

Pharmaceutical and Biotechnology

SANITARY MIXERS BY LIGHTNIN



A World Leader in Industrial Mixing since 1923, Lightnin has 90 years of unrivaled experience in industrial mixing technology, process knowledge, and technological innovation.

Lightnin enjoys a global reputation for durable, long-lasting mixers, agitators, aerators, and flocculators for fluid process systems. We offer a full spectrum of impeller designs for diverse applications. In addition, we offer a worldwide service network, mixer repair, gearbox repair, and replacement parts programs. Look to Lightnin for knowledge, technology, and service excellence.

SPX FLOW, Inc. (NYSE:FLOW) is a leading manufacturer of innovative flow technologies, many of which help define the industry standard in the market segments they serve. From its headquarters in Charlotte, North Carolina, it operates a sales and support network, centers of manufacturing excellence, and advanced engineering facilities, throughout the world. Its cutting-edge flow components and process equipment portfolio includes a wide range of pumps, valves, heat exchangers, mixers, homogenizers, separators, filters, UHT, and drying technology that meet many application needs. Its expert engineering capability also makes it a premium supplier of customized solutions and complete, turn-key packages to meet the most exacting of installation demands. Incorporating many leading brands, SPX FLOW has a long history of serving the food and beverage, power and energy, and industrial market sectors. Its designs and engineered solutions help customers drive efficiency and productivity, increase quality and reliability, and meet the latest regulatory demands. In-depth understanding of applications and processes, state-of-the-art Innovation Centers, and advanced pilot/testing technology further assist in optimizing processes and reducing timescales to reliably meet production targets. To learn more about SPX FLOW capabilities, its latest technology innovations and complete service offerings, please visit www.spxflow.com.

Lightnin Expertise meets your Sanitary needs

Utilizing our experience and technical expertise, we engineer products to meet the demands of sanitary equipment for Pharmaceutical and Biotechnology and other industries where clean design is critical. For virtually any pharmaceutical, biotech, personal care, animal care, or medical application from just a few liters to fermentation reactors in excess of 120 m³ (31,700 gal), we have impeller and mixer drive solutions to meet your needs.

The standards for current Good Manufacturing Practices (cGMP) set by the FDA are more stringent than those for the general Chemical Industry. As a supplier of equipment to cGMP facilities, Lightnin has instituted several procedures and systems to assist engineering contractors, system suppliers, and end-users in meeting these requirements, including:

- A team of in-house experts with experience in aseptic manufacturing: Lightnin's team of experts includes people with knowledge in processing, mechanical design, quality assurance, production, installation, service, and documentation.
- An order plan specific to aseptic mixers: On large projects, a Lightnin team of experts led by a project coordinator oversees the entire project. Internally, Lightnin creates a detailed project plan that controls the order from order entry through shipping to assure that all specifications are met exactly.
- Enhanced finish standards and verification: Lightnin's standard finishes are defined both by Roughness Average (Ra) and by whether the raw material is cast or fabricated. Verification of specified finishes is available in the QAD.
- Compliance to ASME BPE (American Society of Mechanical Engineers BioProcess Equipment).



PROCESS, QUALITY AND TECHNOLOGY

We can match our many years of experience in mixing technology to the rheology of your product to ensure you obtain your process needs. But it doesn't end there. We recognize the importance of material traceability and can provide a comprehensive QAD package with the mixer. We can include: MTRs, FDA Conformity, CE Conformity, PMI, Quality Plan, Welder Qualifications and Surface Finish Certificates

For applications where clean-in-place (CIP) or sterilize-in-place (SIP) we design the features of the equipment to ensure your cleanliness requirements can be met. Engineered to meet your needs, we can offer:

- Crevice free design to allow clean-in-place (CIP) services
- Highly polished surfaces typically 0.5µm Ra (20µin Ra) or better and electropolishing where needed
- Hygienic shaft couplings
- Hygienic impeller connections and blade joints
- Self-draining surfaces
- Hygienic, (GRAS) mechanical seal designs with FDA compliant materials
- Material Certification and Quality Assurance Documentation
- Accurate fixed or variable speed drives with shaft speed monitoring



Select SPX FLOW's Mixing equipment and you get more than an efficient and cost effective process. You get over 90 years of experience in superior processing technology. We were amongst the first to use computational fluid dynamics (CFD). This experience has enabled us to design and develop products specifically for pharmaceutical and biotechnology into the 21st century.

Our laboratory is a standard for the business, and allows us to optimize your process, from pilot to full-scale testing. Your benefits are higher reliability, lower production costs, greater output, resulting in higher profits.

Processing.....we perfected it.

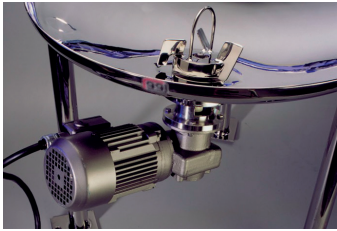
Lightnin Knowledge applied to Sanitary Industries

For these industries we can offer equipment with an all stainless steel construction and features designed to meet ASME BPE Standards and other industry standards, our mixers can be used in a variety of sanitary mixing applications and extend into other industries outside of Pharmaceutical and Biotechnology. We have clarity around the key requirements for success; Cleanability, Containment, Contamination Resistance and Traceability.



Reliability By Design

SPX FLOW understands that when it comes to efficient process plant operations, equipment reliability is of paramount importance. As a long-standing member of AGMA (American Gear Manufacturers Association) SPX FLOW's Lightnin brand recognizes that multi-purpose commercial gearboxes are poorly suited to Agitator service. For more than 50 years the Lightnin products have utilized proprietary, purpose designed agitator gear drives to ensure dependability and lowest cost of ownership. SPX FLOW's agitator drive designs are continually evolving to take advantage of latest materials technologies and manufacturing techniques.



MAGNETIC COUPLING, SEAL-LESS MIXER

- Seal –less technology: Magnetically coupled impeller. No shaft entering vessel.
- Food grade Ceramic product lubricated bearings, other bearing types available
- Electro polished 316SS Hyperflo impeller (0.2µm Ra) for easy cleaning
- Tri-clover flange mount
- Flexible power and speed ranges and globally compliant.
- OSHA & CE compliant, Meets ASME BPE

LIGHTNIN GP2 & LIGHTNIN LB2 - BENCH TOP AND SMALL INDUSTRIAL MIXERS

- Brushless DC motor which is maintenance free and has overload protection
- Sealed Keypad that is easy to use, intuitive and water tight
- Through shaft design making impeller adjustment easy
- Safety Approved, Tested to IEC 61010-1-04 2nd edition and -2-0-0451
- IP42 Environmental Rating



STAINLESS STEEL H-SERIES - SMALL AND LIGHTWEIGHT STAINLESS STEEL MIXER

- Meets EC1935 Standards for food machinery, OSHA & CE compliant, ATEX (2G IIc T4)
- Stainless Steel housings with Clamp Mount, Beam Mount, Tri-clover flange mount
- Stainless Steel Air motor



NETCO S-SERIES - ALL STAINLESS STEEL CONFIGURABLE MIXERS

- Meets 3A and EC1935 Standards, OSHA & CE compliant
- Clamp Mount, Beam Mount, Plate Mount, ANSI or DIN or Tri-clover flange mount
- Stainless Steel IEC TEFC, XP Inverter ready or Air Motors
- Cast Stainless Steel housings
- Single Mechanical Seal w/ UPS Class VI elastomers, Lip Seal available



SR - LOW HEAD ROOM STAINLESS STEEL MIXER

- Meets ASME BPE, OSHA & CE compliant
- ANSI, DIN or Tri-clover flanges
- IEC or NEMA motors TEFC 0.37kw (1/2HP) 50/60Hz. Stainless Steel available
- Stainless Steel Gearbox drive,
- Hygienic in tank screwed couplings available
- Food grade Single Mechanical Seal w/ UPS Class VI elastomers



SSI / SSO - ALL STAINLESS STEEL CONFIGURABLE MIXERS

- Meets ASME BPE, OSHA & CE
- Beam Mount, Plate Mount, ANSI or DIN or Tri-clover flange mount
- Stainless Steel IEC or NEMA motors TEFC, XP or Air Motors. ATEX motors Epoxy painted
- Stainless Steel Polished Cast housings
- Food grade Single Mechanical Seal w/ UPS Class VI elastomers, Lip Seal available



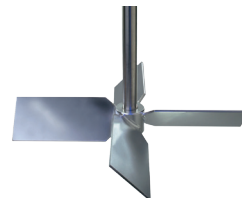
Impeller Technology for Pharmaceutical and Biotechnology

Lightnin has a full range of impellers for each mixing step of the process. We match our impellers to the specific duty accomplishing optimized and guaranteed results. Our impellers can be used in combination to allow multifunctional processes in production and pilot plants.

A200

Recommended for low to medium viscosity blending and solids suspension applications:

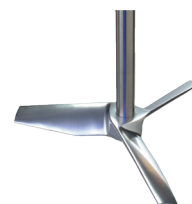
- Classic 45 degree pitch bladed turbine (PBT) design
- Although replaced by the A510, this impeller still is applicable in cases where some fluid shear is required (e.g. solids make down and viscous applications)
- Can be customized with varying blade widths and blade angles and with 2, 4, or 6 blades (A201)
- Hygienic bolted construction is available for tanks with small diameter manways



A310/A510

Low blade solidity hydrofoil, recommended for low viscosity blending and solid suspension applications:

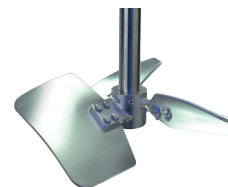
- Varying tip chord angle allows for further optimization of mixer selection
- Maximizes flow generation while minimizing fluid shear
- The A310 is standard for all Lightnin gear drive portable mixers
- Generates the same flow as a pitched bladed turbine (A200) for 60% of the power and 50% of the torque
- Hygienic bolted construction is available for tanks with small diameter manways



A320

High solidity hydrofoil design recommended for high viscosity blending applications:

- High efficiency wide bladed impeller design with high flow/power ratio
- Improved axial flow at low Reynolds numbers ($N_{re} < 500$) reduces power requirements up to 50% over a pitch bladed turbine (A200) for equal blending performance
- Has also been successfully used for gas handling applications
- Hygienic bolted construction is available for tanks with small diameter manways



R135

Parabolic radial flow impeller recommended for high shear mixing and gas dispersion applications:

- Optimized parabolic blade shape improves gas handling ability by 20% and reduces torque requirements by 40% over an R130
- Radial design provides shear to achieve good contacting for liquid-liquid and gas-liquid dispersions and emulsions



MAGNETICALLY COUPLED IMPELLER

Recommended for stirring low viscosity fluids to maintain flow:

- A magnetically coupled impeller that permits mixing without the need of a shaft entering the tank and is completely seal-less – it does not require a mechanical seal.
- Choice of bearing type to suit your application
- Patented Hyper-Flo bearing system to allow CIP fluids to clean the bearings
- Integral lifting loop permits easy installation and removal of the impeller





ENHANCED FEATURES FOR IMPROVED PRODUCTION PROCESSES

To meet the need for cleanliness in reducing the sites where bacterial action can initiate, many features can routinely be added in to the design of our Lightnin mixers. Such features include:

- Mechanical Polished shaft, impellers, flanges and seal areas to reduce the hang-up of product on wetted parts. This can be combined with electro-polish if required
- Crevice free designs that eliminate 'bug traps' from interface points
- Self-draining features on wetted parts on top and bottom surfaces. This assists the prevention of product hang-up on the wetted parts and also assists with Clean-in-Place (CIP) systems
- Mechanical seals with sanitary features that can be provided with FDA compliant material requirements for faces and elastomers. Mechanical seals can also be provided with a debris well to capture any seal face wear product, this when combined with appropriate CIP regimes can enhance seal cleaning.
- We have special Impeller coupling designs that allow cleanable impellers that can be adjusted on the shaft. Being able to adjust the impeller up or down on the shaft can be an important feature for pilot plants and on universal systems for production.

KNOWLEDGEABLE ABOUT YOUR NEEDS

Pharmaceutical and Biotechnology require a high degree of process understanding to achieve optimized results

Understanding and optimizing the results is one part of the production needs; it is also essential to understand the operational requirements of the production or pilot plant to ensure the product being produced meets the expectations of consumers.

At SPX FLOW we understand the production needs of the equipment that serves these markets. We offer hygienic clean designs that meet the current good manufacturing practices (cGMP) for the food industry, Personal Care, Home Care all the way through to the exacting demands of the Pharmaceutical and Bio-science industries including FDA and ASME BPE conformance. We can offer a solution that meets your production needs while offering the most economical solutions.

Matching our process and product knowledge with your requirements, we are also able to provide you with the Quality Assurance Documentation (QAD) that you need to support your processes and validation requirements. Depending on the product and the level of documentation required for production, we can offer an economic document package or we can tailor the QAD package to meet your validation needs.

Documentation that can be offered includes:

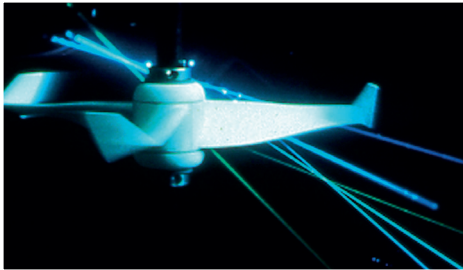
- Material Conformity Certification
- Food Grade Certification
- Polish Certification
- Passivation Certification
- Weld Procedures and Qualification to required Codes
- FDA Compliance

Other forms of documentation are available.



CONSULTING SERVICES

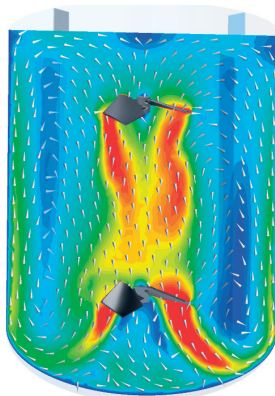
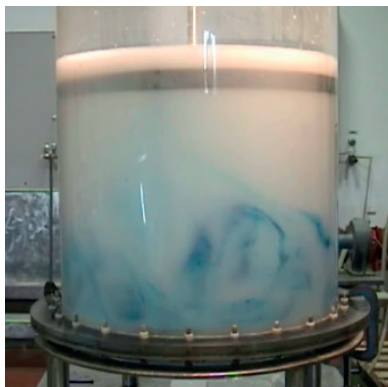
SPX FLOW's Lightnin brand has long supported the need of providing full service mixing support to our valued customers. In today's business environment of "doing more with less," local resources at your operation have been stretched or eliminated. At SPX FLOW, we recognized this and have increased the level of process support available to our customers. Evaluation and resolution of our customer's mixing issues has been a core strength for many years at our Lightnin facilities.



You can leverage the resources and knowledge base of Lightnin by optimizing your mixing processes and solving any mixing problems. Lightnin's Process Technology Laboratory enables this support to be efficiently executed to minimize your costs.

Lightnin's team will evaluate your existing mixer design and process goals to determine opportunities for improvement. Lightnin will team with your technical group to reduce the time and expense for developing new mixing applications.

Lightnin's experts can assist in the specification of mixer design, tank internals, feed stream locations and product draw-off position to optimize your operation. Lightnin has extensive experience in scaling up lab designs and achieving guaranteed full-scale performance.



Lightnin's consulting work starts with a discussion of your needs and process information. Then a proposal is created to define the project scope, responsibilities, deliverables, cost and schedule. A path forward is then concisely and clearly written, and agreed to by both parties. Bi-directional confidentiality agreements are frequently a necessary and common course for doing business.



3 Ways to Test for the Best

As the world's premier mixing expert, we serve a tremendous variety of industries and applications - everything from pharmaceuticals to minerals extraction operations. And the testing involved with each of these applications is just as diverse. Flexibility is key to success. That's why we specifically designed the lab to accommodate a broad range of tests.

1. We'll test your actual materials. We'll perform a variety of scaled-down tests using your actual materials. No matter what your mixing process is - gas dispersion, slurry suspension, paper stock agitation, blending, or nearly anything else - we'll analyze it for optimal flow and shear. That's the best way to find out in advance which impeller will maximize not only mixing, but also the process itself.

2. We'll test an acceptable simulant of your material. While actual materials' testing is preferable to ensure optimum mixing performance, we realize it isn't always possible. So, at the Lightnin Process Technology Laboratory we offer a number of options for materials and process simulation, or computational fluid dynamics (CFD) modelling. We also conduct tests in water to measure mass transfer coefficients and flow/shear ratios and then scale to your process.

3. We'll run full-scale performance tests for you on or off-site. If your application demands it, Lightnin provides scale-up testing capabilities in our test tanks. Or, if necessary, we'll come to your location for full-scale testing to determine the best configuration for your actual process.

Lightnin Mixers and Impellers

PHARMACEUTICAL AND BIOTECHNOLOGY

SPXFLOW

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SPX FLOW, Inc. reserves the right to incorporate our latest design and material changes without notice or obligation.

Design features, materials of construction, and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing. Please contact your local sales representative for product availability in your region. For more information, visit www.spxflow.com.

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