



The Superior Biological Nutrient Removal Process

**PHILADELPHIA
MIXING
SOLUTIONS**



**MIXING
SOLUTIONS
LIMITED**

The most efficient, reliable, long-lasting wastewater mixing solutions



Better Biological Nutrient Removal Performance at a Lower Cost



Applications

- Biological Nutrient Removal (BNR)
 - Anaerobic Mixing
 - Anoxic Mixing
- Aeration
 - Low Speed Surface Aeration
 - Lagoon Aeration
 - Submerged Turbine Aeration
 - Draft Tube Aeration
- Digesters/Fermenters
- Sludge Holding Tanks
- Rapid Mixing
- Flocculation

Philadelphia Mixing Solutions, Ltd. wastewater mixer systems provide efficient, reliable performance for any need. From 200+ horsepower surface aerators to 1 horsepower anoxic and anaerobic mixers, our impeller technology combines high flow, low power, the right amount of shear and ragging resistance to meet permit requirements with minimal operating expense.

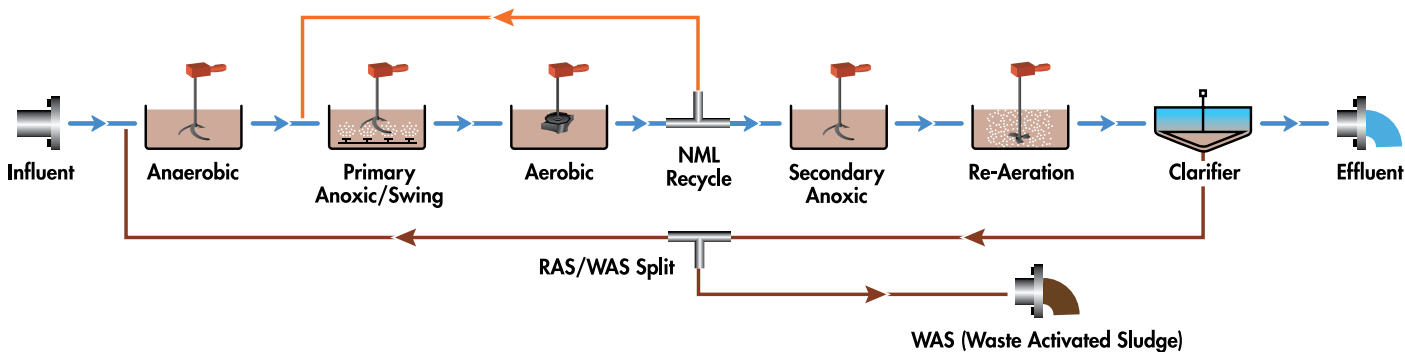
With thousands of wastewater mixer installations in facilities around the world, and the ability to model complex mixing and process scenarios, we bring tremendous experience and cutting-edge technology to bear on each individual application to ensure optimal performance with a long design life.

Philadelphia Mixing Solutions delivers superior biological nutrient removal (BNR) for waste treatment facilities with the ARI-2 Anoxic Mixing System. The new system produces superior nutrient removal with lower capital outlays, reduced energy consumption and improved reliability and maintenance cost control through the life of the waste treatment facility.

Superior biological nutrient removal performance is delivered by improving the mixing performance of the equipment installed on continuous flow anaerobic, anoxic and aerobic mixing trains.

The anaerobic and anoxic mixing processes must maintain optimal solid suspension in the tank while maximizing surface contact with the anoxic bacteria that utilize the nutrients in the waste stream. This process must occur in an environment of low surface turbulence to reduce air entrainment that could reduce oxygen-free anoxic activity.

In the aerobic phase of the BNR process, fine bubbles of air need to be dispersed uniformly from the impeller to promote bacterial growth across the tank.



Mission: To be the customer's first choice in mixing.

Superior Continuous Flow Mixing Performance



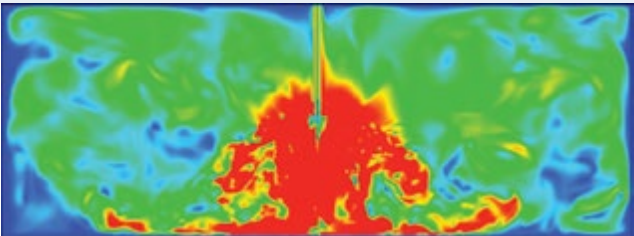
ARI-2 Anti-Ragging Impeller

BNR systems are configured in trains of alternating anaerobic, anoxic and aerobic processes. The process steps combine to steadily degrade solids and nutrient content to meet wastewater discharge quality.

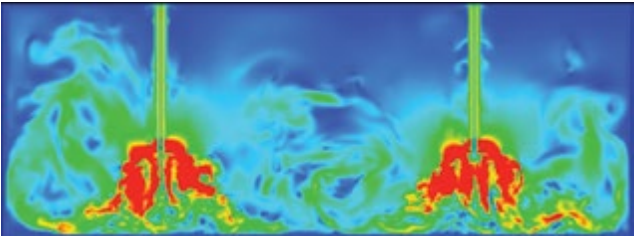
To deliver a superior mixing outcome, each tank installation in the train must maximize the contact of the waste stream with the anoxic or aerobic bacteria that will remove the nutrients. Philadelphia Mixing Solutions has developed an axial flow impeller, the ARI-2, specifically for anoxic BNR processes. The ARI-2 delivers mixing energy into the corners of the blending tanks to keep solids in suspension and encourage maximum biological activity.

The downward thrust of the axial flow produces mixing at the bottom of the tank and reduces surface turbulence and air incorporation that can reduce anoxic activity. The result is a more effective biological process that lowers output nutrient content as the waste stream moves through successive tanks.

Less Horsepower, Less Energy, Fewer Bridges.



Philadelphia Mixing Solutions' Optimized Configuration—**One Mixer**



Traditional Configuration—**Two Mixers**

Our optimized solution uses less power to perform equal or superior mixing to that of other solutions on the market.

The traditional configuration of BNR tanks utilizes two mixers per mixing zone. Our optimized configuration for BNR reduces the number of mixers to **a single, more efficient mixer**, providing lower energy consumption and less infrastructure requirements.



ARI-2 Anti-ragging Impeller



Rag Buildup from Competitor Installation

Lower Capital and Operating Costs

The high-efficiency ARI-2 impeller is able to deliver its mixing performance using at least 20% less power than conventional turbine technology. This reduces capital spending with smaller gearbox requirements, lower horsepower motors and less structural support for suspended equipment and wetted ends. Operating costs are reduced through lower energy use by the smaller equipment packages. The result is lower up-front expense at installation and continuing energy cost savings throughout the life of the facility.

Maintenance Cost Savings

The ARI-2 impeller is configured to resist the accumulation of fibrous solids on the impellers ragging during operation. The accumulation of rags over time increases the loads on the gearbox and wetted ends, creating a greater risk of motor overloads and component failure. Accumulation also requires regular planned shutdowns to clear the impellers of rags. This reduces plant performance capabilities while increasing on-going maintenance expense.

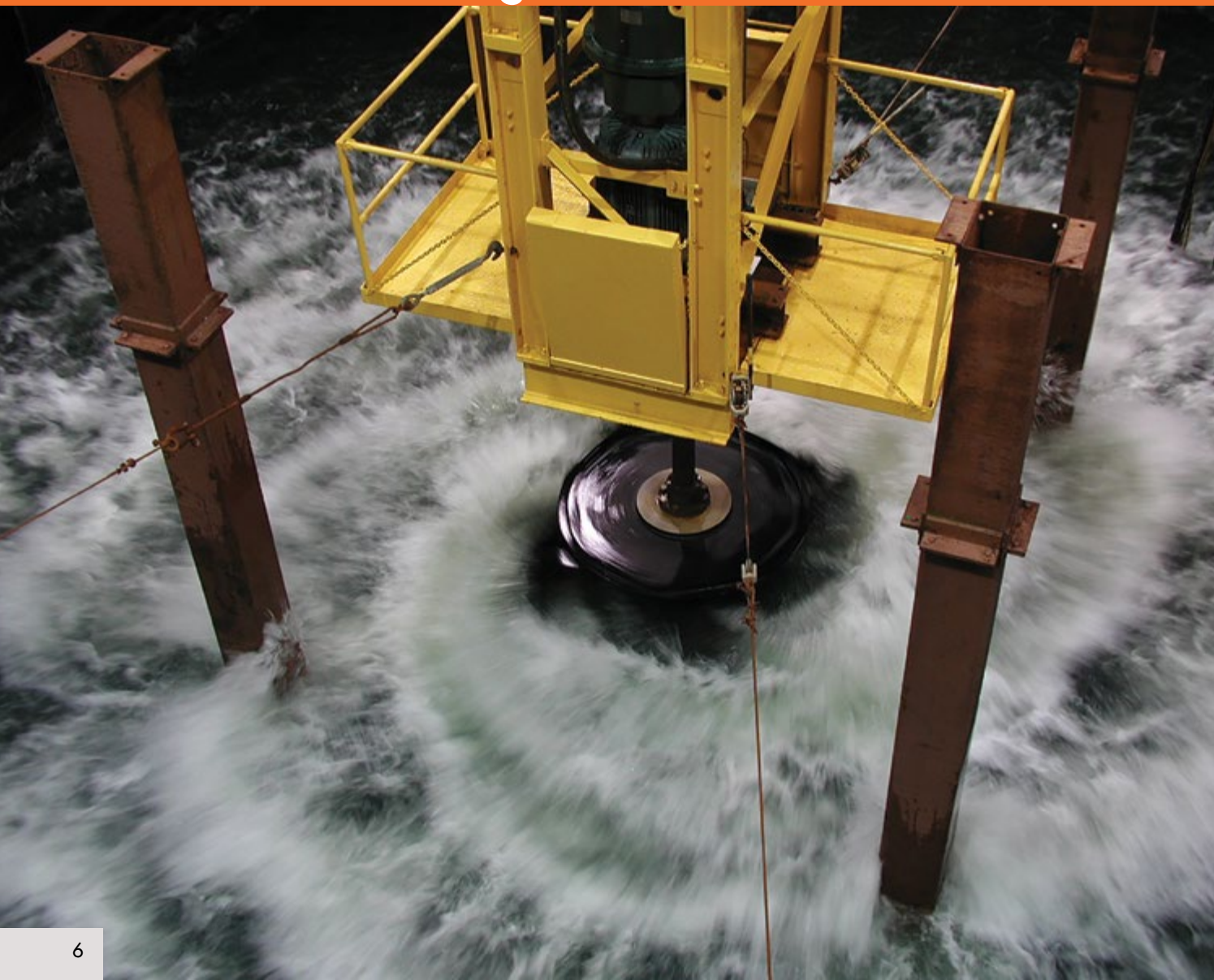
The superior ARI-2 keeps the treatment facility on-mission to treat a continuous waste stream.





An important step in the BNR process is the treatment of ammonia and other nitrogen containing waste stream constituents. Nitrification is the aerobic first step in the treatment of Total Kjeldahl Nitrogen (TKN, the measure of the organic nitrogen, ammonia, and ammonium found in a flow stream). For the nitrification process, 4.6 pounds of oxygen per pound of TKN is required. Compared to the 1.2 to 1.4 pounds of oxygen required per pound of BOD, even with relatively lower TKN loadings, a need for nitrification represents a significant component of the aerobic processes' oxygen demand. With multiple options for robust, reliable aerators offering flexible operating capabilities, Philadelphia Mixing Solutions, Ltd., can tailor an aeration system to meet the needs of any plant. Whether a small industrial waste pretreatment facility or one of the world's highest capacity municipal wastewater treatment systems, Philadelphia Mixing Solutions, Ltd., will provide a reliable, cost-effective solution using proven, cutting edge technology.

Aeration in Biological Nutrient Removal



Fine Bubble Aerobic Processing

Philadelphia Mixing Solutions uses the GDX impeller in the aerobic phase of the BNR process. The GDX applies shear through mechanical mixing to produce fine bubbles from air injected near the impeller and then disperses the bubbles throughout the vessel to provide oxygen for the aerobic treatment process. This eliminates the use of a diffuser grid for oxygenation and saves capital expense on the project. The all stainless steel construction reduces maintenance costs over the life of the mixing unit.

The anti-ragging GDX can also be deployed as an impeller without the use of air injection. This provides process flexibility in swing zones that will change operations seasonally.



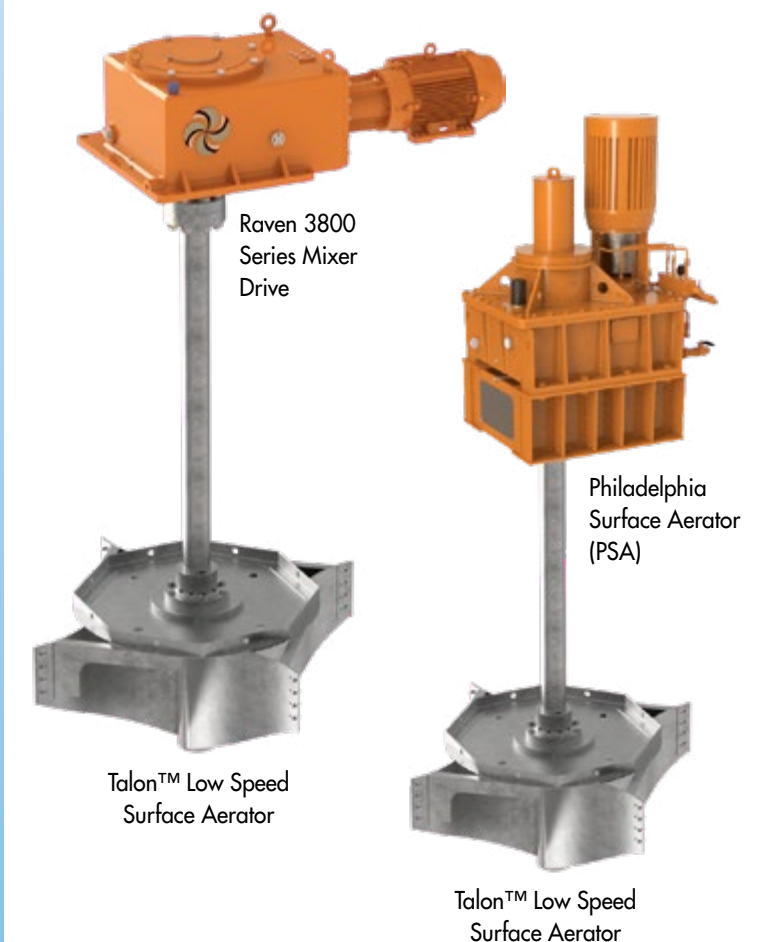
Low Speed Surface Aeration

In aerobic treatment, our low speed surface aerator, or Talon™, used in conjunction with one of our purpose-built mixer drives, maximizes oxygen transfer and eliminates performance reduction over time due to fouling.

Our low speed surface aeration solution provides the following advantages:

- Applicable/adaptable to most aeration operations
- Easily retro-fitted to existing aeration basins
- Capable of more transfer using less power vs. competitive options
- Uses a higher tangential component of velocity to achieve better mixing
- Maintains high transfer efficiency as output speed is decreased, ideal for variable frequency drives (VFD)
- Significantly improves oxygen transfer compared to traditional designs

Transfer 25% more oxygen without additional power input or maintain existing transfer performance while saving 25% on energy.





Globally Proven Mixing Solutions



Philadelphia Mixing Solutions, Ltd.[™] and its subsidiary Mixing Solutions Limited[™] provide customers with a full range of globally proven in-tank mixing solutions. Our industrial mixing solutions are world-renowned for their quality and efficiency — we are a proud partner to clients in the global chemical, oil and gas, wastewater processing and other industries.

We provide local support for your global operation with manufacturing and service locations based in the United States and United Kingdom and representatives worldwide.

Markets

- Chemical
- Oil & Gas
- Water & Wastewater
- Mineral Processing
- Power Generation
- Paints & Coatings
- Pulp & Paper
- Food & Beverage
- Phosphoric Acid

For full details on our industry-leading service offering, visit www.philamixers.com or contact your representative.

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