Mechanimix

REACTOR | RC-M Series

Professional Mixing Technology

Reactor Overview

The RC-M Series Reactor is an industrial-grade equipment designed to meet the needs of the high-demand chemical and pharmaceutical industries. With a capacity of up to 40,000 liters, this system is developed to operate reliably at pressures up to 6 bar and temperatures up to 200°C. Its robust structure, precise temperature control, and continuous mixing performance make it a reliable solution for large-scale production processes.

Reactors used for

- Chemical synthesis under controlled pressure and temperature
- Pharmaceutical formulation and intermediate production
- Polymerization and resin processing applications
- Food and beverage ingredient blending and heating

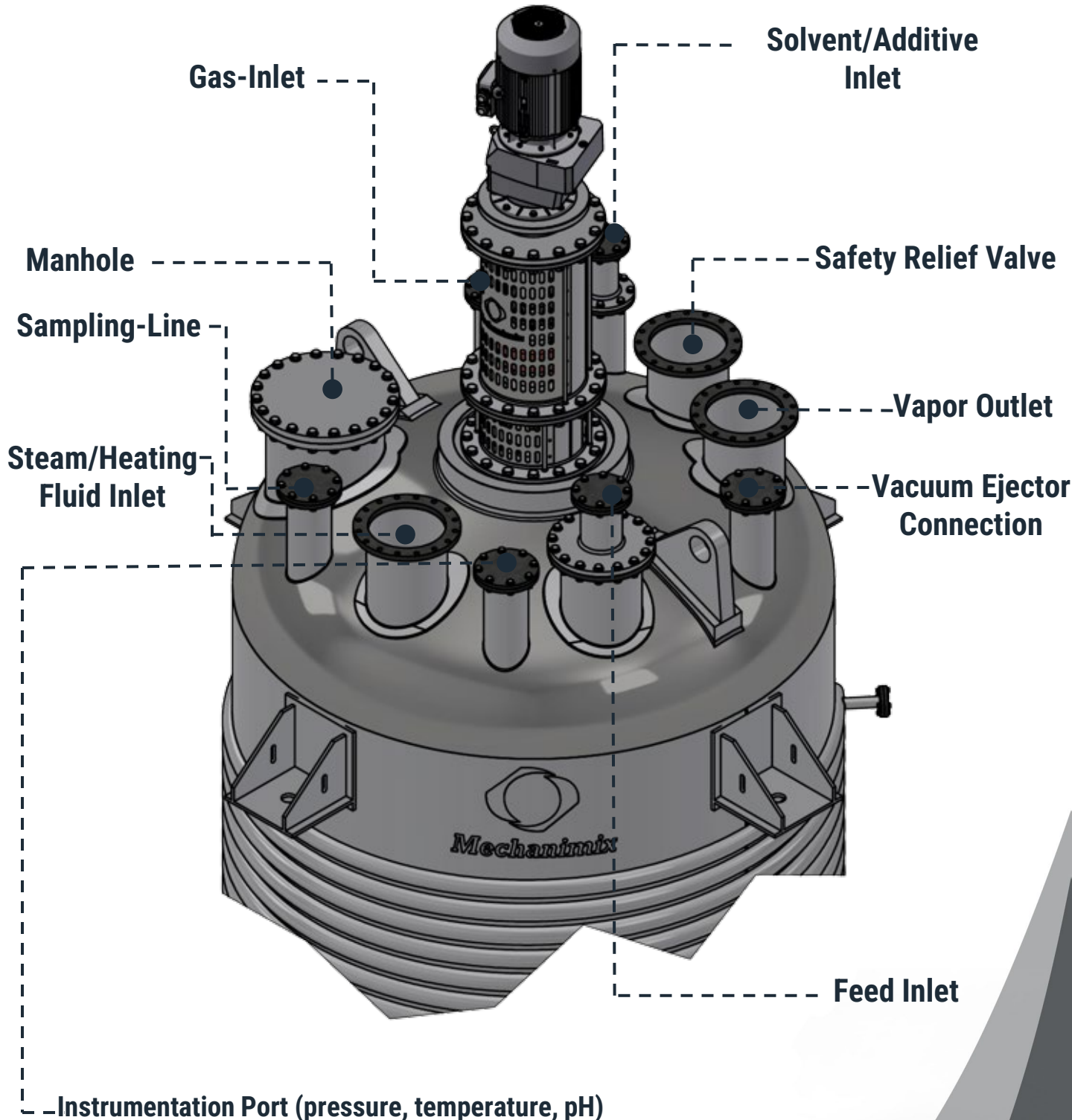
Capacity	630 – 40000 [L]
Design Pressure	-1 to +6 [bar(g)]
Mechanical seal	Single, Double and Triple Acting, Cartridge Types
Shaft diameter	60 – 220[mm]
Design Temperature	-28[°C] to 200[°C]
Motor power	2.2 – 37 [kW]
Materials	AISI 316, AISI 304L, Titanium, Nickel Alloys, Stainless Steel Carbon Coating
Speed	50–400 [rpm](depends on the project)
Industries	Chemical, Food & Beverage, Pharmaceutical, Paint & Resin

High-Capacity, Wide-Range & Safe Reactors

Professional Mixing Technology

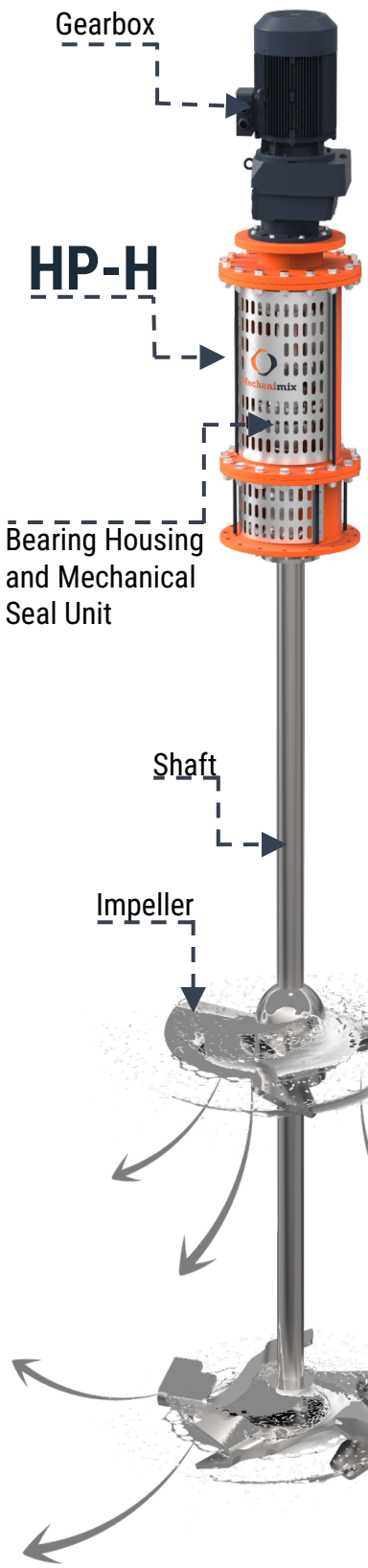
Title	Description
High-Capacity Design for Industrial Applications	• Working capacity up to 40,000 liters • Suitable for chemical, pharmaceutical, food industries • Large space for big-batch operations • Precise mixing & heat transfer • Consistent results, high efficiency, scalability HIGH-CAPACITY DESIGN FOR INDUSTRIAL APPLICATIONS
Advantages	• High resistance to cyclic stress (negative pressure 1–6 cycles) • Wide temperature range: 28°C to 200°C • Wide range: 630 to 40,000 liters. • Pressure stability during fluctuations • Energy-efficient design (reduced energy loss) • Durable construction (high-grade materials, long lifespan) ADVANTAGES
Explosion-Proof Equipment	• For hazardous environments (Zone 1 & Zone 2) • Ex-proof components: drive systems, motors, sensors, controls • Reliable in high-risk industries: chemical, petrochemical, biofuels, solvent production • Continuous & safe performance under demanding conditions • Compliance with ATEX & IECEx standards • Custom solutions available EX PROOF EXPLOSION-PROOF
Wide Operating Pressure & Temperature Range	• Pressure: negative pressure up to 6 bar • Temperature: 28°C to +200°C • Reliable under thermal cycling & pressure fluctuations • Safety, durability, long-term reliability WIDE OPERATING PRESSURE & TEMPERATURE RANGE
Smart Monitoring & Control Solutions	• Parameters: temperature, pressure, pH, mixing speed, torque, vibration • Monitoring: continuous or periodic • Real-time data + intelligent analysis • Early failure detection • Predictive maintenance planning • Process optimization • Minimized downtime • Precise reaction condition control • Consistent product quality • Suitable for lab-scale & industrial processes 
Learn More	• Comprehensive brochure with technical specifications & monitoring control service details

Reactor Top Inlets



Engineered Flexibility For Optimal Flow Control

Professional Mixing Technology



❖ Adjustable Blade Angle

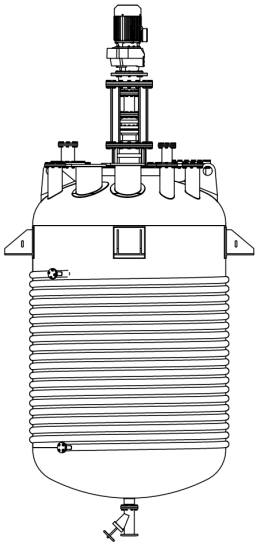
- Independent blade rotation for flexibility
- Fine-tunes flow direction & intensity
- Improves efficiency, cycle time & homogeneity
- Energy saving & easy maintenance

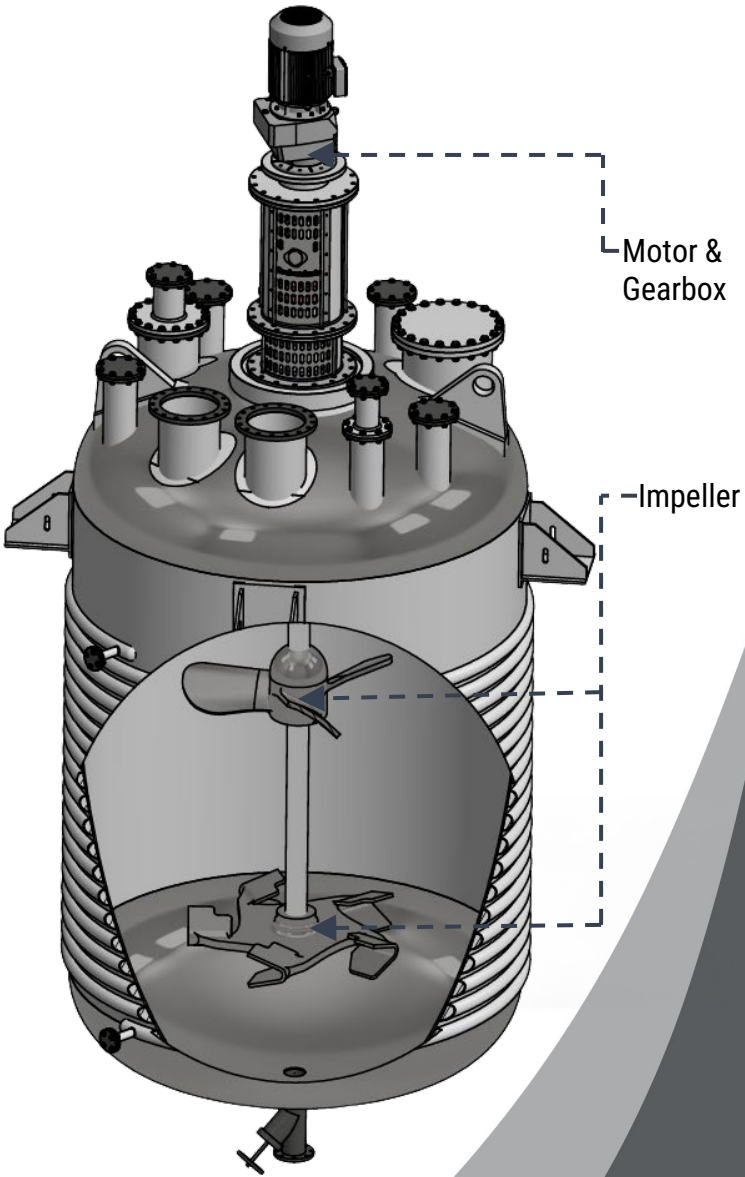
❖ High-Performance Design

- Precision + adaptability in one package
- Advanced process control

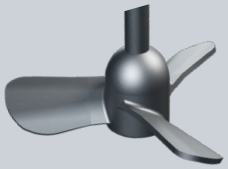
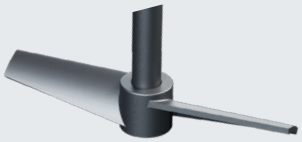
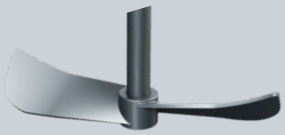
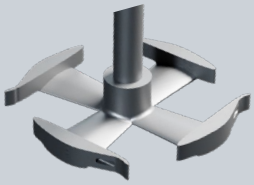
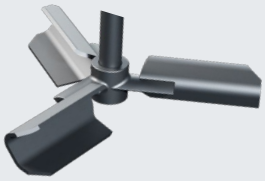
❖ Modular & Versatile

- Fits various drives, impellers & seals
- Fully customizable mixing solution





Impellers Suitable for Reactors Based on Process Conditions and Materials

Model	View	Features
HWM		– Axial Thrust with Wide Blade Impeller – Application in Low and Medium Viscosity Systems – Homogeneous Energy Distribution – Minimum Local Turbulence
HM		– High Flow at Bottom for Solid Suspension – Efficient Mixing in Low/Medium Viscosity – Enhanced Wall Heat Transfer via Axial Flow – Single and Multiple Impeller Arrays – Double, Triple or Quadruple Blade Design – Adjustable Blade Angle
HWM-B		– Low, Internal Cutting Force – High Suspension – Homogenizing Function – Working in Gaseous Environments – Supporting Heat Transfer
HVM		– For High Viscosity or Critical Rheology Fluids – Upward or Downward Pumping as Needed – Ideal for Blending, Heat Transfer, or Solid Incorporation – Mixes to Ensure No Dead Zones Form
TVM		– Application in Low Viscosity Systems or Turbulent Flow Regime – Excellent Axial Thrust Velocities – It Does Not Leave Dead Spots Inside the Tank Inner Wall
GDM		– High Suspension Performance Even at High Gas Flow Rates – Radial Thrust Impeller – Main Gas Distributor Role – Works Easily with Gas in Internal and External Power Supply
GM		– High Gas Supply Capacity – High Contact Surface Area – Specially Shaped Gas Channels – Homogeneous Energy Distribution – Optimum Suction Power
GDS		– Combines Strong Radial and Axial Flows – Excellent Gas Distribution Performance – Fast Mixing – Low Power Consumption – Fully Compatible with Mechanimix GDM

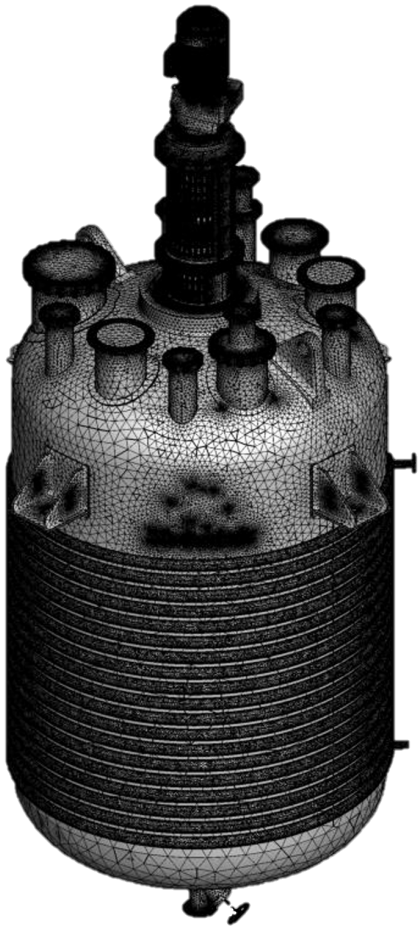
CFD Studies

Computational Fluid Dynamics (CFD)

- Virtual replication of the tank and impeller assembly to predict process outcomes before physical testing (saving time and cost)
- Ensuring the selected design meets key objectives:
  - Homogeneous mixing
  - Reduced cycle time
  - Efficient thermal control
  - Reliable scale-up
- Leveraging years of experience in applying CFD across diverse industries
- Delivering engineering insights through Mechanimix to transform complex challenges into optimized, high-performance reactor systems

Solid Domain Mesh of the Reactor(CFD Post A)

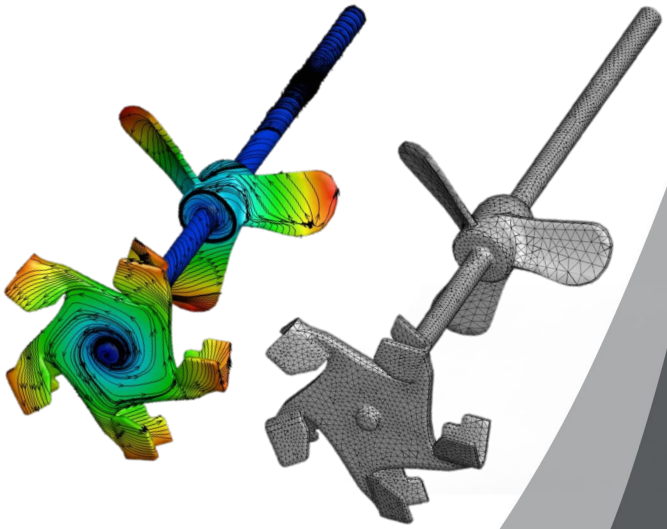
- 3D geometry discretized into smaller elements for numerical analysis
- Enables study of thermal, mechanical & dynamic behavior
- Cylindrical body & reactor connections meshed with triangular and quadrilateral elements
- Essential for FEM (Finite Element Method) & CFD (Computational Fluid Dynamics) simulations
- Accuracy of results strongly depends on mesh quality
- Includes geometrical details (pipes, nozzles, fittings) for realistic performance evaluation



CFD Post A

Impeller Mesh of the Reactor(CFD Post B)

- This image shows the reactor's impeller mesh, a crucial component for fluid mixing and reactor performance.
- The impeller's 3D geometry is discretized into mesh elements for accurate simulations.
- The mesh covers the impeller's blades and shaft, capturing flow interactions and mechanical stresses.
- This meshing is crucial for CFD and FEM analyses, as the impeller affects mixing, shear rates, and energy dissipation in the reactor.
- The high-resolution mesh ensures precise modeling for reliable evaluation of the impeller's performance.



CFD Post B

CFD Studies

Professional Mixing Technology

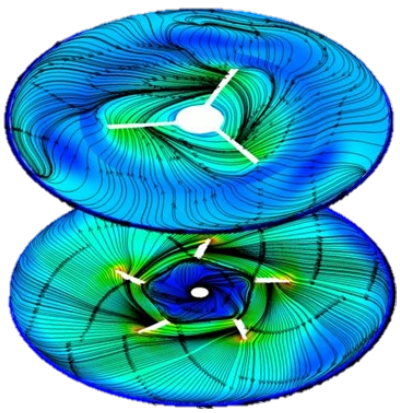
Optimized Flow Superior Mixing Proven by CFD
Our latest CFD study showcases the exceptional mixing performance engineered into our reactor design.
The analysis reveals how every impeller, nozzle, and contour works together to deliver consistent, high-efficiency results.

Engineered for Process Excellence
Every design choice—from blade geometry to positioning—has been optimized for superior turbulence control.
The result: efficient mixing, reduced batch time, and consistent quality in every run.

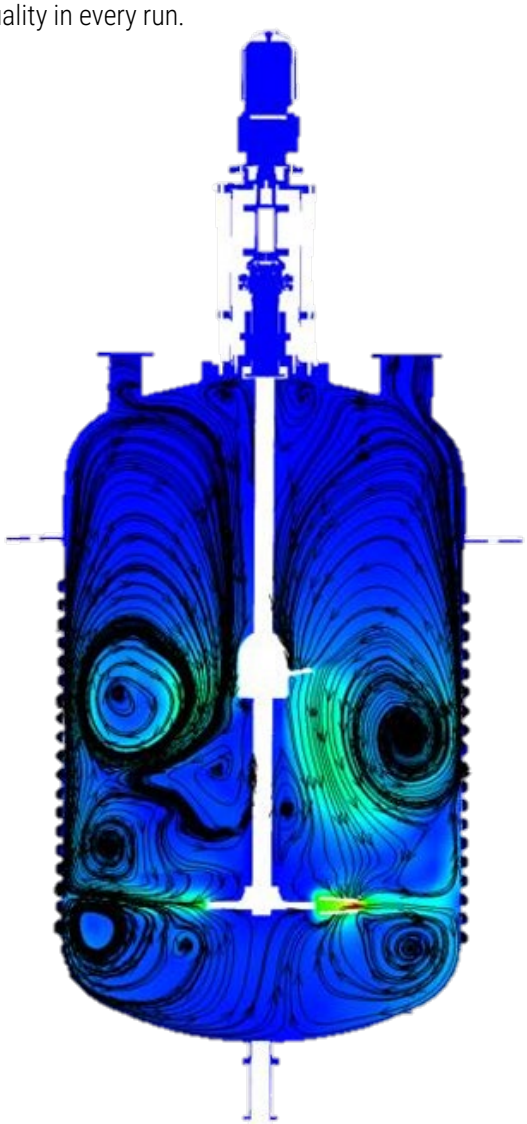
Flow Analysis, Mixing, and Internal Vortices in a Reactor

- **Dark Blue Areas**
  Regions with lower velocity and lower turbulence compared to the other colors.
- **Green to Turquoise**
  Medium velocity and active mixing zones.
- **Yellow and Light Areas**
  Regions with the highest velocity and the most significant motion gradients.
- **Central white area**
  Shaft axis or center of rotation

The positioning of these regions helps identify stagnant zones, the need for improved impellers, and the optimization of inlet design.



Y plane of the Reactor



X plane of the Reactor

Performance You Can See
CFD results clearly visualize our reactor's ability to combine vertical and radial energy transfer.
The balance between impeller zones delivers faster blend times and reduced energy waste.

CFD simulations provide detailed 3D insight into the reactor's internal flow behavior—revealing mixing performance, heat transfer efficiency, flow symmetry, and the influence of impeller design and blade angles on overall circulation.

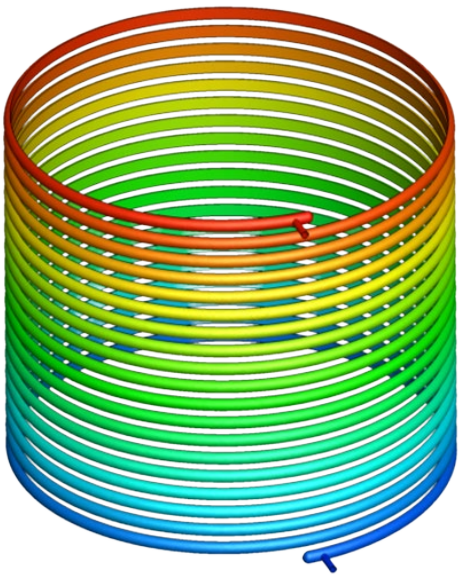
CFD Studies

Why do we use CFD for reactor analysis?

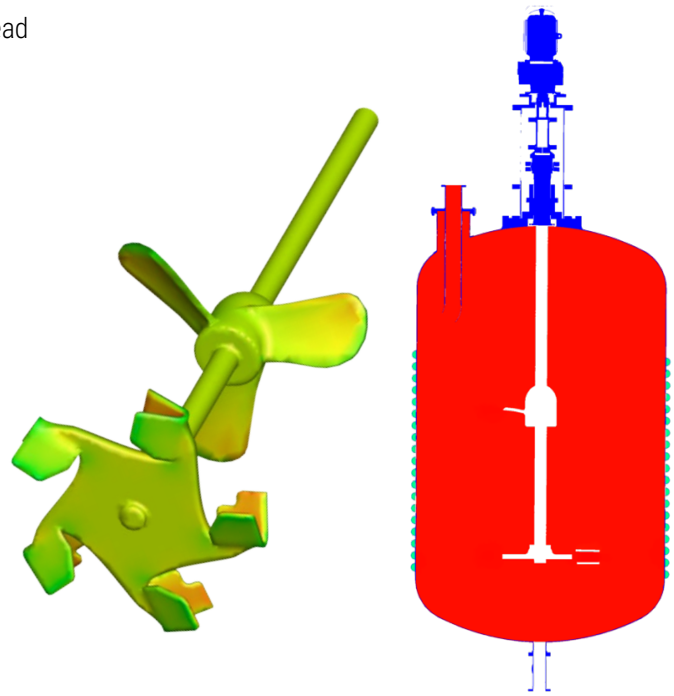
- Reducing design cost and time without the need for multiple prototypes
- Accurately representing the real behavior of the fluid under different operating conditions
- Ability to observe inaccessible areas such as beneath the blades or near the walls
- Improving mixing, heat transfer, and chemical reactions
- Predicting issues such as sedimentation, cavitation, or dead zones

Why is CFD analysis essential in such equipment?

- Preventing stagnation and efficiency loss
- Precise design of blades, baffles, and inlets
- Controlling temperature and concentration uniformity
- Increasing reaction efficiency
- Optimizing energy consumption and reducing mixer power
- Preventing wear, vibration, and flow instability



Reactor Heating Coils



Absolute Pressure Distribution on the Impeller & reactor

Precision-Engineered Impeller Zones

The upper impeller drives turbulence downward with focused energy, ensuring deep, thorough mixing.
The lower impeller pushes turbulence outward in a powerful radial sweep, maximizing lateral distribution.

Minimal Disruption from Nozzles

Top-mounted nozzles have little influence on turbulent intensity, allowing the impellers to dominate and control the flow.

Stable, Balanced Flow Patterns

Two robust vortex cells form naturally along the central axis, sustaining a stable circulation that prevents dead zones.
These symmetrical structures promote uniformity, enhancing product consistency.

Mechanimix

Reactor Dimensions

Professional Mixing Technology

Mechanimix designs and manufactures a wide range of industrial reactors with capacities from 630 to 40,000 liters, engineered for operating pressures up to +6 bar(g) and temperatures between -28°C and 200°C.

Mechanimix provide a wide range of pressurized industrial reactors designed to meet the stringent demands of processes operating under elevated pressure and temperature. With versatile configuration options, these reactors ensure efficient mixing, safe operation, and reliable performance across diverse industries.