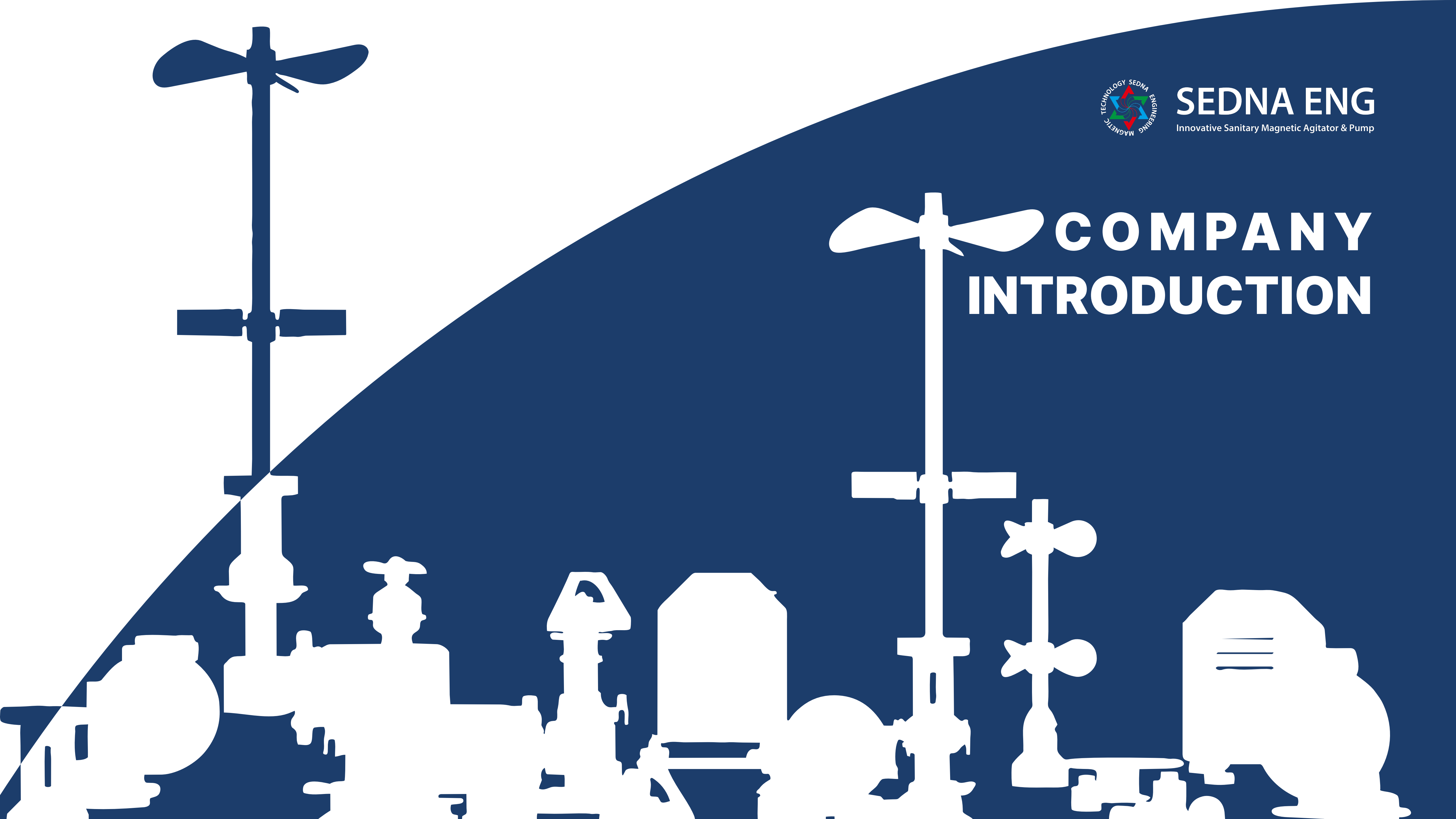




**SEDNA ENG**

Innovative Sanitary Magnetic Agitator & Pump

# COMPANY INTRODUCTION



# CONTENTS

01

## INTRODUCTION

- SEDNA ENG
- History
- Patent

02

## TECHNOLOGY

- Seal and Sealless
- Magnetic Coupling
- Impeller Type
- Other Application

03

## PRODUCT

- Magnetic Mixer
- Magnetic Agitator & Pump

04

## CFD & FEM SERVICE

- Why CFD Is Needed
- CFD Process

05

## SUCCESS CASE

- Success Case 1~10
- Reference Sheet

# INTRODUCTION

01



# SEDNA ENG

Innovative Sanitary Magnetic Agitator & Pump

**SEDNA ENG** is a leading specialist in magnetic coupling technology, setting the standard for the magnetic coupling industry in Korea and beyond.

Through continuous research and practical innovation, we deliver magnetic agitator and pump solutions to customers in a wide range of industries. By applying advanced magnetic coupling technology, we solve complex challenges in industrial environments.

Magnetic Coupling Technology

Safety and Hygienic Design

Experience and Know-how

These solutions are reaching beyond Korea and expanding across global markets.

By addressing new and diverse challenges, **SEDNA ENG** continues to strengthen its pride and reputation as a trusted specialist.



1993

- Hanbaek Founding (Manufacturer of Pharmaceutical Equipment)

2006

- SEDNA ENG Co., Ltd. Established

2010

- Established SEDNA Branch in Jilin, China
- Established Agencies in India and Bangladesh

2012

- Entered the Vietnam Market (Ho Chi Minh)
- Obtained CE Certification
- Developed Magnetic Agitators for Bioreactors (SRF, SRFT)

2014

- Established an In-House Research Institute
- Obtained 3-A Certification for Magnetic Agitators

2016

- Achieved USD 3 Million in Cumulative Exports
- Developed a High-Shear Agitator for Emulsification and Milling (SSN)
- Developed a Medium-Shear Agitator (SDP)

2018

- Constructed and Relocated to a New Headquarters
- Received the Export Tower Award on Trade Day
- Achieved USD 5 Million in Cumulative Exports
- Relocated China Branch (Changchun → Qingdao)

2019

- Selected as a Promising SME in Gyeonggi Province
- A youth-Friendly Small Giant Company
- A small Giant Company by the Ministry of Employment and Labor
- A specialized Materials and Components Company

2020

- Talent Development SME
- Export-Promising SME

2021

- USD 3 Million Export Tower Award
- INNOBIZ Certified

2022

- Selected as a Gyeonggi Star Company
- Annual Exports Surpassed USD 5 Million

2023

- 20+ Domestic and International Patent Applications/Registrations for Agitators and Pumps

2024

- Developed a High-Torque Agitator (HSS1300)
- Obtained CE and ATEX Certification for Magnetic Pumps (SSP)

2025

- Obtained CE Certification (SRF, SRFT Series)
- Achieved USD 26 Million in Cumulative Exports

# HISTORY

Annual Production Volume  
**+1,800**

Cumulative Installations  
**+20,000**

Domestic and International Patents  
**+20**

“ Building core technologies and intellectual property for diverse industries. ”

Domestic patents    Overseas patents    Global certification

**13**    **7**    **CE/ATEX/3A/ISO**

**PATENT**





## WORLD CLASS Manufacturer

Global Magnetic Coupled Mixers Sales Market Share by Manufacturers

\*\*Source : Global Magnetic Coupled Mixers Market Research Report, QYResearch, 2022

No.	Company	Sales
1	AI***(SE)	17.90%
2	Sp***(USA)	15.09%
3	Z***(AUT)	12.87%
4	St***(SE)	7.06%
5	Me***(SE)	3.24%
6	Ar***(GER)	3.17%
7	Mi***(US)	3.58%
8	H***(GER)	2.95%
<b>9</b>	<b>SEDNA ENG(KOR)</b>	<b>2.81%</b>
10	P***(GER)	2.65%

# Magnetic agitator market share No. 1 in Asia, No. 9 in the world

Global Top 5 by 2028

A specialized brand dedicated to magnetic agitators

**TECHNOLOGY**

**02**

# SEAL AND SEALLESS



## Mechanical Seal

### Cause of the Problem

- Improper installation
- Seal face opening
- Inappropriate seal selection
- Poor design
- Bearing failure
- Foreign matter
- Overheated process fluid
- High pressure

### Problem

- Disposal of contaminated fluid
- Exposure of hazardous substances to the outside environment
- Severe noise generation
- Damage to the entire equipment system

These issues can result in poor hygiene, reduced safety, and inefficient maintenance.



## Magnetic Coupling

### The Better Alternative

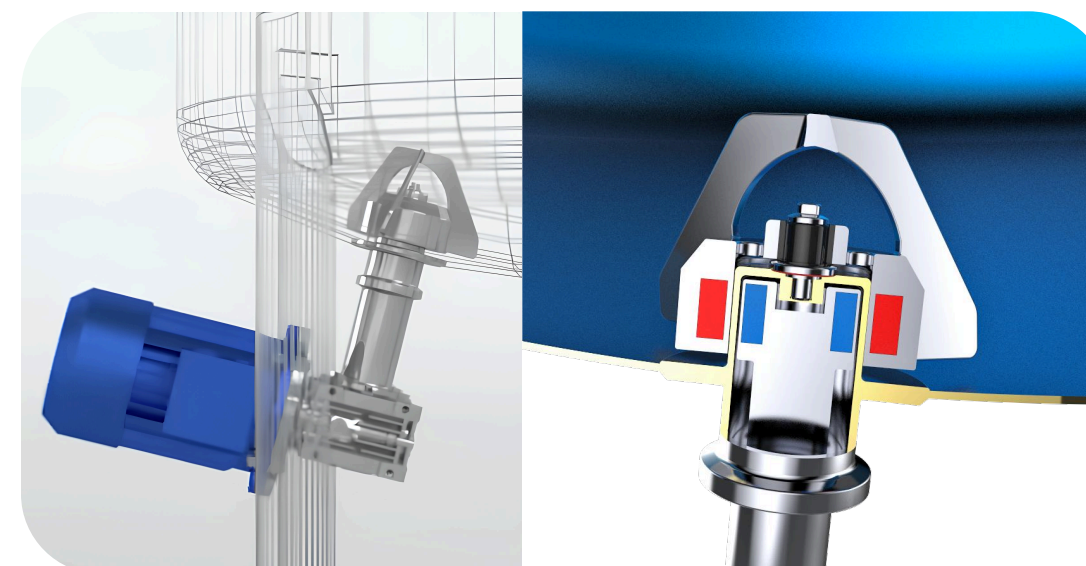
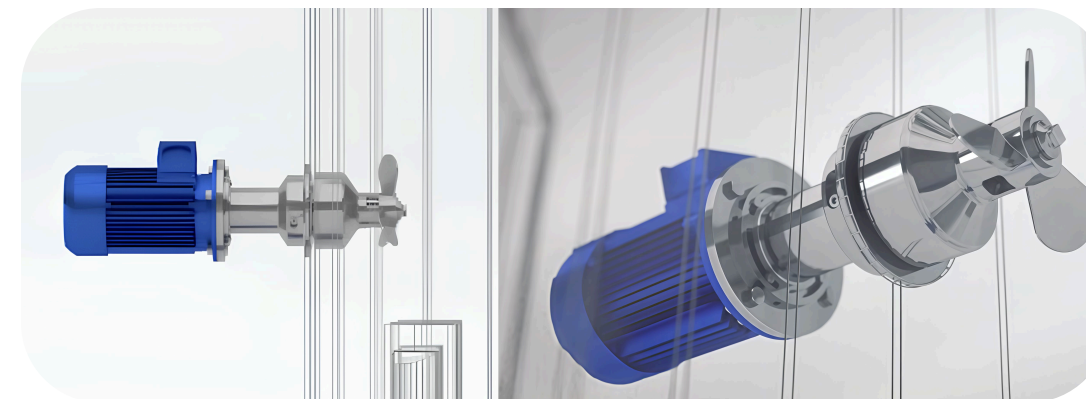
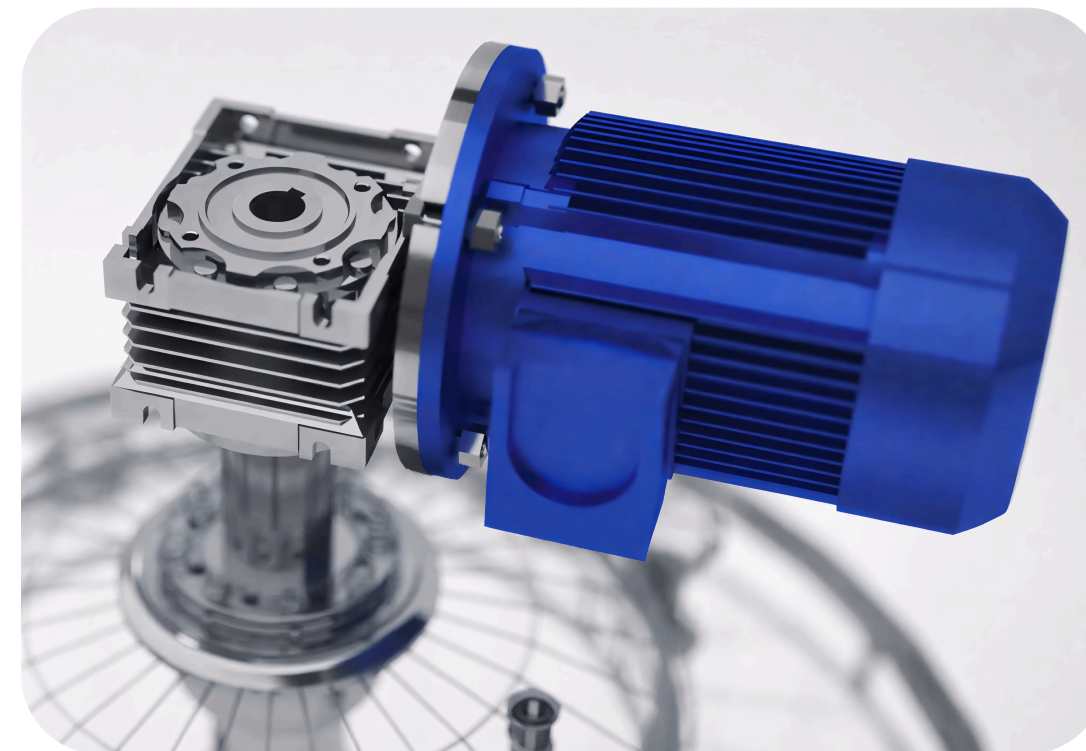
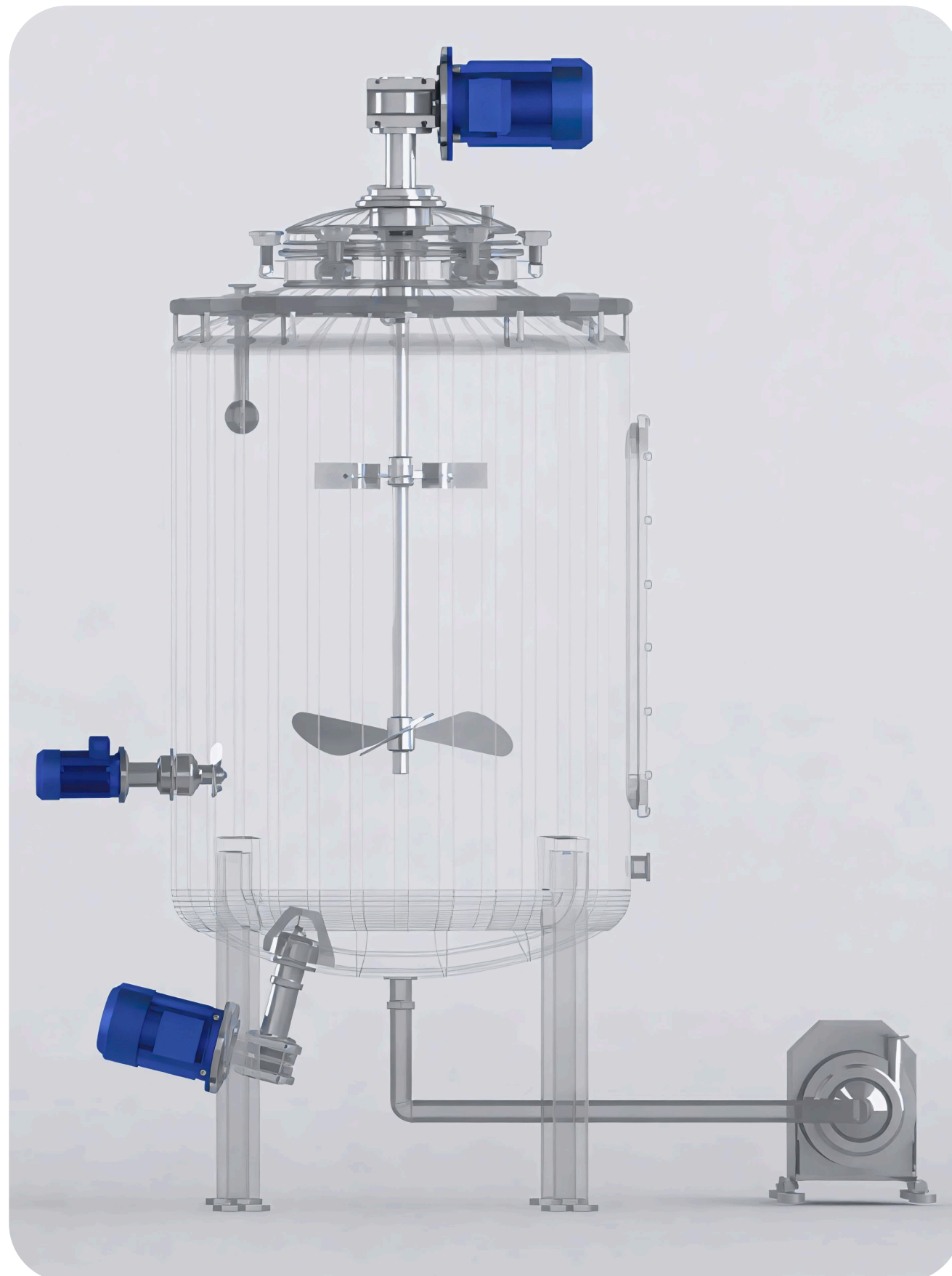
- Prevention of leakage and contamination ingress
- High maintenance efficiency and Reduced seal replacement costs
- Semi-permanent service life
- Proven for hygienic and safe operation

### Operating Principle

- The welding plate completely separates the inside of the vessel from the outside, while motor power is transmitted from the rotor to the impeller through magnetic force.

CIP/SIP compatible for excellent hygiene, safety, and longer service life.

# MAGNETIC COUPLING



## Top-Mounted Agitator

- **Top-mounted** alternative to mechanical seal agitators
- **Various impeller options** for different mixing purposes
- **The world's first structure** with the impeller body located inside the tank, offering superior hygiene, space efficiency, and ease of maintenance
- Commonly **replaces conventional mechanical seal agitators** in pharmaceutical processes

## Side-Mounted Agitator

- Installed on the side of the tank for agitation
- **Suitable for large tanks**, such as silo tanks, where utilizing the external space beneath the tank is difficult
- Multiple units (two or more) can be installed
- **Application examples:** Seoul Milk 150-ton tank (to prevent milk sedimentation), Ottogi 400-ton tank (to prevent edible oil sedimentation)

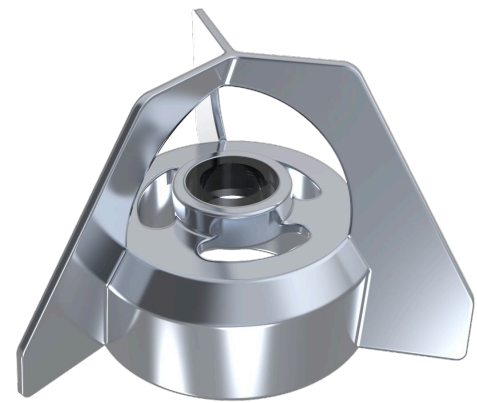
## Bottom-Mounted Agitator

- Provides excellent mixing performance through bottom-mounted agitation
- Capable of effective agitation even **at minimal working volumes**
- **Utilizes the external space beneath the tank**, contributing to space savings

**PRODUCT**

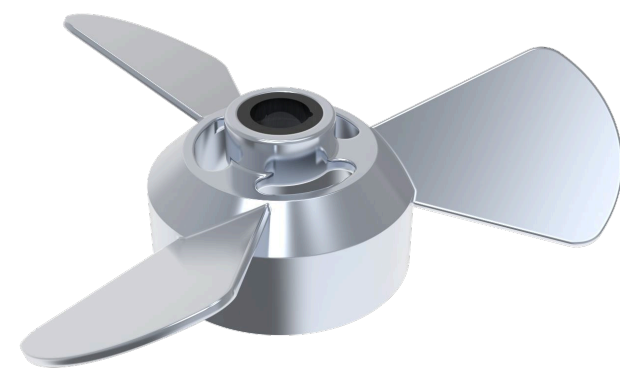
**03**

# MAGNETIC MIXER



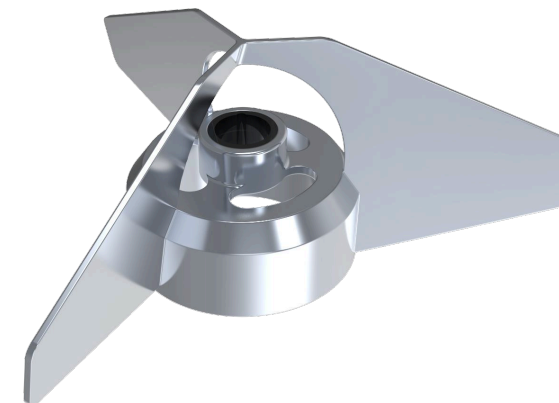
## SDM series

All Industries / General  
Mixing  
MAX RPM : 450  
Volume : 10 ~ 50,000 liter



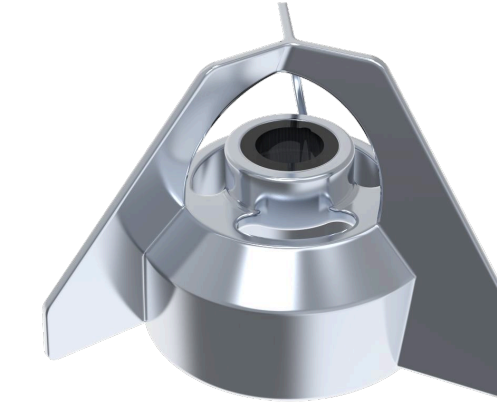
## SDB series

Pharmaceutical /  
Fermentation etc.  
MAX RPM : 220  
Volume : 10 ~ 15,000 liter



## SDL series

Pharmaceutical, Food &  
Beverage, etc.  
MAX RPM : 220  
Volume : 10 ~ 50,000 liter



## SDF series

All Industries / General  
Mixing  
MAX RPM : 450  
Volume : 10 ~ 3,000 liter



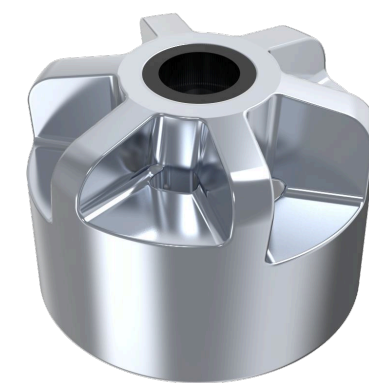
## SIB series

Designed for small-tank  
fermentation and reactor  
vessel applications  
Net Weight : 3.12 ~ 12.78 kg  
Net Volume : 0.88 ~ 3.42 liter



## SRD series

Dispersion / Powder  
dispersion  
MAX RPM : 1,800  
Volume : 20 ~ 2,000 liter



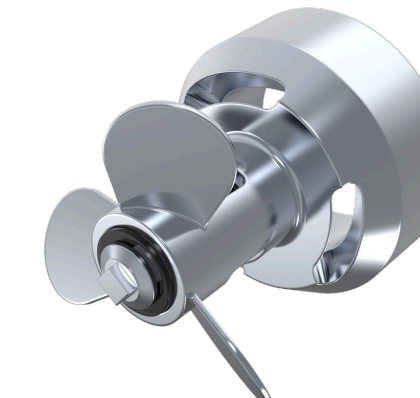
## SDP series

Dispersion / Powder  
dispersion  
MAX RPM : 1,800  
Volume : 20 ~ 2,000 liter



## SSN series

Emulsification /  
Homogenization  
MAX RPM : 3,600  
Volume : 20 ~ 2,000 liter



## SHM series

Side-mounted agitator  
Sedimentation prevention / Food  
& Beverage, etc.  
MAX RPM : 1,800  
Volume : 20,000 ~ 150,000 liter

# MAGNETIC AGITATOR & PUMP



## SRF series

Bottom-mounted bioreactor  
For cell culture, reaction,  
fermentation, etc.  
RPM : Inquiry required  
Volume : Inquiry required



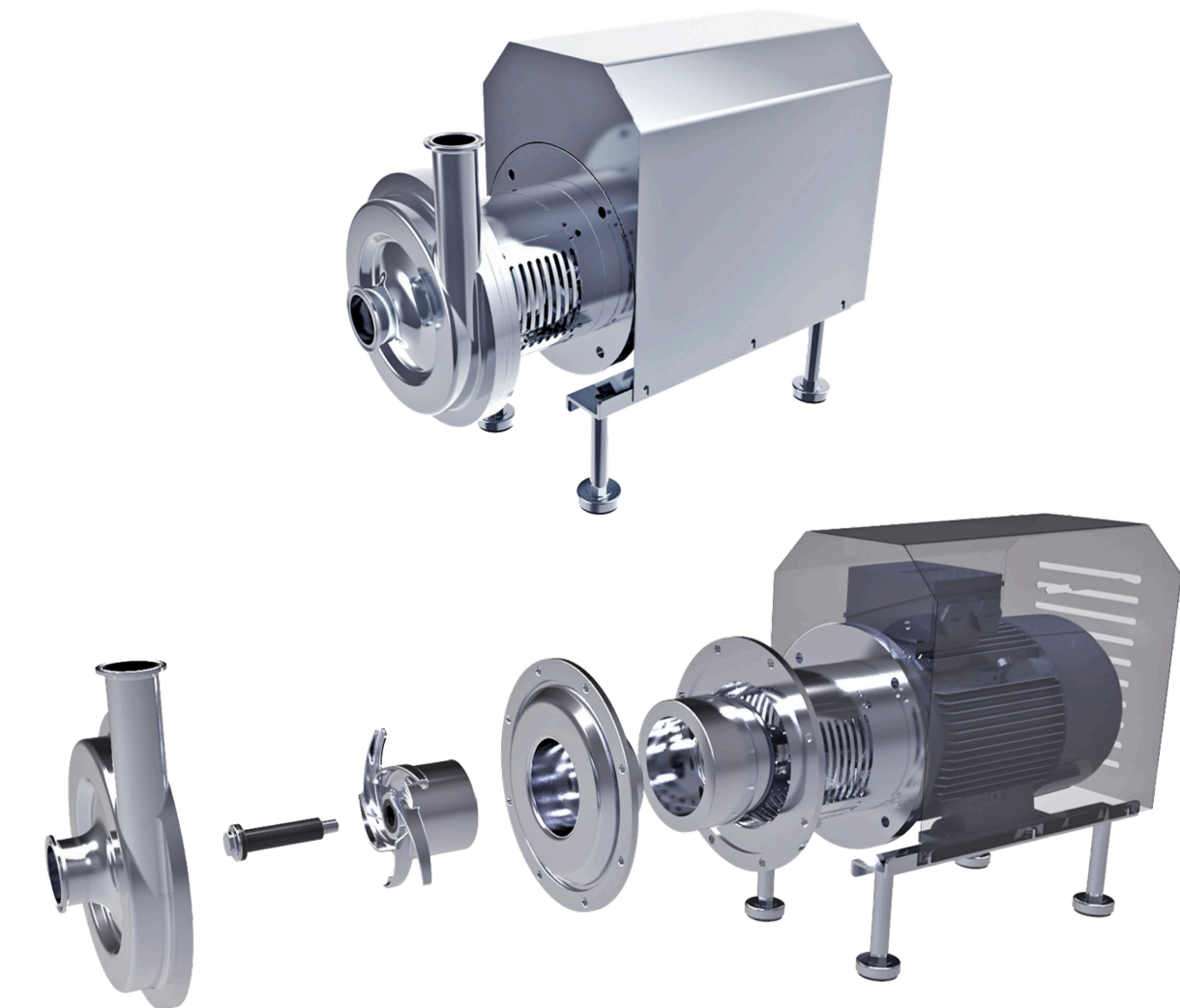
## SRFT series

Top-mounted bioreactor  
For cell culture, reaction,  
fermentation etc.  
RPM : Inquiry required  
Volume : Inquiry required



## SROT series

Top-mounted flushing  
channel agitator  
For cell culture, reaction,  
fermentation etc.  
RPM : Inquiry required  
Volume : Inquiry required



## SSP series

Food and pharmaceutical  
transfer, CIP  
RPM : 3,000 ~ 3,600  
Flow-rate : ~ 30 m<sup>3</sup>/hr  
Head : ~ 60 m  
Material : AISI 316L  
Bearing : Tungsten Carbide  
Silicon Carbide

**CFD & FEM SERVICE**

**04**

# Why CFD Is Needed

SEDNA provides optimized mixing solutions by dramatically reducing trial and error through CFD analysis.



## Real-time prediction

By predicting liquid mixing performance in advance, we help shorten development cycles and support faster decision-making

## Cost reduction

Enables testing of various scenarios while reducing material and experimental costs.

## Simulation under various conditions

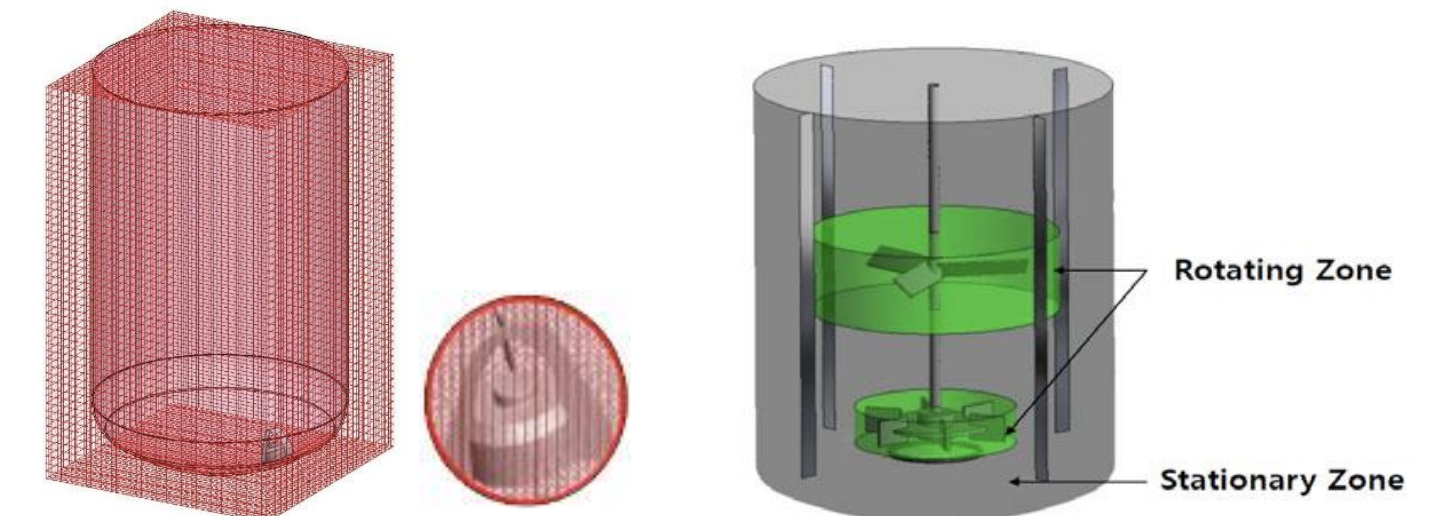
Evaluate a wide range of conditions through simulation, including scenarios that are difficult to test in real-world environments.

## Design optimization

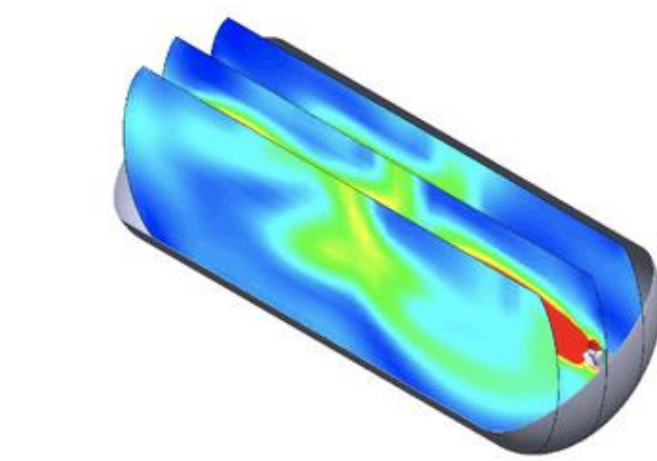
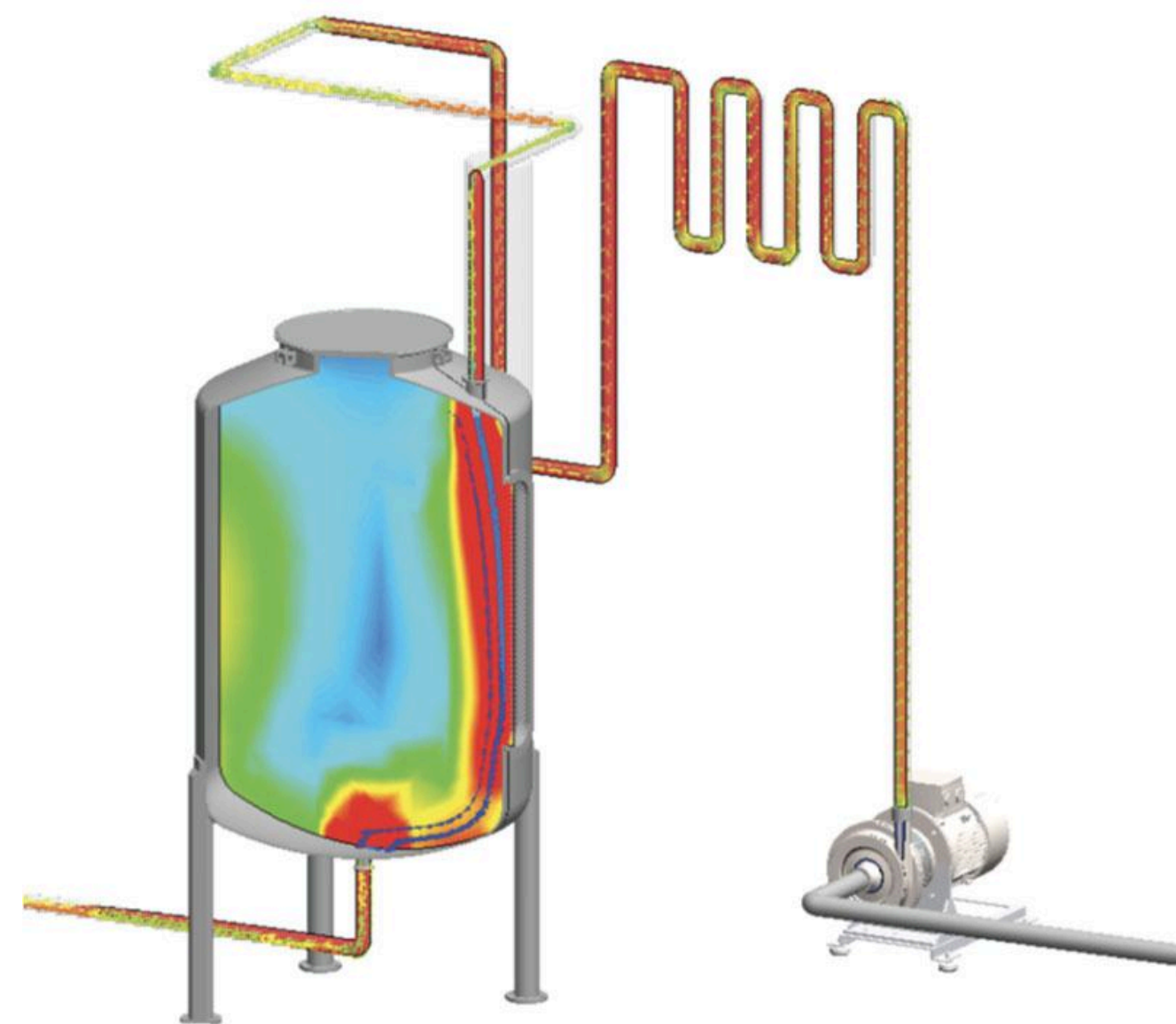
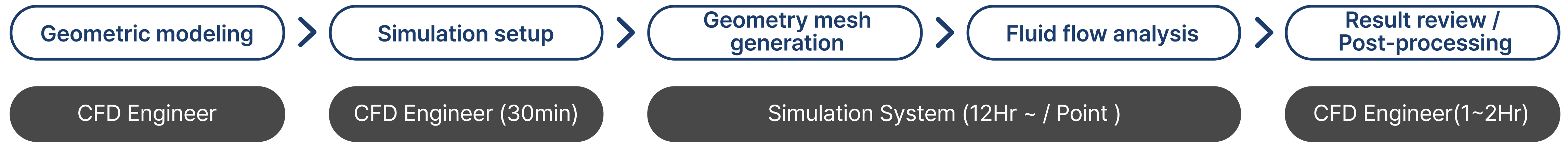
Evaluate various impeller design variations and develop the optimal performance design.

## Complex geometry evaluation

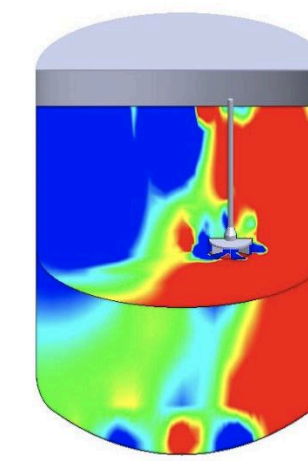
Effective evaluation in large-scale and complex process conditions that are difficult to replicate using conventional experimental methods.



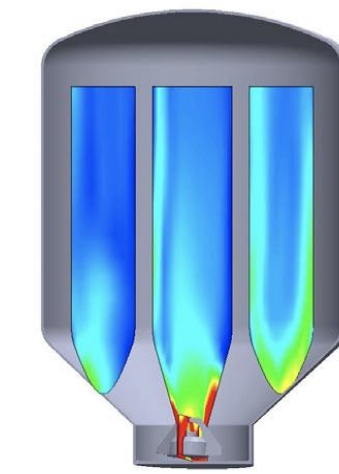
# CFD PROCESS



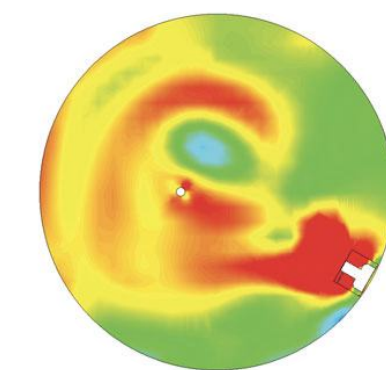
Flow analysis in a horizontal tank



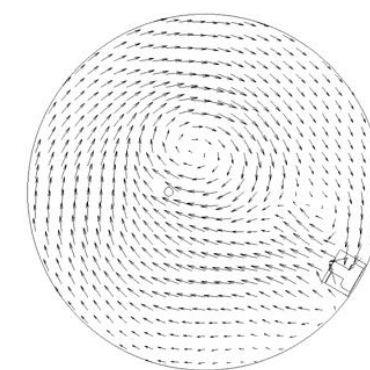
Flow analysis using a top-mounted agitator



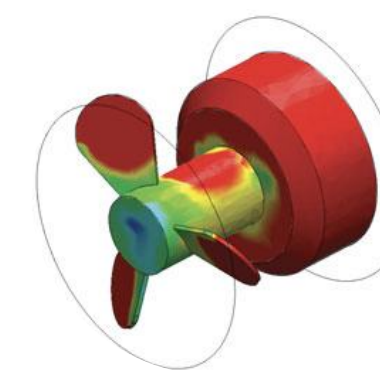
Dead-zone mixing and flow analysis in a tulip-type vessel



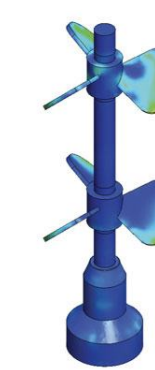
Flow pattern analysis



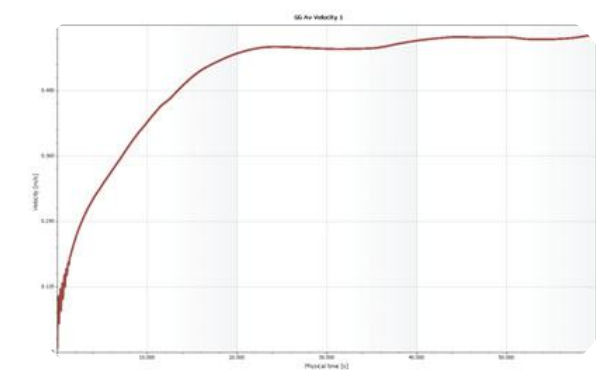
Vector analysis



Mixing load analysis



Shear stress analysis



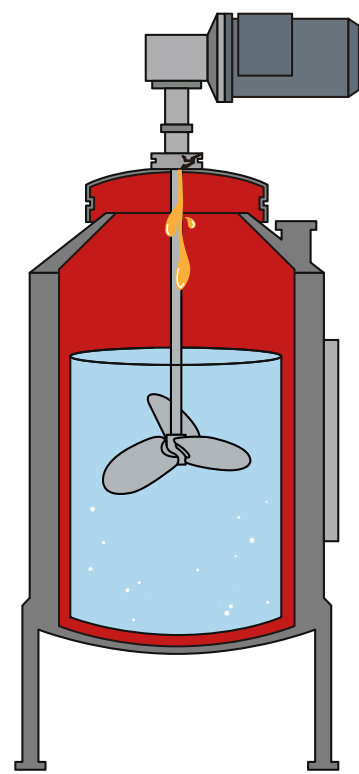
Velocity analysis

# REFERENCE

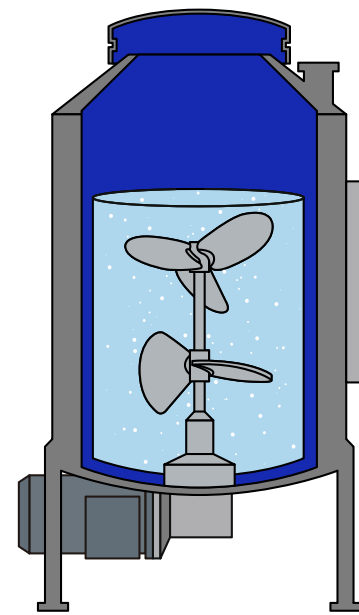
05

**Case 1. 10 kL Fermenter Flow Optimization Project**

**PROBLEM**



**SOLUTION**



**Technical advantages**

- Enhanced uniform flow and oxygen transfer in large fermenters via advanced down-flow impeller.
- Higher gas hold-up ensures stable DO, fewer dead zones.
- Clean, contamination-free mixing with magnetic coupling.

**Operational benefits**

- Lower CAPEX without additional compressors.
- Reduced aeration load, higher efficiency, lower costs.
- Greater process stability and reproducibility for scale-up productivity.

**Project Overview**

Company A, a global biotech leader producing tryptophan and lysine in a 10 kL large-scale fermenter, repeatedly faced DO depletion and compressor capacity limits during cell growth. To boost process stability and productivity without major upgrades, they turned to SEDNA ENG for mixing efficiency solutions.

**Key Challenges**

- 1. Oxygen transfer limits and equipment burden**
  - Repeated DO shortages during rapid biomass growth.
  - Excessive aeration reached compressor limits.
  - Large compressor upgrade would require major CAPEX.
- 2. Seal wear and contamination risk (legacy design limits)**
  - Ongoing risk of foreign matter from top mechanical seal wear in high-speed fermentation
  - Even minor contamination threatens quality in bio processes
- 3. Mixing non-uniformity in scale-up**
  - No pilot issue, but dead zones arose in 10 kL large tank
  - Lower mixing uniformity and variability increased, especially with ammonia sedimentation

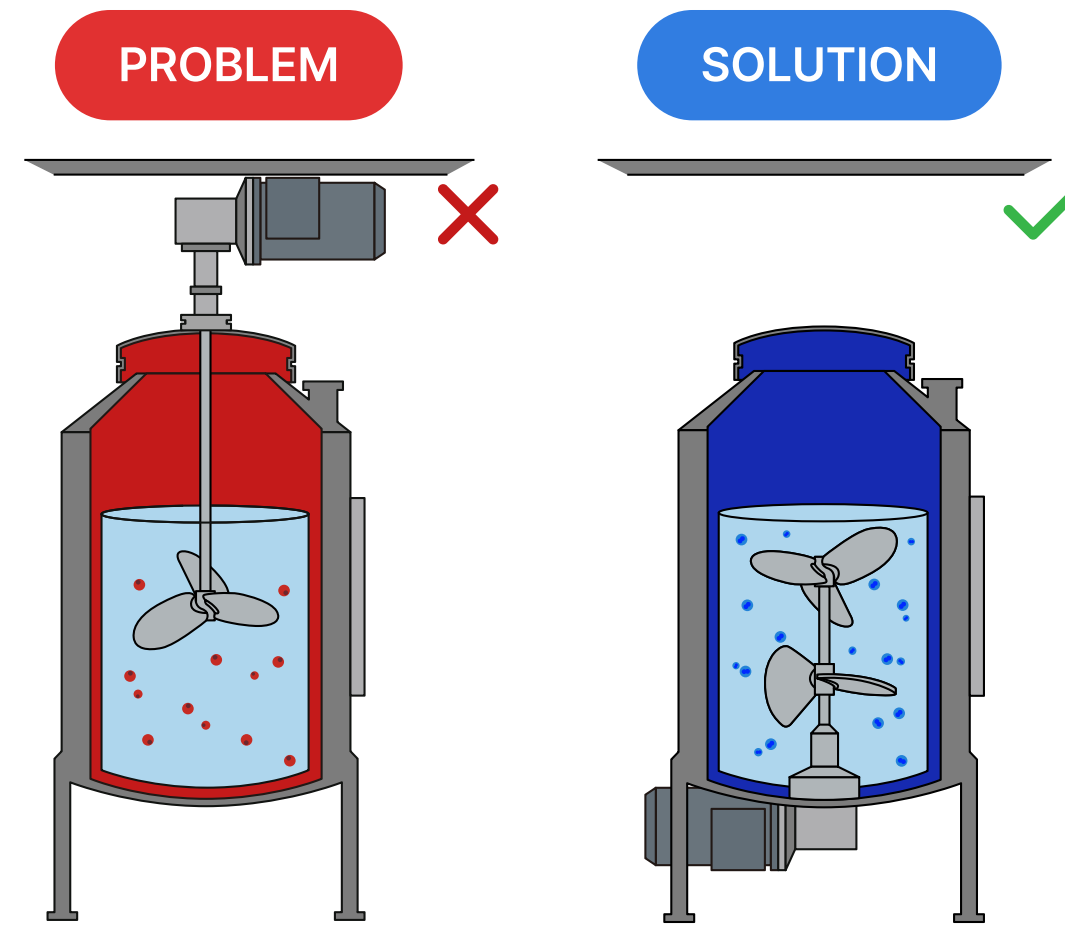
**Applied Solution**

- 1. Enhanced Down-Flow impeller design**
  - A CFD-based design applies impeller maximizing down-flow
  - Suppresses bubbles escaping to the surface and strongly circulates to the tank bottom
  - Dramatically increases gas hold-up time
- 2. Fully sealed agitator with magnetic coupling**
  - Mechanical seal-free magnetic coupling
  - No wear parts even at high speeds
  - Meets fermentation cleanliness and contamination-free requirements

**Results**

- Improved dissolved oxygen (DO) transfer efficiency**
  - Optimized impeller shape increases oxygen transfer even with same aeration, reduces compressor load
- Secured compressor capacity margin**
  - More air supply margin, saves CAPEX on large compressor expansion
- Improved process stability and reproducibility**
  - Stable DO during key growth phase minimizes batch variation and boosts productivity

**Case 2. 10-ton Cultured Meat Bioreactor Project for Mass Production in Europe**



**Technical advantages**

- Space-efficient large bioreactor design with bottom drive structure
- Low-shear, large impeller technology for uniform mixing at low speed
- Ultra-hygienic magnetic agitation meeting EHEDG standards

**Operational benefits**

- Large-scale up without factory expansion, saving facility investment
- Minimized cross-contamination risk securing food safety & process reliability
- Turn-key capability from global manufacturing to delivery and installation

**Project Overview**

Company B, Europe's leading cultured meat company, pursued a 10-ton mass production plant based on lab-scale validation. However, height restrictions prevented the installation of a top-mounted agitator, while both low-shear performance and EHEDG hygiene standards had to be met. To satisfy these requirements, the company adopted SEDNA ENG's magnetic agitator SRF/HSS with a custom sanitary design.

**Key Challenges**

- 1. Structural constraints from factory height limits**
  - Need for 10-ton large tank, but upper motor installation not possible due to ceiling limit
  - Need for high-power drive structure utilizing lower space
- 2. Shear stress control for tissue formation**
  - Cultured meat process sensitive to shear stress
  - Large blade (ø1000) design needed for uniform mixing of heavy medium at low RPM
- 3. Mixing inconsistency in scale-up**
  - Cross-contamination risk from residue since cultured meat is food
  - Drainage design prevents liquid pooling; complete seal prevents media penetration

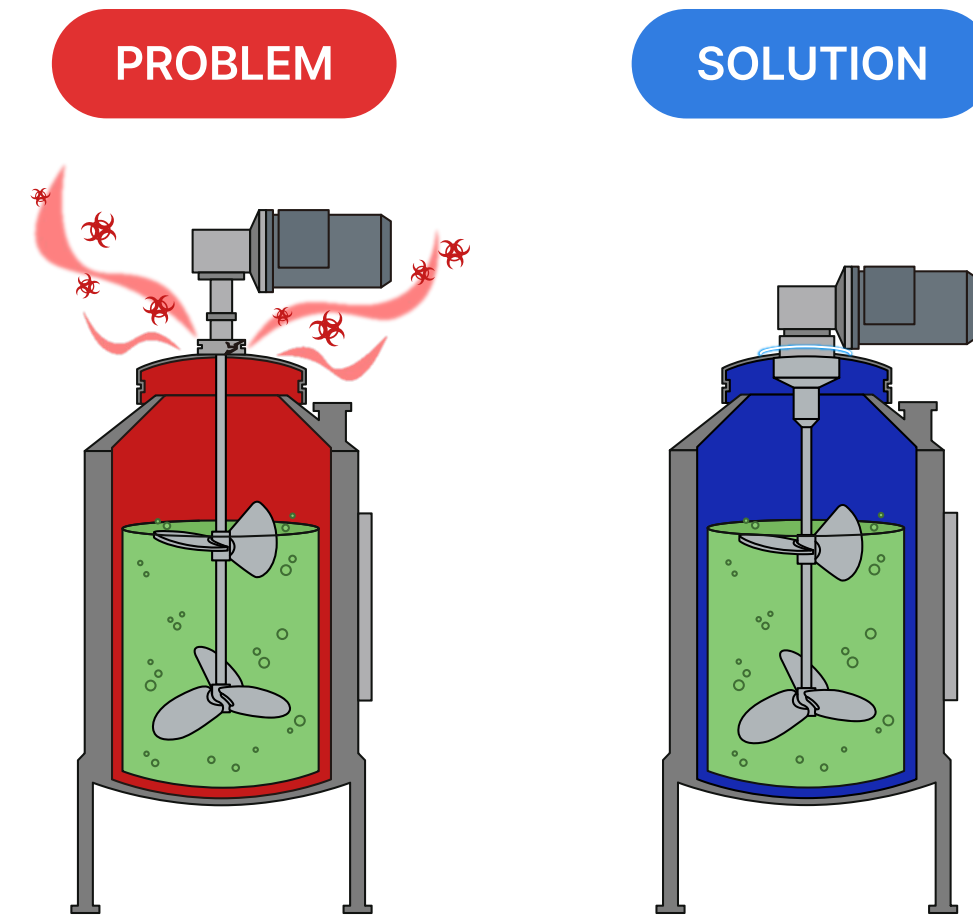
**Applied Solution**

- 1. Bottom-mounted magnetic agitator & custom large impeller**
  - Bottom-drive magnetic mixer solves upper space constraint
  - ø1000 large impeller ensures sufficient flow even at low speed
- 2. EHEDG-grade hygienic design**
  - Curved machining and super polishing to impeller and bolt heads
  - Special elastomer sealing prevents liquid ingress
  - Hygienic design meets EHEDG standards
- 3. Zero-pooling full drainage design**
  - Precision-machined impeller base fits tank bottom
  - Zero-pooling drainage, no liquid residue

**Results**

- Complete space constraint solution**
  - Achieved 10-ton scale-up mass production without factory expansion using bottom drive system
- Optimized cell viability & tissue formation**
  - Low-shear design and hygienic surface treatment optimize cultured meat tissue formation environment
- Proven global project capability**
  - Safely delivered and installed large precision equipment from Korea to Europe, proving global mass-production project skills

**Case 3. Avian Influenza Vaccine Project Achieving Perfect Containment Without Process Modification**



**Technical advantages**

- Perfect compatibility with existing process structure by maintaining top-drive system
- Complete containment with seal-less structure
- CIP/SIP optimization for high-viscosity bio-materials

**Operational benefits**

- Minimized verification risk with upgraded containment, no process change
- Reduced implementation time and cost without re-validation
- Field safety and operational reliability for virus handling processes

**Project Overview**

Company C, an animal vaccine specialist, suffered from leakage issues with conventional mechanical seal agitators in its egg protein-based avian influenza vaccine process. To achieve complete containment without altering equipment or validation, the company adopted SEDNA ENG's top-mounted magnetic agitator (SRFT).

**Key Challenges**

- 1. Containment and Sealing Limitations**
  - Complete leak-tightness is essential in avian influenza virus processes
  - Conventional mechanical seals can't fully eliminate minor leaks
- 2. Validation and Top Structure Limitations**
  - Retrofit of lower-mount magnetic mixers is impossible as process validation must be preserved
  - Seal-less agitator with top drive is required
- 3. Challenges in Cleaning and Sterilizing High-Viscosity Egg Protein**
  - High-viscosity egg protein adheres to equipment, complicating cleaning
  - CIP/SIP must be flawless even with top-mount agitator structure

**Applied Solution**

- 1. SRFT Series (Top-Mounted Magnetic Mixer) Using Patented Technology**
  - Top-drive magnetic agitator patented in Korea, US, and China
  - Complete separation of internal and external without mechanical seal via magnetic coupling and barrier structure
- 2. Seamless Retrofit Design (Full Compatibility)**
  - Headspace structure similar to existing top-mounted mechanical seal agitators
  - Direct 1:1 agitator replacement is possible without tank modification
  - Maintains existing validation
- 3. Optimized CIP/SIP body design**
  - Special body design for cleaning fluid flow
  - Verified complete cleaning and sterilization with actual CIP/SIP test, no protein residue

**Results**

**Zero Leakage**

- Magnetic coupling technology blocks virus leakage risk
- Maximized process safety

**Validation Continuity**

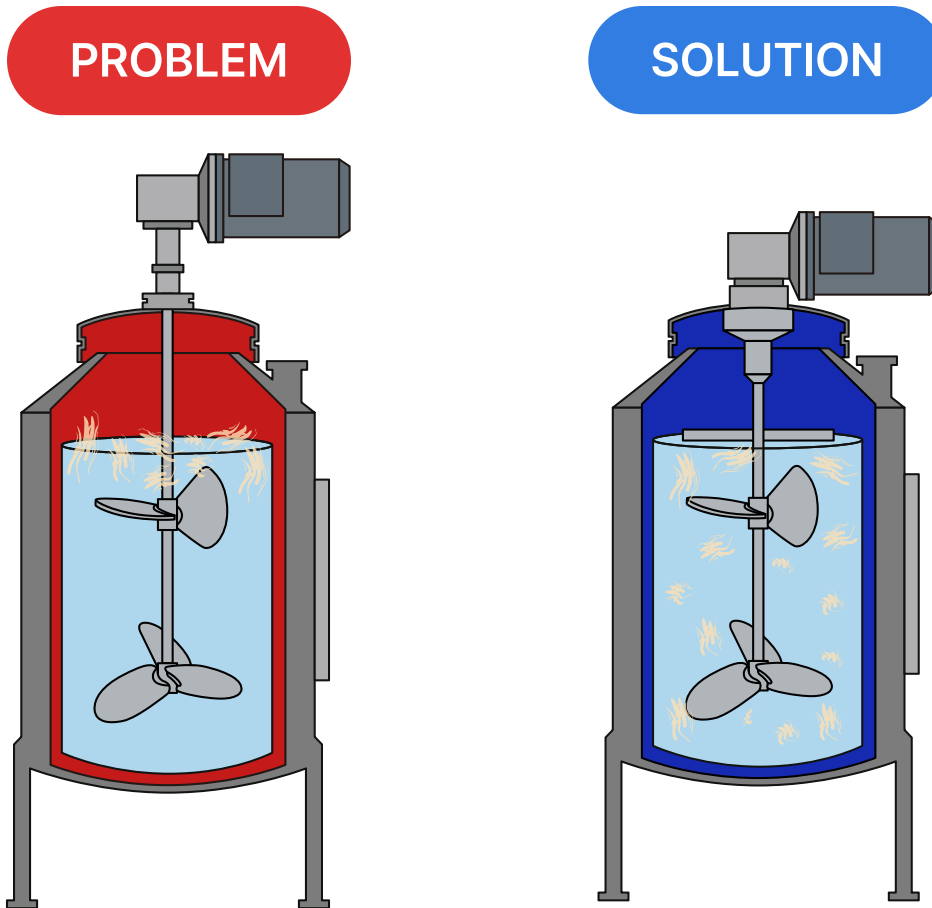
- Retrofit applies without tank modification, drastically cutting revalidation cost and time

**Perfect Hygiene**

- Demonstrated residue-free CIP/SIP, even with high-viscosity egg protein, turning hygiene concerns into confidence



**Case 4.** Project solving 40-day long-term cultivation with patented rolling blades for wild ginseng root culture



**Project Overview**

Company D, a leading health functional food and ginsenoside extraction company, faced the challenge of ensuring a fully aseptic, sealed environment to minimize contamination risk and to address both surface hardening and liquid level changes during a 40-day large-scale (12-ton) wild ginseng root culture process. To overcome this, the company introduced SEDNA ENG's variable impeller-based magnetic mixing solution.

**Key Challenges**

- 1. Contamination risk during 40-day culture**
  - 40-day culture: even minimal contamination means discarding entire 12-ton batch
  - Hermetic sealing required at pharmaceutical levels despite food process
- 2. Growth decline due to surface hardening**
  - Wild ginseng roots require full immersion for proper growth
  - Exposure to air leads to surface hardening, growth stop, and reduced ginsenoside
- 3. Uncontrollable liquid level (Sensor Blindness)**
  - Culture root growth and liquid absorption cause constant liquid level change
  - Density of roots blocks traditional level sensors
  - Cannot actively adjust impeller position

**Applied Solution**

- 1. SRFT Top-Mounted Magnetic Mixer Applied**
  - Top-mounted magnetic mixer (SRFT) blocks contamination from mechanical seal wear
  - Maintains sterile condition even during 40-day operation
- 2. Patented Rolling Blade (Water Level Tracking Impeller)**
  - Sensorless water level response with patented Rolling Blade technology
  - Impeller moves up and down automatically with water level via buoyancy and mechanics
  - Always stays at surface for gentle root wetting effect
- 3. Optimized Oxygen Transfer Design**
  - Magnetic mixing disperses sparger-supplied oxygen evenly throughout medium
  - Stable oxygen supply even in high-density, long-term culture

**Technical advantages**

- Fully sealed magnetic mixer optimized for long-term culture
- Patented rolling blade technology auto-responds to liquid level changes
- Stable oxygen supply and mixing in high-density cultures

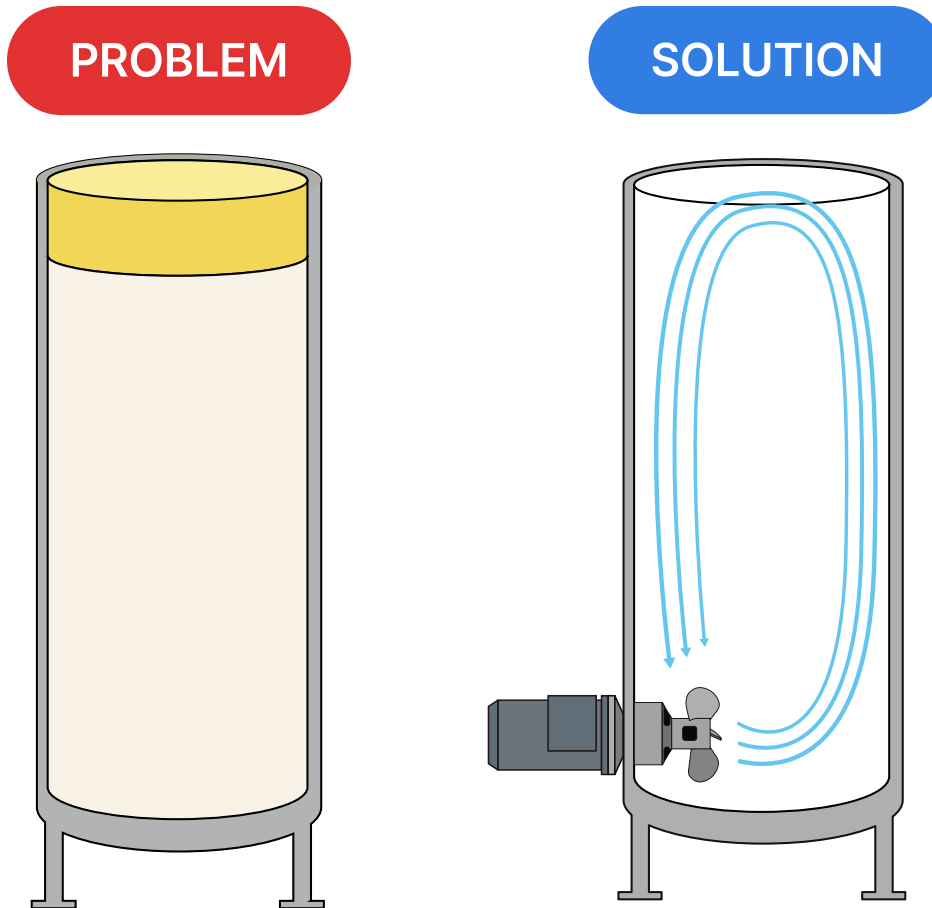
**Operational benefits**

- Minimal product disposal by eliminating contamination risk during long culture
- Process operation and maintenance simplified with low sensor reliance
- Improved yield & quality of high-value functional ingredients

**Results**

- Surface hardening greatly reduced**
  - Rolling blades keep roots moist 24/7, cutting surface hardening by over 50%, ensuring top-quality wild ginseng roots
- Auto-Leveling**
  - Impeller tracks liquid level without complex sensor controls, enabling process automation and easy management
- High-purity ginsenoside production achieved**
  - Target ginsenoside yields exceeded under stable culture environment

**Case 5. Side-Driven Mixing Solution to Prevent Creaming in 150-Ton Raw Milk Storage Tank**



**Technical advantages**

- Side magnetic seal design with zero leakage even under high pressure
- 20m vertical circulation enabled by CFD-based design
- Continuous operation and load distribution system optimized for large silos

**Operational benefits**

- Maintains raw milk quality and freshness long-term by preventing creaming
- No high-place work needed—better on-site safety and easier maintenance
- Simulation-driven design cuts lead time and cost

**Project Overview**

Company E, a large dairy company, faced creaming issues in a 150-ton outdoor raw milk silo during process downtime or when temperatures rose. Due to the tank's massive outdoor design and high water pressure, conventional agitation methods were not viable, so the company solved the problem with SEDNA ENG's SHM (Side-Mounted Magnetic Mixer) series.

**Key Challenges**

- 1. Inaccessible Height & Maintenance Risk**
  - Outdoor silos are so tall, top-driven agitator installation and maintenance are unrealistic
  - High-place work is risky, so side installation is the only viable option
- 2. Leak & Contamination Risks from 150-Ton Pressure**
  - Agitator at lower side must withstand extreme hydrostatic pressure at 20m depth
  - If seals break, both product contamination and major spills are possible—high-risk facility
- 3. Limited Flow to Upper Levels**
  - Standard side agitators push fluid only horizontally
  - Structurally inadequate to deliver flow to the 20m-high creaming layer

**Applied Solution**

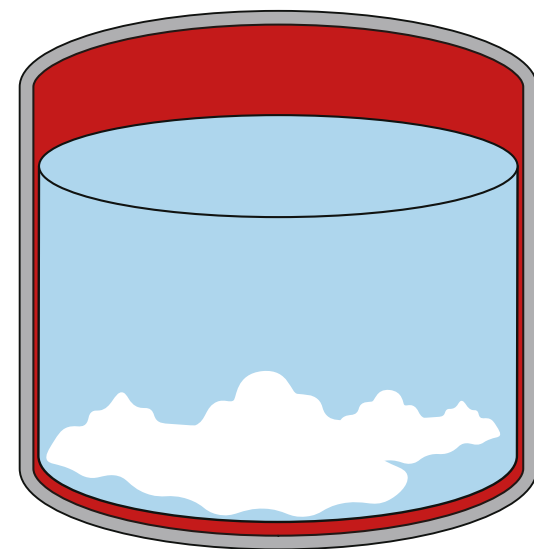
- 1. Leak-Free SHM Side-Mounted Magnetic Mixer Applied**
  - Side-mounted magnetic mixer (SHM Series) used for leak-free high-pressure operation
  - Seal failure risk eliminated by magnetically coupled full-seal structure
- 2. CFD-Based Flow Angle Optimization Design**
  - Design validated by CFD simulation when 150-ton real-scale testing is impossible
  - Pre-verified top-bottom circulation by adjusting mixer angle for full vertical flow
- 3. Dual Alternating System (24/7 Operation)**
  - Two SHM mixers per tank alternate to balance motor load
  - 24/7 crude oil circulation system

**Results**

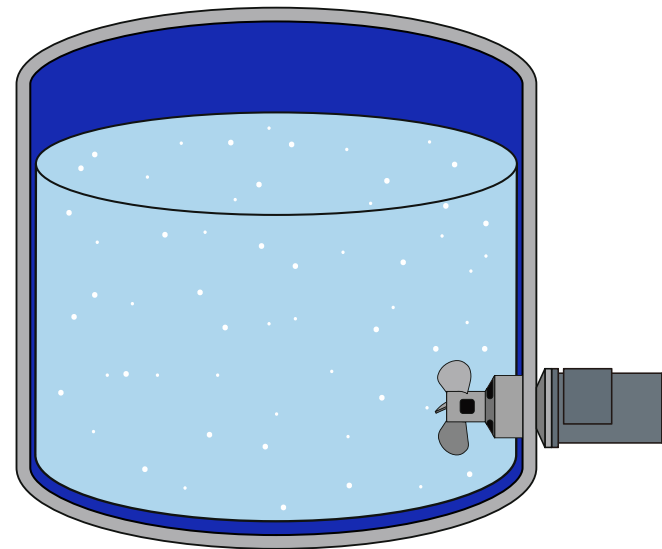
- Zero Creaming Achieved**
  - Complete elimination of fat separation and creaming during long-term storage by CFD-validated vertical circulation
- Risk-Free Operation**
  - Magnetic technology eliminates leakage/spill risks in high-pressure settings; safe ground-level maintenance without rooftop work
- Smart Engineering Cost Saving**
  - Optimized mixer placement and angle by simulation—no trial run needed; drastic reduction in project time and cost

**Case 6.** 400-ton Large-Scale Edible Oil Tank Silicon Sedimentation Prevention & Quality Uniformity Project

**PROBLEM**



**SOLUTION**



**Technical advantages**

- Shaft-extended magnetic mixing for extra-large tanks
- Re-suspension flow system keeps particulates suspended
- High-volume mixing covers full tank with no dead zones

**Operational benefits**

- Consistent quality at bottling, higher product reliability
- No re-mixing needed during storage, improved efficiency
- Minimal retrofit reduces risk and cost for large systems

**Project Overview**

Company F, a major edible oil producer, faced silicon sedimentation and the resulting concentration imbalance in its 400-ton storage tank. To maintain uniform silicon concentration across the entire volume within tolerance levels, the company adopted SEDNA ENG's custom magnetic mixing solution for large tanks.

**Key Challenges**

- 1. Silicon Sedimentation in Large Tanks**
  - Silicon is essential for oil quality, but naturally settles at the bottom in 400-ton tanks under long-term storage.
  - High-level challenge: not just mixing but actively resuspending sediment particles continuously
- 2. Quality Deviation by Bottling Time**
  - With outlet valve at tank bottom, silicon-rich oil is discharged first, later only silicon-deficient oil comes out
  - Critical issue impacting taste, quality, and consistency across products
- 3. Deadzone from Large Tank Diameter**
  - Large diameter prevents typical side agitators from delivering flow to center and far end bottom
  - Unavoidable formation of lower deadzones where silicon accumulates

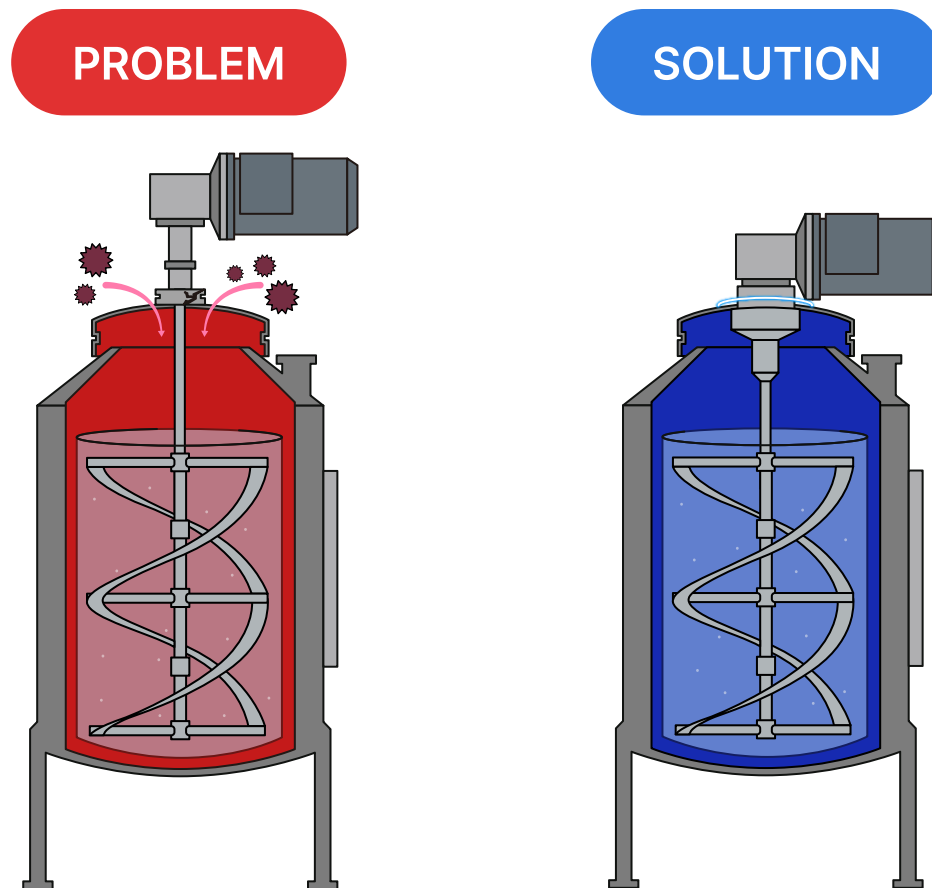
**Applied Solution**

- 1. SHM with Extended Shaft**
  - After analyzing oil and silicon properties and density, SHM magnetic mixer shaft extended significantly
  - Blades positioned deep near tank center to ensure vortex flow reaches throughout tank
- 2. Zero-Deadzone Flow Dynamics**
  - Extended blades generate strong upward flow, continuously resuspending settled silicon
  - Structurally eliminate lower deadzones
- 3. Mega-Scale Custom Side Mount Design**
  - Maintained side mounting considering 400-ton tank specs
  - Applied custom magnetic mixing with minimal internal modifications

**Results**

- Perfect Uniformity**
  - Silicon content deviation kept within tolerance across entire 400-ton volume, consistent quality regardless of bottling time
- Effective Sedimentation Control**
  - Shaft extension technology fundamentally resolves silicon settling, maintains stable dispersion even during long storage
- Optimized for Mega-Scale Verification**
  - Applied long-shaft custom design based on thorough analysis of oil and silicon properties, maximized mixing efficiency in ultra-large systems

**Case 7.** High-Torque Mixing Solution for Production of High-Viscosity Fillers for Cartilage and Plastic Surgery



**Technical advantages**

- High-torque magnetic drive for ultra-high viscosity and heavy-duty processes
- Helical ribbon blade optimized for laminar mixing
- Fully sealed, leach-free design compliant with medical device regulations

**Operational benefits**

- Minimize disposal and rework by eliminating mix defects
- Stable, non-stop operation for continuous production
- Reliable process enables easy medical device certification

**Project Overview**

Company G, a medical device specialist, adopted SEDNA ENG's high-torque magnetic mixing system, which ensures sterility and biocompatibility, to overcome the rapid viscosity increase that made conventional mixing impossible during high-viscosity filler manufacturing.

**Key Challenges**

- 1. Sudden Ultra-High Viscosity and Torque Load**
  - Physical properties rapidly shift from low-viscosity liquid to ultra-high viscosity gel right after crosslinker addition
  - Massive viscous resistance in this stage can stop the mixer or cause drive system overload
- 2. Structural Limits of Standard Turbulent Mixing**
  - Standard propeller types just spin in high-viscosity media —no effective mixing occurs
  - Special low-speed, high-torque blades are essential to move material from tank walls and bottom for full mixing
- 3. Biocompatibility Needs for Implantable Products**
  - No trace impurities or extractables acceptable due to direct injection into the body
  - All contact materials must meet USP Class VI medical grade

**Applied Solution**

- 1. High-Torque SRFT Magnetic Mixer Applied**
  - Selected SRFT magnetic mixer proven for high-torque delivery, tailored for ultra-high viscosity processes
  - Delivers strong torque stably without magnetic coupling decoupling, even during rapid viscosity changes
- 2. Helical Ribbon Blade (For High Viscosity)**
  - Helical ribbon blade optimized for laminar mixing
  - Continuously circulates tank wall and bottom material for dead zone-free complete mixing
- 3. USP Class VI Certified Materials Used**
  - USP Class VI certified material used for all contact elastomers
  - Ensures perfect biocompatibility without harmful extractables under high viscosity/high torque

**Results**

**Perfect Mixing in Ultra-High Viscosity**

→ Helical ribbon blade and powerful torque transmission maintain uniform mixing even during gelation, achieving zero mixing defects

**Biocompatible & Safe Process**

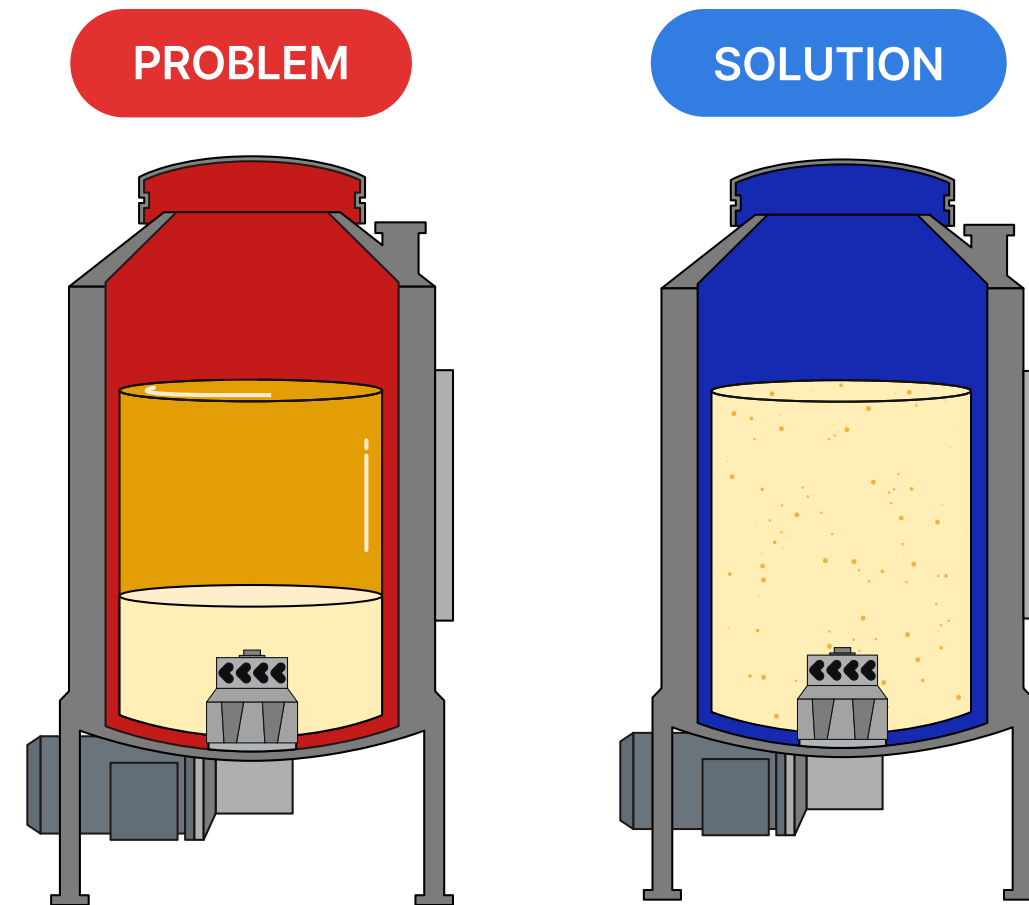
→ USP Class VI certified materials eliminate extractable risks, meeting strictest medical device standards

**Stable & Continuous Operation**

→ Stable, uninterrupted operation despite rapid load changes; dramatically improves reliability of continuous production

**Case 8.**

**Micro Particle Homogenization & Seal Failure Solution Project for Premium Mayonnaise Production**



**Project Overview**

Company H, a Korean food company, faced seal failures in conventional emulsifiers during high-viscosity emulsification for premium mayonnaise production, and adopted SEDNA ENG's high-shear magnetic mixing solution to secure both fine emulsion quality and equipment reliability.

**Key Challenges**

- 1. Seal Failure Due to Viscosity Change**
  - Mayonnaise process starts as low-viscosity liquid; viscosity rises sharply above 2,000 cP during emulsification
  - This overloads the lower mechanical seal, causing frequent breakage and leakage
- 2. Micro-Scale Homogenization Required**
  - For stable, non-separated mayo, oil droplets must be finely and uniformly dispersed
  - Existing equipment cannot achieve targeted micron-level particle size distribution
- 3. Contamination Risk Threatening Food Safety**
  - Seal failure may introduce lubricant and wear particles into product
  - Severely undermines food safety and product reliability

**Applied Solution**

- 1. SSN High-Shear Magnetic Mixer Applied**
  - Fully sealed high-shear magnetic mixer (SSN Series) without mechanical seal
  - Magnetic coupling eliminates seal failure
  - Leak-free, stable operation even for high-viscosity emulsions
- 2. Precision Rotor-Stator Technology**
  - Generates powerful high shear force with precisely machined rotor and stator combination
  - Uniformly reduces oil particle size to microns at high speed through a narrow gap
- 3. Hygienic & Reliable Design**
  - Seal-free structure blocks contamination paths
  - Durable bearings and magnetic design for heavy-duty continuous operation

**Technical advantages**

- High-shear magnetic mixing technology for micro-level emulsification
- Fully sealed rotor-stator design with zero seal failure
- Continuous operation stability for high-viscosity food processes

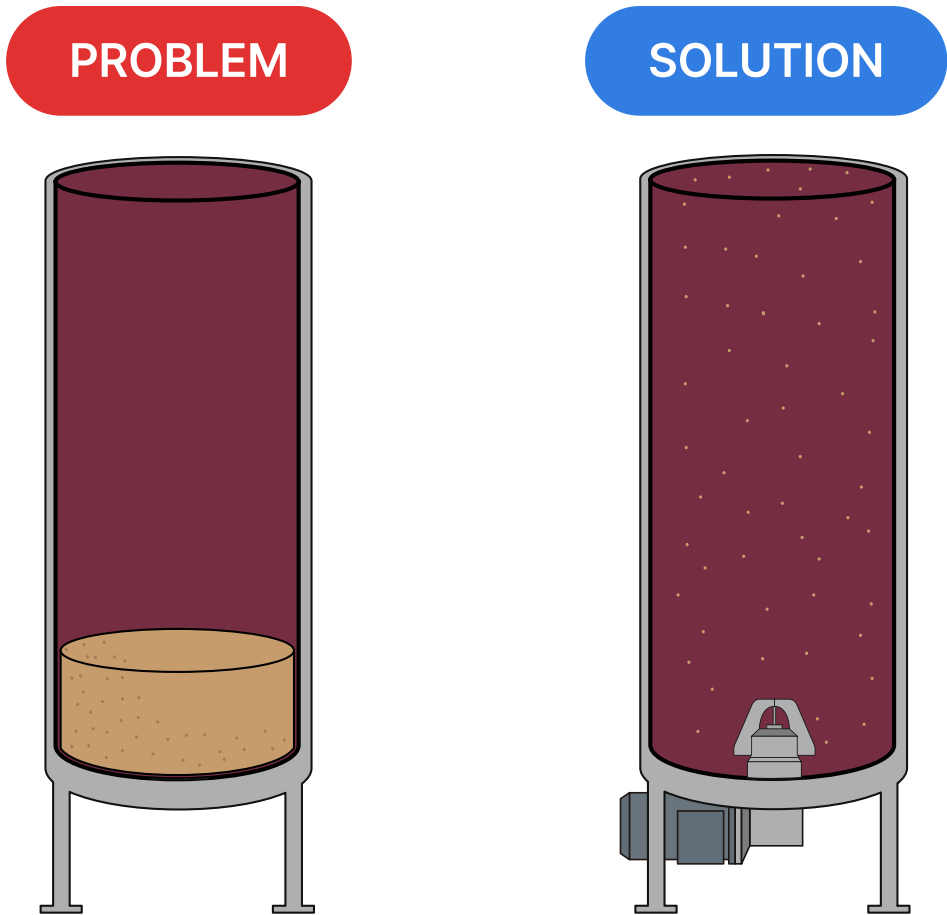
**Operational benefits**

- Stable emulsion quality for improved product uniformity & brand trust
- No need for seal replacement or leakage response—lower maintenance cost
- Meets food safety standards, minimizes quality claim risks

**Results**

- Perfect Homogenization**  
→ Achieved uniform micron-level particle size, delivering smooth, stable, no layer separation premium mayonnaise
- Zero Seal Failure & Leakage**  
→ After magnetic technology adoption: zero seal or leakage incidents, lower maintenance cost, improved uptime
- Enhanced Food Safety**  
→ Fundamental barrier to contamination, HACCP-compliant hygienic production

**Case 9. Sediment Prevention Solution to Maximize Filtration Efficiency in Wine Fining**



**Technical advantages**

- Direct bottom magnetic mixing at sedimentation point
- Powerful upflow design for narrow, elongated tanks
- Stable suspension maximizes filter aid adsorption

**Operational benefits**

- Improved filtration stabilizes wine quality and clarity
- Simplified upper structure reduces maintenance time and risk
- Minimal downtime boosts production efficiency and reliability

**Project Overview**

Company I, a premium wine producer, faced reduced efficiency due to perlite and bentonite sedimentation in filtration tanks, and adopted SEDNA ENG's bottom-mounted magnetic mixer (SDM Series) to keep the sediment suspended effectively and adapt to long tank structures.

**Key Challenges**

- 1. Rapid Sedimentation of Filter Aids**
  - Perlite and bentonite, denser than wine, rapidly settle at tank bottom after dosing
  - Sediment state reduces adsorption surface, lowering filtration efficiency and wine clarity
- 2. Limitations of Tall Tank Geometry**
  - Narrow, tall tanks need high mixing energy to raise bottom sediment to top
  - Standard mixing can't achieve sufficient re-suspension
- 3. Difficult Top Installation & Maintenance**
  - Top-mounted mixers require tank opening and shaft removal for maintenance and cleaning
  - High work difficulty and safety risk; top space needed

**Applied Solution**

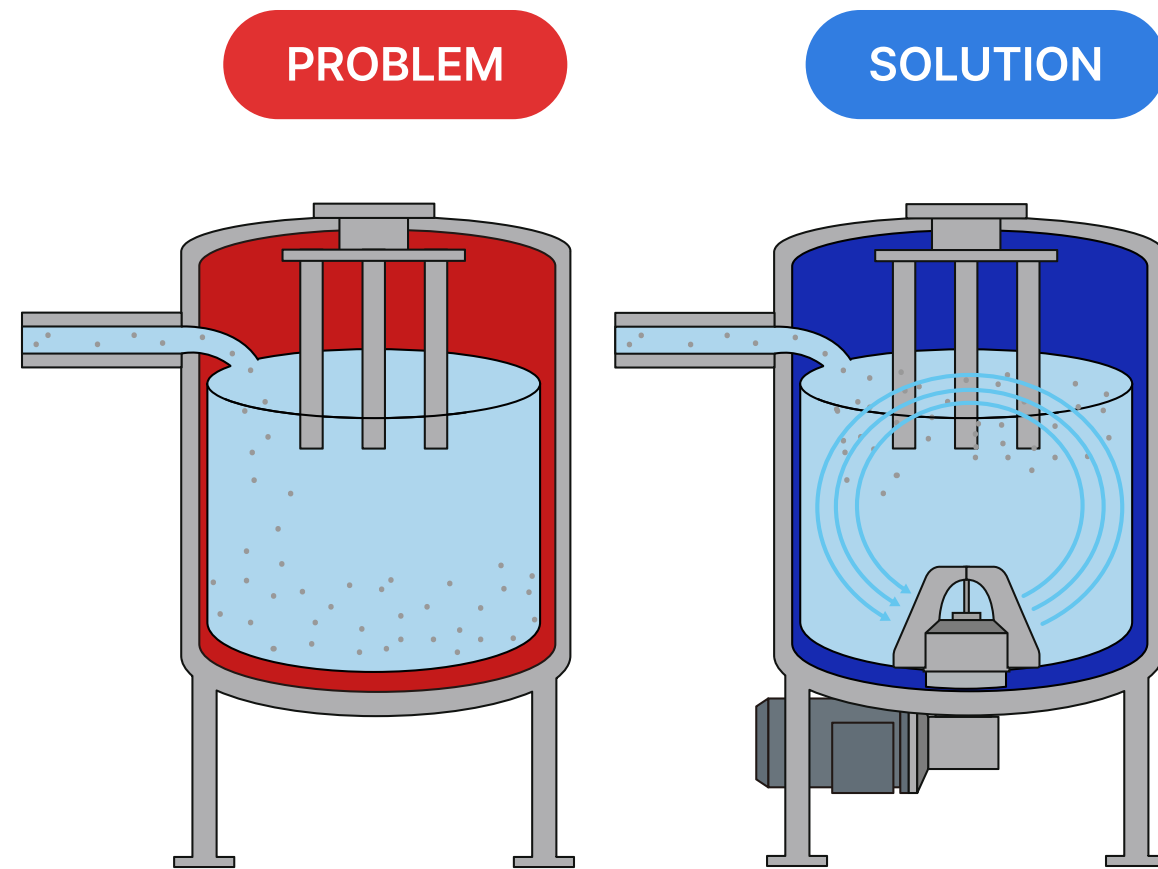
- 1. Bottom-Mounted SDM Magnetic Mixer Solution**
  - Installed SDM Series at tank bottom to provide direct agitation where sediment occurs
  - Mixes at optimal position for most efficient sediment suspension
- 2. Powerful Upward Flow Generation**
  - Impeller chosen to create strong upward flow suited for narrow, tall tanks
  - Continuously lifts perlite and bentonite from bottom for uniform suspension
- 3. Top Space Secured for Easy Maintenance**
  - Moved drive unit to tank bottom, eliminated complex top structures
  - Tank lid opens freely; much safer, easier maintenance and cleaning

**Results**

- Maximized Filtration Efficiency**  
→ Uniform perlite and bentonite dispersion throughout wine, no sediment; maximized adsorption efficiency, producing clearer, higher-quality wine
- Effective Sediment Re-suspension**  
→ Direct agitation from below ensures perfect sediment re-suspension even in narrow, tall tanks
- Improved Operational Convenience**  
→ Top space secured, easier maintenance, reduced safety risks



**Case 10.** Mixing solution for extreme high-temperature, high-corrosion, and high-wear environments in waste battery lithium extraction



**Technical advantages**

- Fully sealed magnetic drive endures high temperatures, strong acids, and heavy wear
- Ceramic-coated wetted parts resist chemical and physical wear
- Long-lasting design with SiC bearings for extreme applications

**Operational benefits**

- Longer agitator life cuts maintenance and downtime
- Safer operation without leaks; better environmental compliance
- Stable operation even in tough recycling environments

**Project Overview**

Company J, a battery recycling company, adopted SEDNA ENG's Extreme-Duty Magnetic Mixing Solution to enable stable lithium hydrometallurgical extraction in highly acidic, corrosive, high-temperature, and abrasive environments.

**Key Challenges**

- 1. Risk of Aggressive Sulfuric Acid Vapor Leakage (Leakage Hazard)**
  - If high-temp sulfuric acid vapor leaks, it corrodes equipment and poses major safety risks.
  - Mechanical seal methods are structurally unfeasible.
  - Complete hermetic sealing is an absolute requirement.
- 2. Material Limits in Highly Corrosive Environments (Corrosion)**
  - Even SUS 316L-based magnetic agitators corrode within 6 months in strong acid, high heat.
  - Frequent replacement causes downtime and high maintenance (OPEX) costs.
- 3. Severe Physical Abrasion from Particles (Abrasion)**
  - Fast-spinning mechanochemical particles and waste lithium directly wear down impellers and bearings.
  - Agitator lifespan dramatically reduced.

**Applied Solution**

- 1. Application of Hermetic Magnetic Coupling**
  - Fully sealed magnetic agitators powered by magnetic force
  - Eliminates sulfuric acid vapor leak risk.
  - Ensures workplace safety and regulatory compliance.
- 2. Advanced Ceramic Coating Technology**
  - Special ceramic coating on impellers and wetted parts
  - Offers much higher corrosion resistance and hardness than stainless steel
  - Prevents both chemical and physical wear
- 3. Extreme-Duty Material & Bearing Design**
  - Uses high-purity SiC (Silicon Carbide) bearings in high-wear zones
  - Particle ingress and abrasion minimized by gap optimization to magnetic force limit
  - Reliable long-term performance in extreme conditions

**Results**

- 200%+ Lifespan Extension Achieved**  
→ Ceramic coating and special bearings extend agitator life from 6 months to over 1 year, greatly cutting maintenance costs.
- Zero Emission & Safety Secured**  
→ Fully blocks hazardous sulfuric acid vapor, ensuring operator safety and environmental compliance with a green process.
- Stable Lithium Recovery Achieved**  
→ Reliable, nonstop agitation in harsh conditions, supporting lithium recovery targets.

## Global partner of SEDNA



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