

Mixing Technologies

Chemineer™ Rotating Mixers

Kenics™ Static Mixers

Greerco™ High Shear Mixers

Prochem™ Belt Driven Mixers



NOV



Chemineer agitators can be used in a variety of applications in any chemical plant

Bringing You Excellence in Mixing Equipment

We are a supplier of mixing solutions and products to customers in a variety of industries throughout the world.

Founded in 1952, we have a wide range of equipment in various markets including chemical & petrochemical, polymers, food & beverage, pharmaceutical, water and wastewater treatment, oil and gas, biotechnology, agricultural processing, mineral processing, and pulp & paper.

We distinguish ourselves from competitors with our pioneering spirit, technological innovations, and willingness to partner with customers on mixer solutions. Our fluid mixing knowledge, supported by the best application software, proprietary mixer designs, and state of the art laboratory, allows us to be the preferred supplier of fluid mixing equipment.

Our leadership position among mixer suppliers is demonstrated by the way we have revolutionized the agitation industry over the years.

The following list describes some of our pioneering events:

- The first static mixer — Kenics
- The first to use Particle Image Velocimetry (PIV) and Computational Fluid Mixing (CFM) to visualize flow patterns
- The first expert design software — AgDesign, AgDraw, AgOrder, Maestro, SmDesign, AgSolver and KmSolver
- The first high efficiency gas dispersion impellers — CD-6, BT-6
- The first manufacturer to produce a gearbox specifically designed for the mixing industry
- Developed ChemScale™ to educate the industry on mixing intensities and publish to users

Customers look to us to solve their mixing challenges. The key to our success is the belief that business prospers as a result of good customer service. The commitment to quality, service and timely response has earned us the trust of our customers.

What do We Offer?

Reliability

We have been at the forefront of the mixing industry since 1952. Many of the original gearboxes are still in service today. We are recognized for producing dependable, heavy duty equipment. As a member of American Gear Manufacturers Association (AGMA), we are known to have time

trusted reliability. If assistance is ever needed with your mixing equipment, we have highly trained field service technicians and multiple service centers available throughout the world to assist with any mixing challenge. Our aftermarket programs and services are designed to solve any problem that may arise on short notice.

Chemineer agitators provide over 20 years of reliable service in most water treatment applications



Diversity

We offer a wide range of Chemineer gearboxes, impellers, seals and more to meet the requirements of any application. Our offering includes a combination of heavy duty large and small top entry mixers with parallel or right angle drives, direct drive or gear reduced. We are more than just rotating agitators. In addition to Chemineer, we offer the Kenics, Greerco and Prochem product lines. Kenics offers a wide variety of static mixers and heat exchangers. Greerco offers many high shear products including pipeline mixers, colloid mills and homogenizers. Prochem offers our belt driven side and top entry mixers suitable for many applications. We have facilities around the world, with locations in Ohio, Massachusetts, United Kingdom, Singapore, China, Austria, Mexico and representatives covering various key territories throughout the world.

Flexibility

Does your process require a customized solution? Let our experienced application engineering team design the equipment to enhance your process. We offer many standard options, and we also have the ability to modify our equipment to meet your specific needs. With over 60 years of agitation

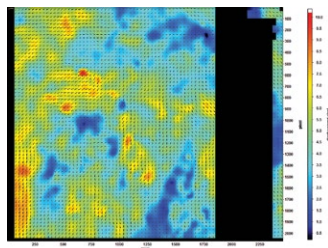
experience, we can customize a solution for any mixing application.

Technology

We use the latest in data evaluation and mixing research to provide customers with the proper equipment. Computational Fluid Dynamics (CFD), Laser Induced Fluorescence (LIF) and Digital Particle Image Velocimetry (DPIV) assist our engineers to better predict the performance of any mixing process. We use our state of the art on site laboratory to develop and test proper agitation systems for even the most complex processes.

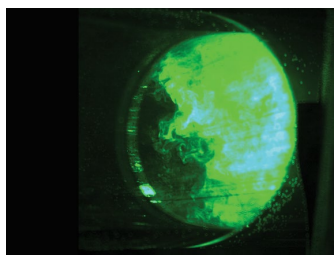
Innovation

Our application engineers and representatives use technologically advanced proprietary software to design a customized mixing solution for every process. Our website, www.nov.com/mixing, provides customers with direct access to all of our product lines, the latest in mixing technology, and our rep locator. Our company does not merely sell fluid mixing equipment, we sell process solutions and answers to suit all of your needs. We want our customers to walk away understanding WHY our equipment and mixing solutions are the best in the industry!



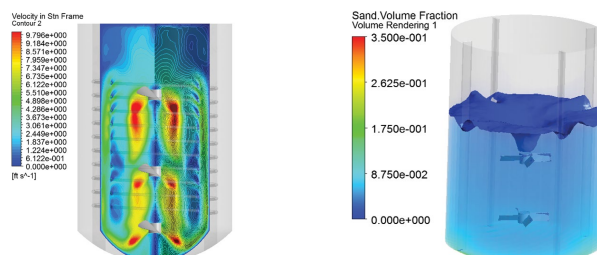
Digital Particle Image Velocimetry (DPIV)

DPIV keeps us on the forefront of mixing technology. DPIV uses a pulsed YAG laser to illuminate neutrally buoyant fluorescent particles. The result is a visual description of the agitated system, allowing engineers to see the actual flow patterns within the system. When used in conjunction with Computational Fluid Mixing, DPIV provides the most accurate application evaluation possible.



Laser Induced Fluorescence (LIF)

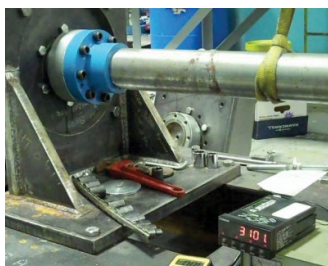
LIF is a measurement technique which enables the direct measurement of the degree of mixing. A laser beam is spread into a sheet light and projected through a clear pipe or vessel to illuminate a fluorescent dye. Images of the mixing are analyzed for blend time for agitators or COV for static mixers. This is used in product development, process research and application validation.



Computational Fluid Mixing (CFM)

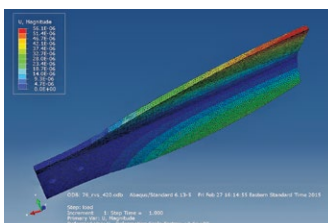
CFM is a powerful fluid flow modeling tool that provides visual analysis of agitated systems. CFM uses mathematical fluid flow models to analyze blending and motion, solids suspension, chemical reaction and heat transfer processes.

Our application engineers can produce two dimensional CFM simulations for rectangular and cylindrical tanks as well as turbulent and laminar flow static mixers. Three dimensional CFMs can be designed for non-symmetrical applications such as multi-reaction designs. The Chemineer Expert Design System (CEDS) can produce CFM simulations in as little as 15 seconds.



Mechanical Testing

Continuous research is important for process response and mechanical design. Using full scale vessels with strained gaged shafting and impeller, hydraulic forces are studied. These results are used in static and fatigue based FEA simulations as well as design calculations.



Design Tools and Lab Capabilities

R&D Facility

Our laboratory is located on the same campus as our Ohio manufacturing facility. Our laboratory provides research and development support as well as application specific customer testing.

The facility strives to keep Mixing Technologies at the forefront of innovation. Laboratory and research studies are used to enhance the Chemineer Expert Design System (CEDS) to provide continuous improvements to existing designs, to develop new products and application solutions, and to improve your process results. Our cutting edge technical research is presented at mixing seminars and conferences throughout the world.

Customer Test Facility

Many applications require a more in-depth analysis of the fluid mixing challenge. We have a

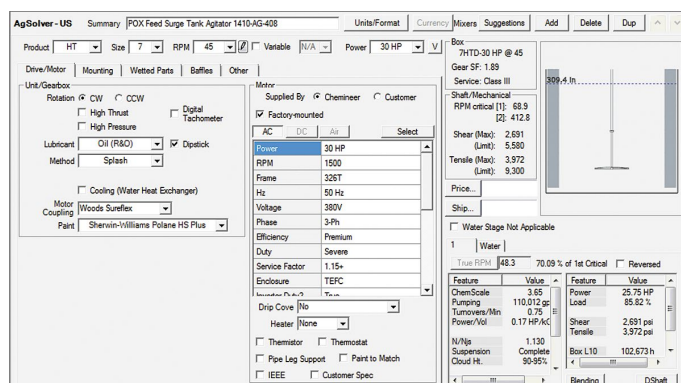
dedicated customer testing center inside our R&D facility. This center has the capability to scale down a process and model it with our various mixing technologies.

Chemineer Expert Design System (CEDS)

Our design program consolidates fluid flow system design and mechanical agitator design into one program. We treat every single inquiry as a unique application. Our revolutionary

software gives your local representative the power to simultaneously evaluate your process, propose a mixing solution, and verify the mechanical integrity of the design with a single program.

We apply CEDS, CFM, LDA, and DPIV to consistently improve our product line and application design procedure. The result is a more efficient, reliable, and economical mixing solution that is backed by years of experience.



Mixing Technologies maintains high quality control by manufacturing all products in house. In house manufacturing capabilities include welding, machining, forming, testing, and assembly.



We take pride that we are the only mixing company that designs and manufactures its own gearbox specifically suited for mixing applications. The Chemineer brand has earned a reputation over the years for its expertise in process design for all mixing applications and wet end technology. Those components coupled with the gearbox, form the basis for the production of quality, durable and reliable agitators, which are the trademark of Chemineer equipment.

Our manufacturing locations are strategically located to support the four brands we produce.

- Dayton, Ohio—our flagship factory where we produce all four brands under the Mixing Technologies name. Here we produce Chemineer top and

side entering agitators and impeller systems, Prochem belt driven top and side entry agitators, Kenics static mixers and Greerco high shear mixers

- Harvey, Louisiana—produces some of the Kenics static mixer projects and our Kenics heat exchangers, utilizing their ASME code welding capabilities
- United Kingdom—this is the location of our European manufacturing facility. In this location, the Chemineer, Kenics and Greerco brands are produced and distributed throughout the world including Europe, Middle East, Far East, Australia, and Africa.
- China—our manufacturing facility in China manufactures the Chemineer branded products and serves the Chinese market.

Our high quality standards are enforced at all of our manufacturing facilities. Our reliability and technology are achieved and maintained through the following programs:

- Quality assurance provides formal written procedures that guide the manufacturing processes
- Standard industry practices are employed to assure compliance with customers' specifications
- Material inspection and vendor qualification are in place to eliminate defects and rework
- NC machining is utilized for precise fit and tolerance
- Each rotating piece of equipment is run tested
- Every component is dimensionally checked before shipment

Application Capabilities



Chemicals/Polymers/Plastics

We have designed agitators for thousands of different applications over the past 60 years. This experience along with our advanced design programs allow us to effectively size equipment in any application. With dozens of alloys available for use as wetted parts, and a large variety of sealing options, our agitators can be adapted to work with nearly any process. Continuing advancements allow us to stay ahead of the competition. Our XE-3 impeller provides an efficient design that produces the same flow characteristics at lower power levels. We are also able to provide complex impeller system using various impeller technologies to optimize your specific application.



Water and Wastewater Treatment

We are able to offer both rotating and static mixers for Water and Wastewater Treatment applications. We can supply an entire package using a combination of these different style mixers that will give the most efficient design and effective results. We offer a wide range of options like the RL-3 ragless impeller, up pumping designs or the space saving UltraTab™ to provide you the latest technology and most optimized designs.



Pulp and Paper

We use a thorough, specific, design process for all applications in the Pulp & Paper industry using the basis of a process number. The process number design method has proven to efficiently size our agitators for complex Pulp and Paper applications. Chemineer and Prochem branded products can offer belt or gear driven side entry or top entry options. Developed in our R&D facility, the WSE-3 impeller has the highest efficiency of any side entry impeller on the market. Using the WSE-3 will lower capital and operating costs since it draws less horsepower than competitive designs at equal mixing intensities.



FGD

Gas dispersion is extremely important in SO₂ removal and oxidation processes of FGD plants. Our vast installation base in FGD and gas phase chemical reactors provides a wide array of experience in all industries pertaining to gas dispersion. This leads to a more efficient and more reliable process solution to any oxidation system. Our solids suspension procedures, based on particle settling velocities, are second to none in the mixer industry.



Biotech/Pharmaceutical

Our biotech products are suited to work in the most sterile environments. Highly polished wet ends and debris catching mechanical seals are provided on most applications. Steam-in-place and clean-in-place capabilities can be provided as standard options as well as FDA approved mechanical seal components.

The most critical component to certifying your process lies in the documentation package submitted with purchased equipment. We can provide a submittal package structured around the ASME BPE 2012 code to meet all necessary requirements. This equipment turnover package includes material certifications, elastomer and seal component certifications, polishing test reports, quality assurance testing and more—everything you need to certify your new mixer!



Mineral Processing

Our industry leading drive, impeller, static mixer and heat exchanger technology allows us to design and optimize the best solutions for your specific requirements. Whether you have a high temperature, high pressure autoclave or a general purpose blend tank, we have the equipment to handle these drastically different applications with confidence and reliability. Our products will withstand the harshest conditions, delivering the consistent performance you need.



Oil and Gas

We have equipment installations and experience throughout various upstream, midstream and downstream processes. Our expertise allows us to provide optimized and reliable mixing equipment for these often demanding applications. From exploration to downstream processing, our equipment blends materials and suspends solids into homogeneous mixtures. Our equipment is often required for accurate measurement in transfer applications or mixing drilling mud.

Aftermarket Parts and Services



Highly trained field service technicians can install your mixing equipment to quickly get your process up and running

We utilize a comprehensive network of manufacturing resources, inventory investment, suppliers, support personnel, and service centers to maximize the uptime of our customers' mixing processes.

We offer fast delivery of standard components through on site and supplier inventory, including gearboxes and components, mechanical seals, bearings, and gears. Many of these standard components are available for same day shipment or even same day delivery when required. Raw materials are generally available for planned outages or emergency breakdowns.

Our field service technicians are available to assist with agitator installations and repairs. Training seminars are available to educate our customers on agitator operation, evaluation, maintenance, and repair.

All field service technicians are trained in lockout/tagout, confined space entry, and fall protection by an OSHA certified safety instructor. Condition monitoring and vibration analysis services are also available.

As more local services are required, an authorized service center is located near you. Authorized service centers are fully trained and certified to provide agitator evaluations and repair and replacement services backed by the factory, providing the assurance that your agitators will be repaired to our new equipment standards and specifications.

Technical sales specialists are available during normal business hours, providing over the phone technical support for any of your mixing equipment needs.

Emergency services are available 24/7 by calling (937) 926-1724.

We offer trade in credits for select Chemineer and competitive gearbox models when a replacement is purchased. Certified refurbished gearboxes are available, offering a cost effective alternative when replacing and upgrading existing equipment.

Retrofits for obsolete Chemineer and competitive drive units are available. Modernizing your agitator fleet greatly increases the availability of replacement parts. Retrofits for wetted parts are also available. Upgrading impeller systems to newer technologies will prevent or delay equipment failures, and may also maximize the efficiency or capacity of your processes.



Model 20 HT/GT Mixer

With a high efficiency gearbox in right angle and parallel shaft configurations, modular design and a wide range of speeds, these agitators provide outstanding application versatility.



MR Mixer

Metric unit that combines quality, durability, and economy to supply unbeatable value in mixing equipment for the chemical, water and general processing industries.



HT Mixer

Known for its reliability and flexibility, the HT can be used for any top entry application, simple or complex, up to 1000 HP. We have over 75,000 in service today.



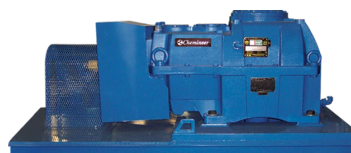
QED^{Plus} Mixer

Value priced, right angle mixer with a dry well and proprietary worm gear designed specifically for mixing.



HS Mixer

Side entry agitator that is a great alternative to top entering selections for extremely large tanks or when limited headroom constraints are present.



HTM Mixer

Available for extremely large applications in a right angle or parallel drive with all the same options as the HT.



BT Mixer

Biopharma mixer used in any sanitary application. We offer an extensive submittal package to meet the latest FDA requirements.



XP Mixer

Portable mixer that is available in a bung or clamp mounting arrangement. Most standard designs can be shipped within 48 hours.



DT Mixer

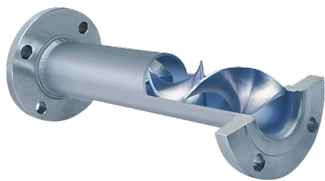
Small mixer that has many sealing, drive, and wetted parts options and provides long term, trouble free service. These units are also readily available with right angle or parallel drives.



QC Tote Mixer

Tote mixer with a quick connect drive that can be modified to fit any tote.

Kenics™ Products



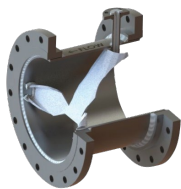
KM Static Mixer

With the longest list of installations in the industry, the detailed design capabilities of this mixer offer guaranteed mixing results.



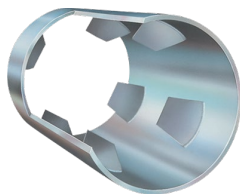
KMX-V Static Mixer

Cross-stream mixing and flow splitting allow this unit to handle even the most extreme viscosities and volumetric ratios in the laminar flow regime.



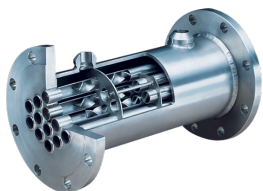
UltraTab Static Mixer

Designed for low viscosity mixing such as chemical dosing, water treatment and desalinization applications.



HEV Static Mixer

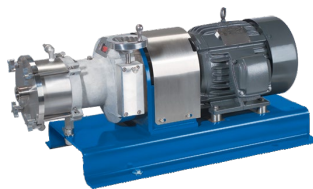
With the lowest pressure drop per degree of static mixing available, this is ideal for low viscosity liquid or gas blending applications.



Heat Exchanger

Edge-sealed elements dramatically improve heat transfer coefficients in high viscosity applications.

Greerco™ Products



Colloid Mill

Specifically designed to disperse solids and liquids into a carrying fluid, producing stable emulsions to the sub-micron particle range.



Homogenizer

High speed high shear batch mixer ideal for fast blending and homogenizing of materials through a wide range of viscosities.



Pipeline Mixer

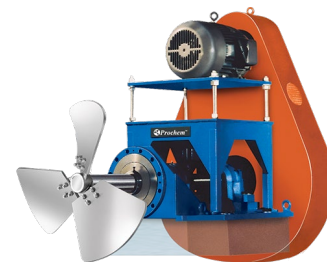
Designed for inline, continuous high shear homogenizing, mixing, emulsifying and rapid dispersing.

Prochem™



MD Mixer

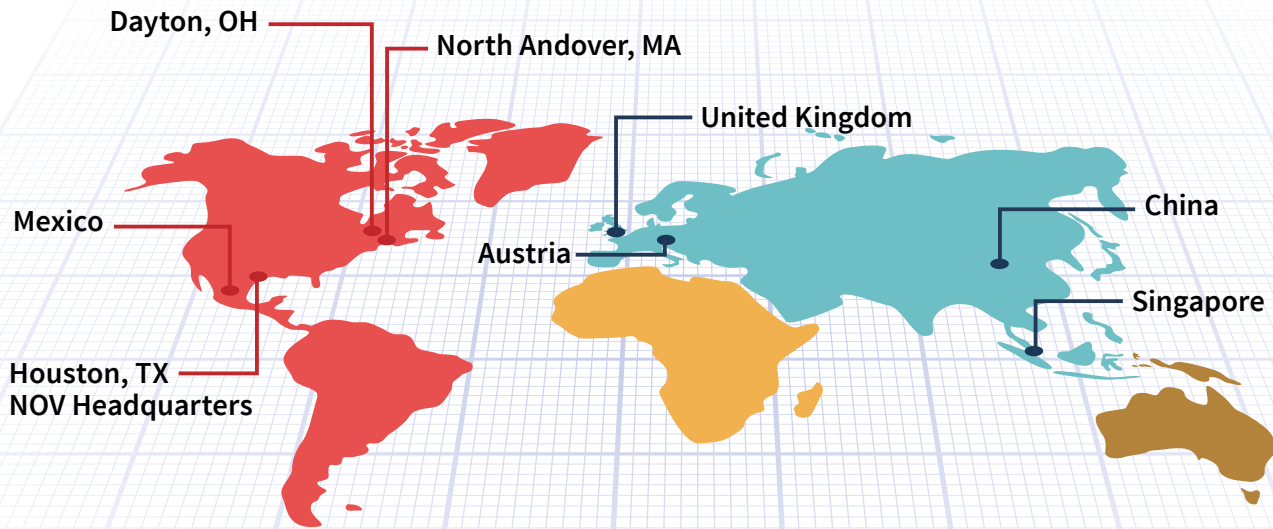
Side entry belt driven with a modular bearing cartridge design allowing longer operating runs between maintenance periods.



PB Mixer

Combines the proven features of the MD series with the simplicity of the pillow block bearing design.

Sales representatives have territories throughout the world and are supported from these facilities:





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