
sepro
mixing & pumping
Specialists in
Fluid Mixing

Mixing Experience and Technology

Sepro Mixing and Pumping

Sepro Mixing and Pumping draws from over 40 years of experience, selecting and designing agitators, trouble-shooting, and problem solving. Sepro personnel have travelled the world identifying and solving some of the world's most complicated mixing problems.

Whether it's insufficient suspension, gas flooding, impeller blade or shaft failures – we've solved process and mechanical problems from all types of mixing applications.

From mining and mineral production to food and beverage production – Sepro has experience in most applications where agitation and mixing are a part of the process cycle. We have projects in greenfield, brownfield, refurbishing and upgrading existing agitators as well as designing and building new units from scratch.

We provide technical and maintenance support for all our clients with the option to perform site visits for maintenance and commissioning.

When you choose Sepro Mixing and Pumping, you're drawing from a team of experts with direct process knowledge on your application.

What Does Sepro Offer?

TECHNOLOGY

We use proprietary in-house sizing software to develop the most efficient agitation system for all process requirements, drawing on our mixing knowledge and experience to ensure the best solution is delivered to each customer.

Our team uses Computational Fluid Dynamics (CFD) to assist in predicting performance of complex mixing systems. Our mechanical designs are backed up with Finite Element Analysis (FEA) and Sepro quality standards.

RELIABILITY

When purchasing from a vendor, you need to be sure that your equipment won't break on the job.

We use gearboxes from internationally recognized manufacturers such as SEW, NORD, Rossi, Sumitomo, and others. Not only does this make maintenance and service much more accessible for our customers, but this also provides additional assurance for the most mechanically complex elements of the design.

High quality standards are backed up by increased safety factors for gearboxes (min 1.8). All mechanically loaded elements of agitators are checked for material stresses after application of respective service factors using inhouse structural software. We also run FEA analysis for critical elements.

These factors help Sepro maintain their reputation for designing and manufacturing heavy duty mixing equipment for reliable long-term operation. Our field service team is always available to address any questions regarding installation and maintenance of our equipment.

Did you know?

These are two main formulae used for calculation of impeller performance.

Power absorbed by impeller is

$$P = N_p \rho N^3 D^5$$

Flow generated by impeller is

$$Q = N_q N D^3$$

INNOVATION

Sepro has continued to improve on existing designs and continually develop new and innovative solutions. As technical experts in mixing and pumping, we believe that our work will impact the mixing industry by setting a high standard for quality and results.

Research and Development (R&D) plays a vital role in the development of all Sepro products. Extensive studies are conducted to check the performance of each prototype before they are released for manufacturing. Not every idea makes it to the end of the development cycle, but if they do, these ideas often have a large impact on the market.

Sepro will often conduct field or in-house studies to support developing projects or to address challenges of existing installations. We have the capacity to design and test different critical parameters of any mixing system.

Our dedicated laboratory, Sepro Labs, is located in the same building as our head office and provides extensive R&D support and application-specific studies, including sample testing, for our clients. This allows us to analyze our customers' product to tailor the design of a mixing system to the process requirements.

Computational Methods

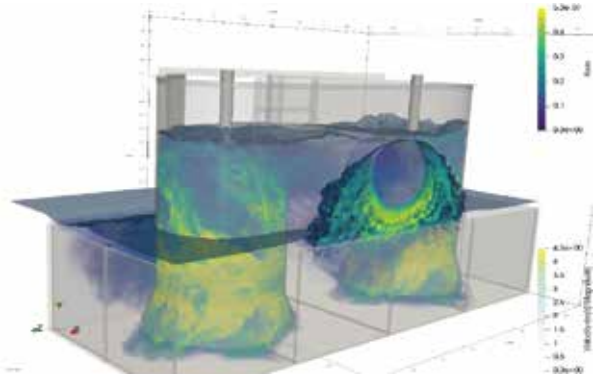
CFD ANALYSIS IS IN THE CORE OF A PROCESS

Computational Fluid Dynamics (CFD) is a branch of fluid

mechanics that uses numerical analysis and data structures to analyze and solve problems that involve fluid flows. It is a physics-based modeling tool for performing numerical experiments. It solves Navier-Stokes equations using advanced Lattice-Boltzmann algorithms on GPUs to produce a detailed process simulation. The results can be presented as a table, chart, picture, or video.

The scope of Sepro simulation study includes free surface flows, gas transfer, complex rheology, chemical reactions, droplet dispersion, fluids blending, residence time distribution, particle coalescence and breakup, and many other processes.

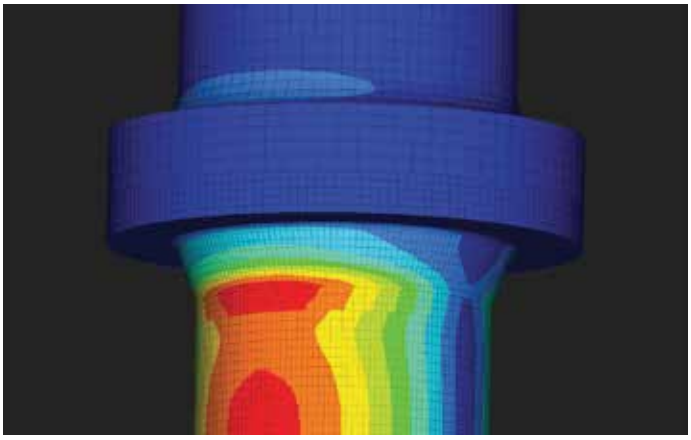
We run CFD simulation for every challenging mixing application to ensure the performance of the mixing system. Advance CFD analysis of clients' system can be provided by Sepro specialists.



We use FEA to determine stress concentrations, and then determine the weld strength that is required.

FEA IS AN INTEGRAL PART OF SEPRO DESIGN

Sepro utilizes Finite Element Analysis (FEA) in the design phase to simulate product performance under various loading conditions, enabling the development of better and more robust products, expediting the design, and reducing cost.



Impellers

Impellers are the heart of the mixer. The key to a successful mixing unit is knowing which impeller to use, and how to use it correctly. There are multiple configurations for different applications.

The **Hydrofoil CHF** design is used for most flow-driven applications including blending and solids suspension.

The **Medium Solidity Hydrofoil CHV** configuration is used for elevated viscosity product where conventional impellers don't work.

High Solidity Hydrofoil CHG impellers are used on gassed applications where conventional impellers lose pumping capacity due to flooding.

SPECIALTY IMPELLERS

Sepro has more than 60 different impeller configurations available to make sure that the impeller meets a specific process requirement. Some of these impellers include:

- ***BAR TURBINE***
- ***PITCH BLADE TURBINE***
- ***RUSHTON TURBINE***
- ***SAW TOOTH***
- ***PUMPER IMPELLER***
- ***FOLDING BLADES IMPELLER***

Mechanical Design

While every mixer design begins with a focus on process requirements, the mechanical design should follow to ensure reliable and long-term operation. Each component should satisfy several design criteria which are specific to the element. For example, the shaft should be able to transfer torque from gearbox and withstand bending moment generated by fluid forces acting on impeller blades. Also, it must be stiff enough to operate outside of the first natural frequency of the assembly (first critical speed).

A combination of sophisticated software, knowledge, experience, and good engineering practice is used for the design of every mixer to guarantee both process and mechanical performance. The agitator is not a separate piece of equipment from the process standpoint, but rather an integral part of the mixing system, working together with the tank, baffles, support, and other components.

Agitator shaft, hubs, blades, and other components are designed using proprietary in-house structural design software followed by FEA analysis of crucial elements. This ensures reliable long-term performance of Sepro agitators.

Sepro Quality Policy

Sepro has a dedicated quality department to ensure that each product leaving our facilities is up to our standards. Our quality policy is communicated, understood, and applied within the organization through display, training, and periodic review.

Sepro follows a Quality Management System (QMS) manual which specifies the requirements for Quality Systems that aim to enhance customer satisfaction. These systems include processes for continual improvement, assurance of conformity to the customer, and applicable statutory and regulatory requirements. To this end, Sepro complies with ISO 9001:2015 international standards.

Types of Design Supplied by Sepro

Large Top Entry — typically used in mineral processing on CIL, Leaching, Neutralization, Cyanide Destruction, Lime makeup and storage and other general mixing duties. They use industrial, helical drives specifically designed for the arduous duties required for agitators in viscous slurries. Units have extended bearings, dry well construction, and robust removable flanged couplings. Shafts can be solid, but more often, tubular, using heavy walled, scheduled pipes. Impellers are Aerofoil low solidity impellers or high solidity gas dispersing impellers.

Bases are heavy duty, fabricated and machined to ensure accurate alignment with the mounting structure. In-tank materials are mild steel, stainless steel, duplex steels, or rubber covered. Installed power can be in excess of 500HP.

Small Top Entry — these are used in chemical and food production, pilot plants and other small-scale projects. This design uses up to 22kW (30HP) drive, in-line or parallel helical gear motors, solid or tubular shaft with installed impellers selected for process requirements. Blades can be welded or bolted to the hub. We use a removable coupling flange or removable clamp flange. Materials of in-tank construction are in mild steel, stainless steel, exotic metals, or rubber covered mild steel. Robust fabricated mounting plate is used to support the agitator.

Side Entry — these mixers are used for large storage tanks or where top entry is not a practical option. For very large tanks multiple side entry mixers can be used in one vessel. They can be fitted with either stuffing box or mechanical seal with shut-off device, which allows a seal replacement without the draining tank's content. They can use a belt drive or gearbox.

Solvent Extraction (SX) — these highly specialized mixers are used in a solvent extraction settler cells acting as pump mixers and secondary and auxiliary mixers. Sepro in-house design program accurately predicts head and flow requirements, balancing the operation point between air entrainment and phase separation. Specialized pumping impellers often made from more exotic materials, e.g. SAF2507, SAF2205, or *high grade* stainless steel. Single and dual impellers systems are available. Our dual impeller systems are comprised of a lower CPM 690 pumper and an upper, up-pumping CHF 322U axial impeller. Dual, or even triple, up-pumping CHF 322U impellers are used in the auxiliary/secondary mixing tanks.

The auxiliary impeller is required to refresh the boundary layers between the dispersed droplets and the continuous phase to enhance the mass transfer and copper yield. This is accomplished by rapidly mixing the phases without introducing additional shear.

Attrition Cells – this type of design is used for solids size reduction and scrubbing process. The Sepro axial flow, high solidity impeller, applied on the attrition section of the cell, is specifically designed for high velocity operation in viscous pulp. The high solidity rate ensures minimum bypassing and maximum shear between the impeller zones.

The aerofoil design limits the radial loss at the tips of the blades, as occurs in pitched blade turbine designs. These radial components at the tips cause turbulence and erosion, resulting in premature blade wear.

The impeller has bolted blades, which are rubber covered. Plates protect the bolt heads, which can be site patched after assembly, with suitable rubber compounds being used to fill the cavities. This site patching can easily be removed for blade replacement where necessary.

Attrition systems require a steady flow through the cells, to maintain retention time and provide stable operating conditions. The Sepro CRF 690 BS is uniquely designed to provide a combination of flow and shear, lifting the flow over the launder baffle, at the required flow rate through the system. *As the flow has nowhere to go but through the upper orifice, retention control is well in excess of 94%.*

DESIGN OPTIONS

Shaft Seal	Stuffing Box, Lip Seal, Vapor Seal, Mechanical Seal (single or double) with different Plans
Construction Material	Carbon Steel, SS304, SS316, Duplex Steel, high Ni, high Cr alloys, special metals (Zr, Ni, Ti, etc.)
Wet End Coating	Natural Rubber, Nitrile Rubber, Butyl Rubber, Halar, Teflon, Neoprene, FRP and others
Hazardous Installation	Different classes, Divisions and Groups of Hazardous Areas and IP requirements
Mounting Base	SEPRO manufactured and machined mounting base to provide integral support to the gearbox and assist with stiffening the mounting beams
Mounting Pedestal	SEPRO designed pedestal to support agitator with a shaft seal
Special Mount	Special support for off-centre angular installations and side-entry installations

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Contact Sepro

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