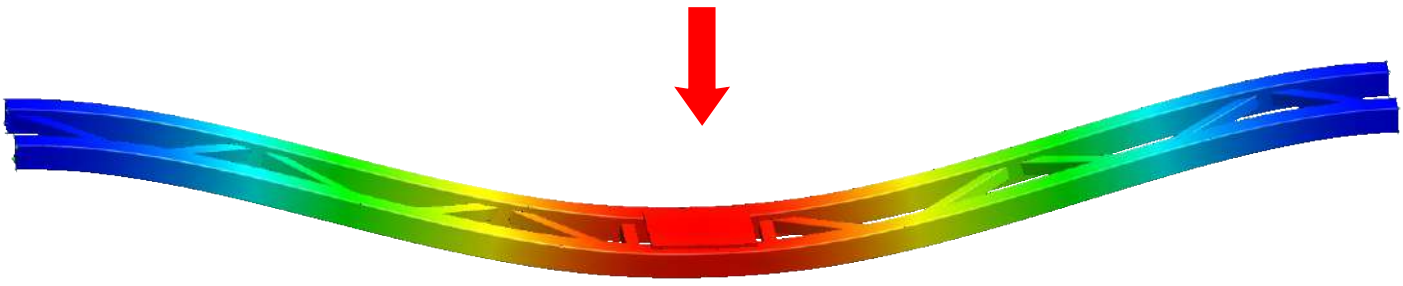
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- **Large Gearbox Size:**
  High torque at low speed operation results in the need for large and heavy gearboxes.



- **Large Supporting Structure on tank:**
  The combined weight of shaft, impeller, and gearbox requires heavy-duty supporting structures, increasing installation complexity and cost.

Accordingly, Side Entry Mixers represent an optimized, cost-effective, and engineered solution for large tank mixing applications.

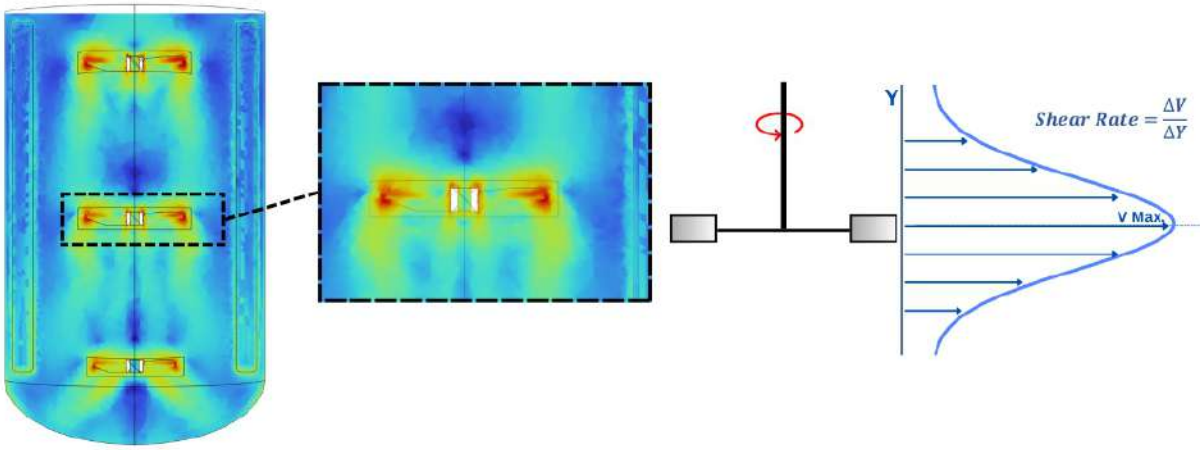


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2-Low Requirement for Shear Stresses

In many mixing processes, the application of shear forces is essential to accelerate the process or enable proper mixing, such as dissolving sugar in water where shear action helps break down particles and enhance dissolution. However, in processes such as fermentation, homogenization, or storage, the main objective is only to maintain uniformity within the tank contents, and high shear forces are not required.

In such applications, Side Entry Mixers represent a suitable, efficient, and cost-effective solution.



3-Suspension Process for Low Density Difference Materials

In crude oil refining industry, numerous storage tanks are operated where the main purpose of mixing is to prevent the settling of water and sludge (BS&W) inside the tank. Since the density difference between these phases and the main fluid is relatively low, Side Entry Mixers, due to their suitable hydrodynamic design, generate a uniform circulation within the tank and effectively prevent sedimentation at the tank bottom.



Main Components of Side Entry Mixers

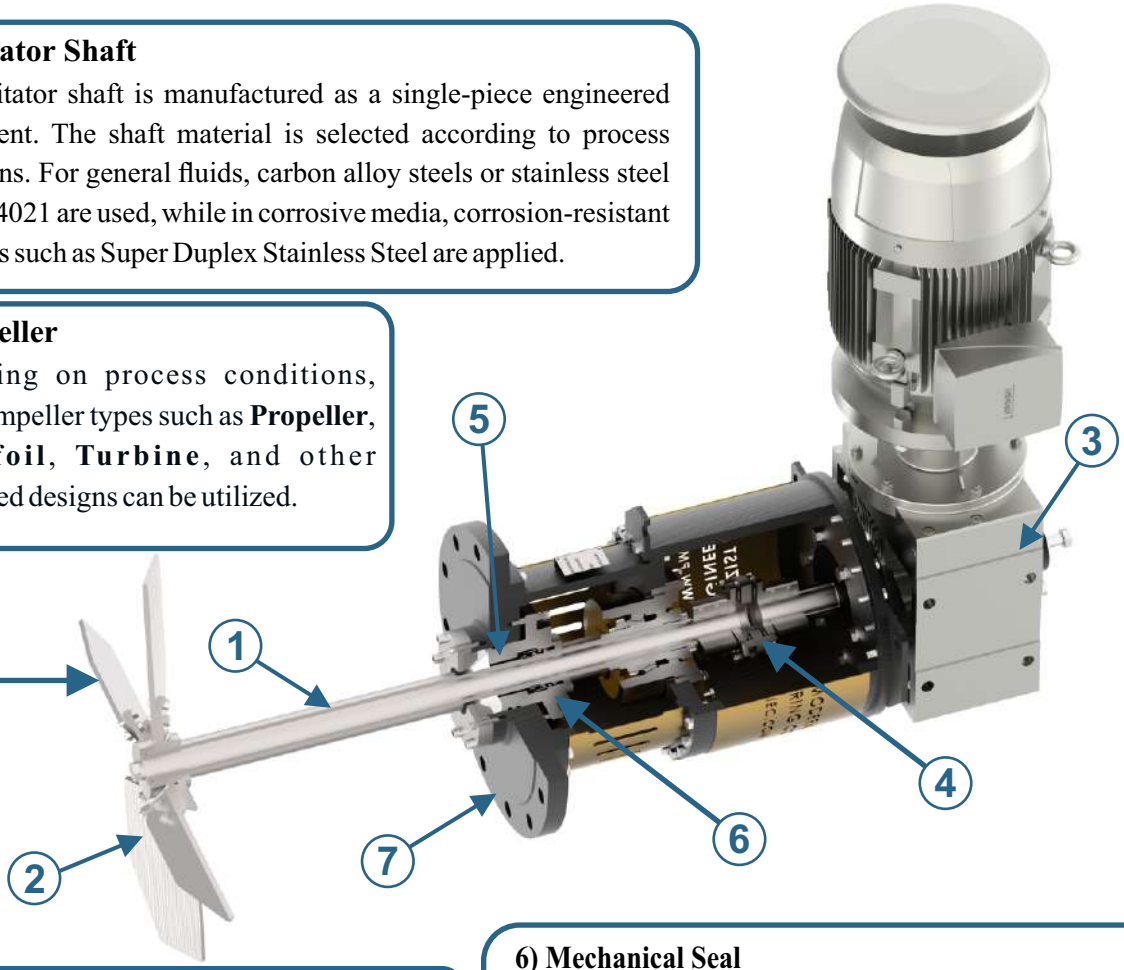


1) Agitator Shaft

The agitator shaft is manufactured as a single-piece engineered component. The shaft material is selected according to process conditions. For general fluids, carbon alloy steels or stainless steel grade 1.4021 are used, while in corrosive media, corrosion-resistant materials such as Super Duplex Stainless Steel are applied.

2) Impeller

Depending on process conditions, various impeller types such as **Propeller**, **Hydrofoil**, **Turbine**, and other specialized designs can be utilized.



3) Drive Unit

This section utilizes parallel shaft and bevel helical gearboxes to drive the mixing system.

4) Flexible Coupling

Flexible couplings are used to compensate for any geometric tolerance errors. This enhances the service life of both the gearbox and the mechanical seal.

5) Shut off Device

This mechanism allows maintenance and complete replacement of the mechanical seal while the tank remains full of process fluid and in operation (In-Service). This feature eliminates the need for process fluid draining and significantly reduces downtime and operational costs

6) Mechanical Seal

The mechanical seal used in Side Entry Mixer systems is a single mechanical seal, supplied by internationally recognized manufacturers such as John Crane (USA), Burgmann (Germany), and Fluiten (Italy).

For cooling and lubrication of the sealing system, various **API 682** standard plans can be applied. In cases where the process fluid contains suspended solids, is contaminated, operates at high temperature, or has abrasive properties, **API Plan 32** is required for flushing and cooling of the mechanical seal.

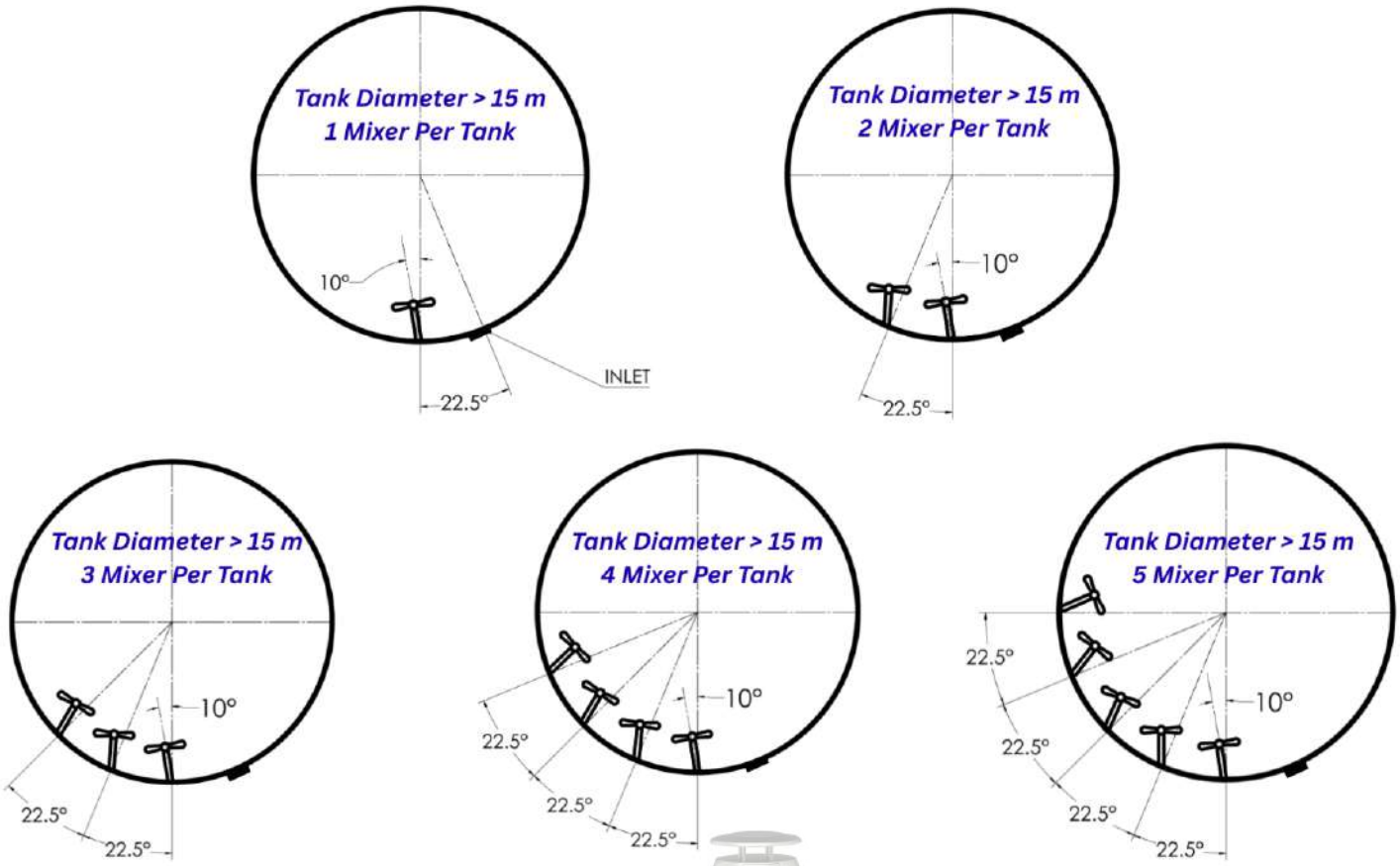
7) Mounting Flange

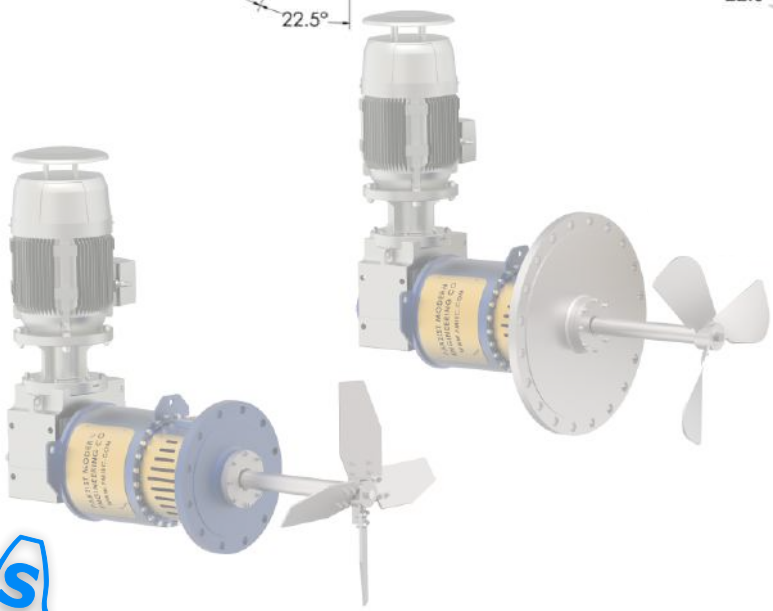
The design and manufacturing of the mixer mounting flange on the tank nozzle is performed in accordance with ASME B16.5 for sizes below 24 inches and **ASME B16.47 (Series A & B)** for sizes above 24 inches

Positioning of Side Entry Mixers

The arrangement and positioning of side entry mixers on the tank wall is a key parameter in achieving optimal system performance. The installation is designed according to tank geometry and specific angular positions.

Jet stream length and impeller **pumping capacity** are the main factors determining the required **number of mixers** for each tank.

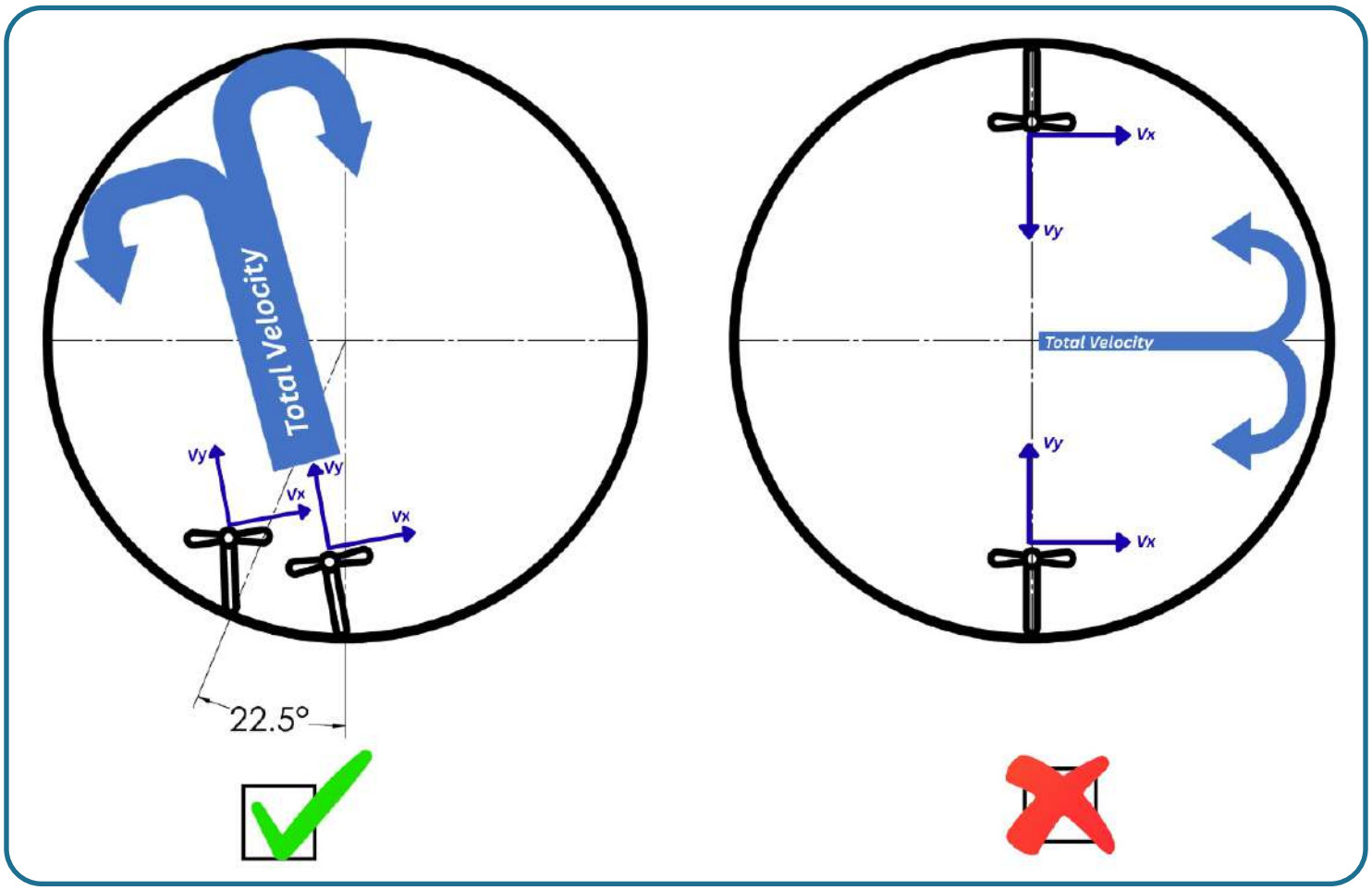




Positioning of Side Entry Mixers

As shown below, in the **optimized** side entry mixer arrangement (left image), two mixers are installed at a **22.5° angle relative to the tank radius**, resulting in aligned velocity vectors and a more effective resultant flow.

In contrast, in the **opposed arrangement** (right image), flow components cancel each other out, significantly reducing mixing efficiency.

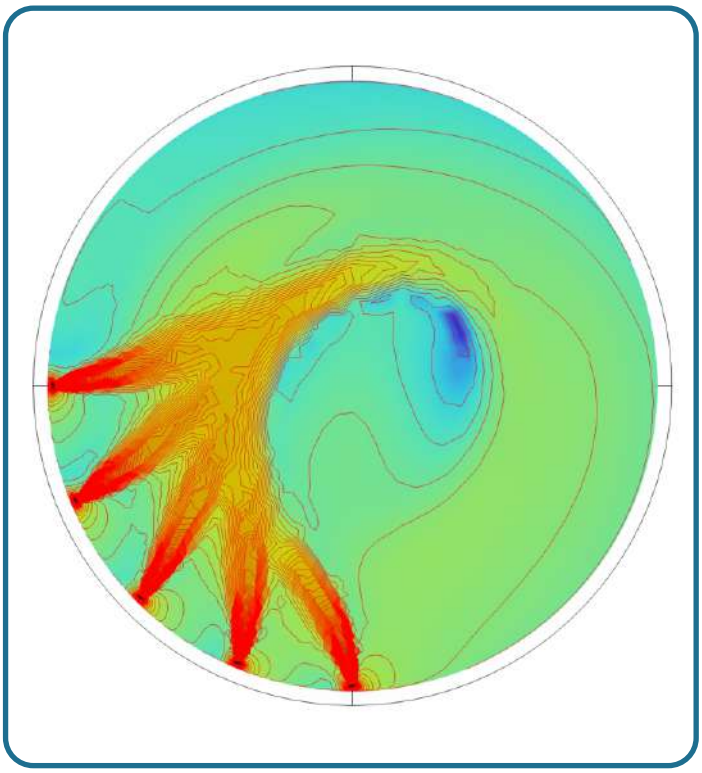


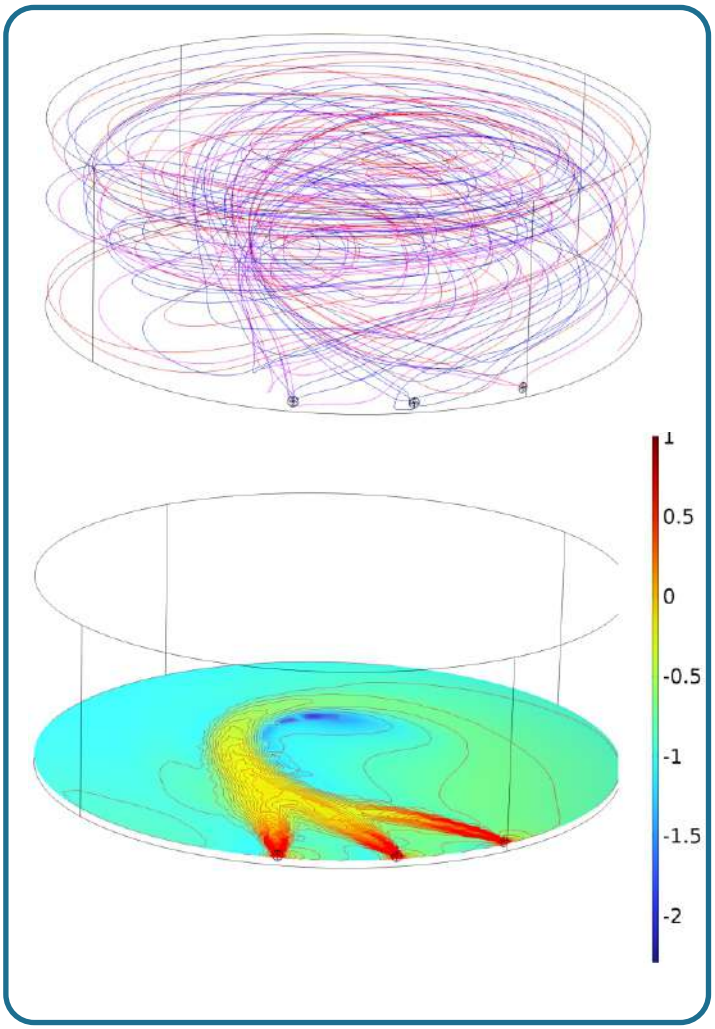


CFD Analysis

CFD simulations and analyses are performed specifically according to the process requirements and tank design, enabling the most optimized technical solution for the selection and design of side entry mixers.

These analyses provide a detailed 3D representation of fluid flow behavior and, by determining the optimal **number and orientation** of mixers, **eliminate dead zones** and ensure uniform mixing performance.



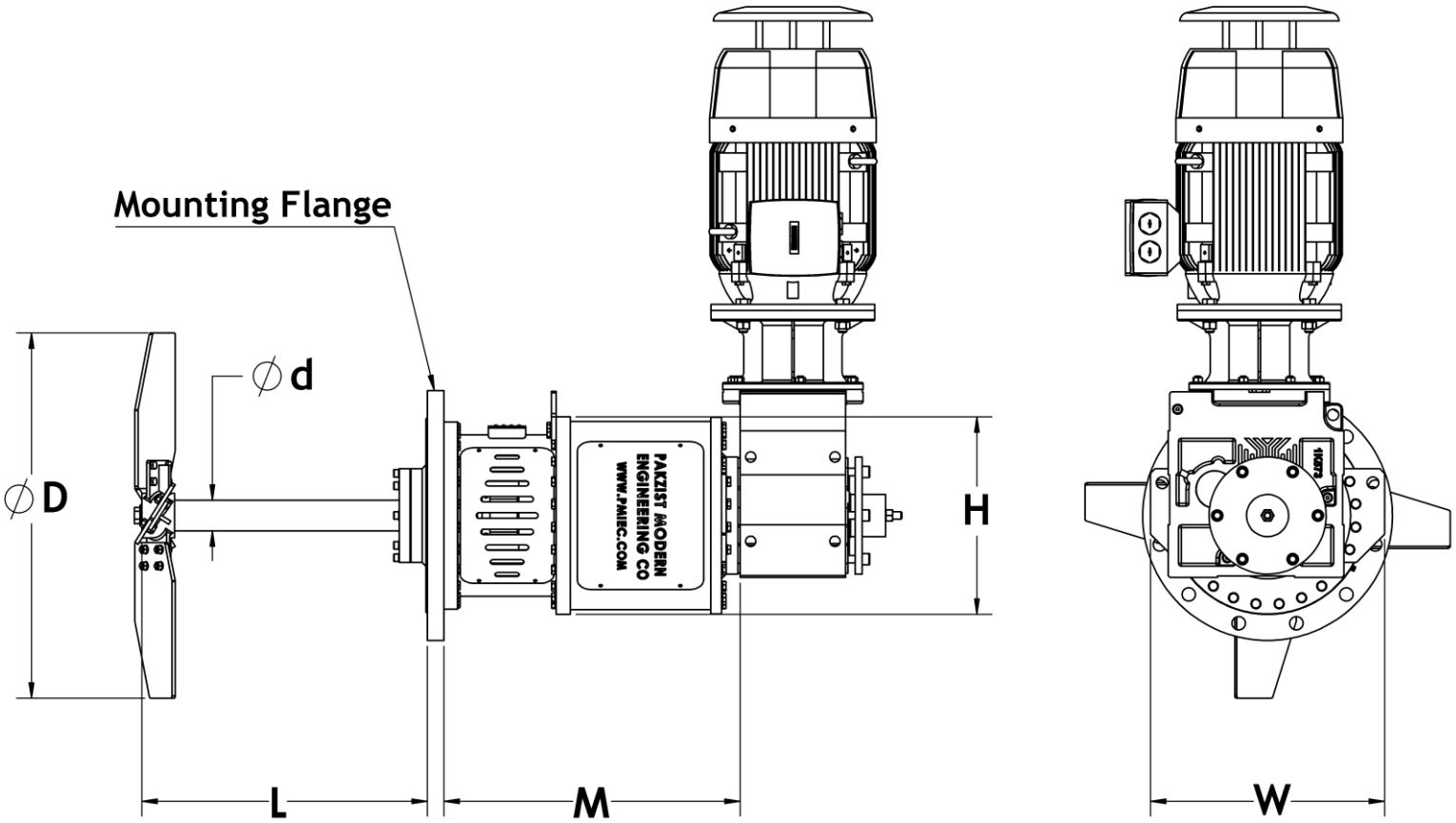


Standard Specifications of Side Entry Mixers

Side Entry mixers manufactured by this company utilize an **electric motor and industrial gearbox power transmission system**, ensuring stable operation with minimal vibration.

The use of a **geared transmission system** instead of belt and pulley drive results in higher efficiency, improved **durability**, and **easier maintenance**.

These industrial mixers are available in different models and **power ratings** depending on tank volume and process requirements



Standard Specifications of Side Entry Mixers

Category	Parameter	Symbol	SEMS	SEML
Dimensions and Mechanics	Impeller Diameter (mm)	ØD	400 ~ 800	400 ~ 800
	Shaft Length (mm)	L	400 ~ 1000	400 ~ 1000
	Overall Dimensions	MxWxH	628x500x422	688x600x505
	Shaft Diameter (mm)	Ød	65	80
	Impeller Material		SS 316L, Duplex and Super Duplex SS,CS	SS 316L, Duplex and Super Duplex SS,CS
	Mounting		Flanged	Flanged
	Angle		Fixed	Fixed
Performance	Motor Power (Kw)		5.5 ~ 22	30 ~ 55
	Speed (RPM)		200 ~ 400	200 ~ 400
	Torque (N.m)		Up to 720	Up to 1800
	Tank Turnover per Minutes		0.05 ~ 0.2	0.05 ~ 0.2
Operating Conditions	Max. Temperature (°C)		-20 ~ 55	-20 ~ 55
	Viscosity Range (cP)		Up to 1000	Up to 1000
	Max. Pressure (bar)		Up to 6	Up to 6
	Permitted Fluids		Crude oil, Fuel Oil (e.g. HFO, Diesel),Water Alcohols (e.g. Ethanol, Methanol), Wastewater or Effluent, Latex or Polymer Emulsions	
	Seal Type		Single Mechanical Seal	Single Mechanical Seal
	Maintenance lnterval		10,000 hr	10,000 hr