

The Superior Biological Nutrient Removal Process

Biological Nutrient Removal



**PHILADELPHIA
MIXING
SOLUTIONS**



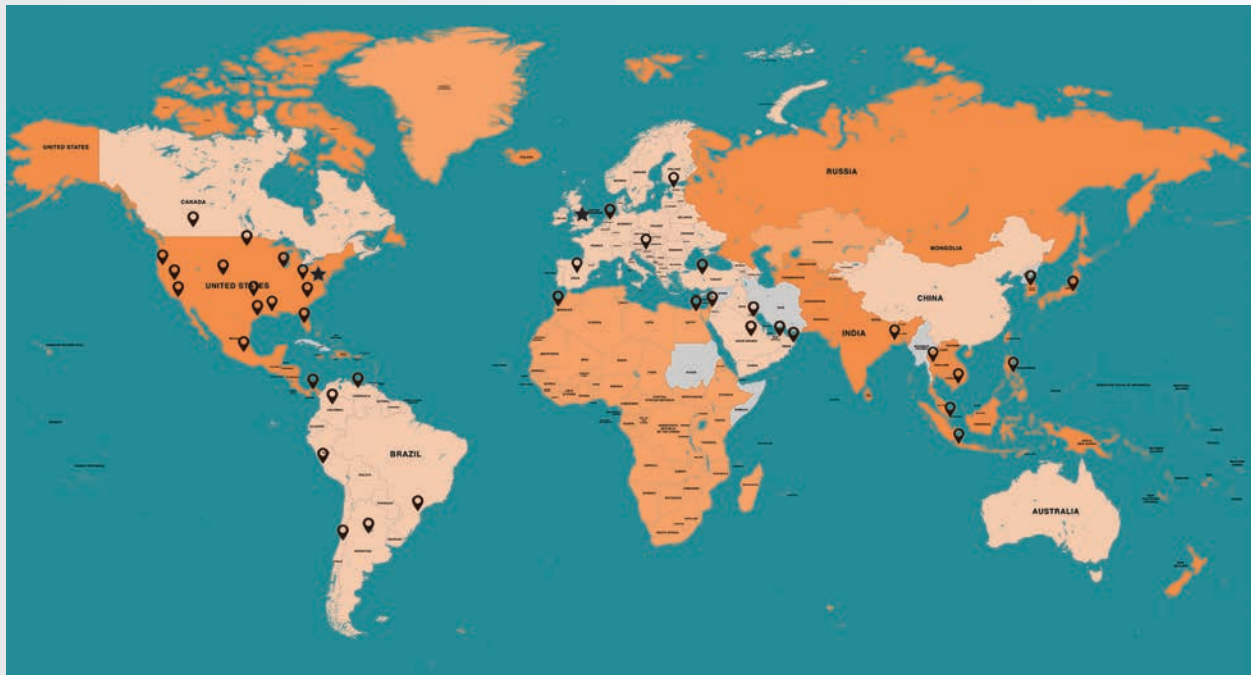
**MIXING
SOLUTIONS
LIMITED**

MISSION: BE THE CUSTOMER'S FIRST CHOICE IN MIXING

Technical Agitation and Mixing Solutions On-Call

Philadelphia Mixing Solutions, Ltd.TM and its subsidiary Mixing Solutions LimitedTM lead the industry in providing customers with improved agitation and mixing processes for their mission-critical mixing operations. Backed by over 60 years of industry experience, and with a rich tradition of technology going back to our roots with the original Philadelphia Gear Corporation, our technicians can analyze, design and implement superior mixing operations in a wide variety of agitation applications.

We are a process solution focused company. From high-viscosity non-Newtonian environments to rapid blending and agglomeration, Philadelphia Mixing Solutions and Mixing Solutions Limited can help customers optimize their operating performance. The result—greater throughput, higher quality and lower energy consumption that improves bottom line performance. With manufacturing locations based in the United States and United Kingdom and representatives worldwide, we provide local support for your global operation.



★ Manufacturing facilities

📍 Regional offices

Markets

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

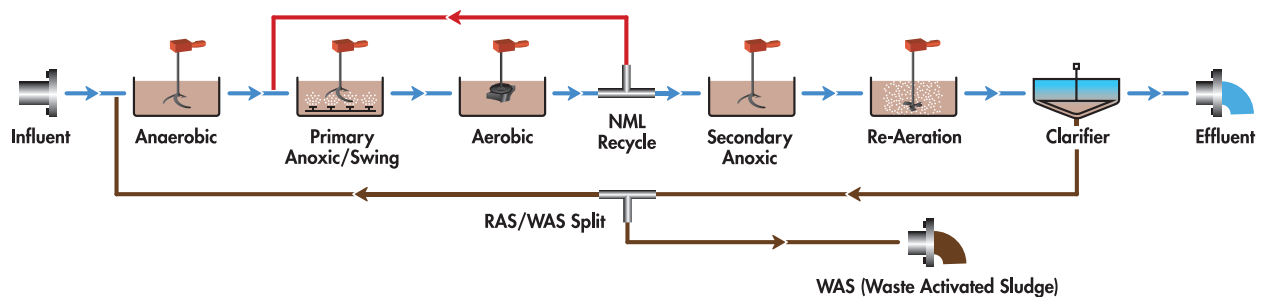


BETTER BIOLOGICAL NUTRIENT REMOVAL PERFORMANCE AT A LOWER COST

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.



SUPERIOR CONTINUOUS FLOW MIXING PERFORMANCE

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.



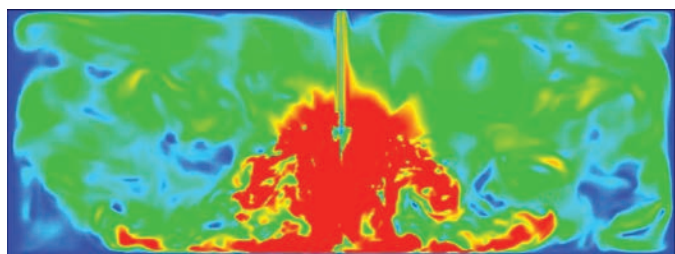
ARI 2 Anti-Ragging Impeller

**LESS HORSEPOWER,
LESS ENERGY,
FEWER BRIDGES**

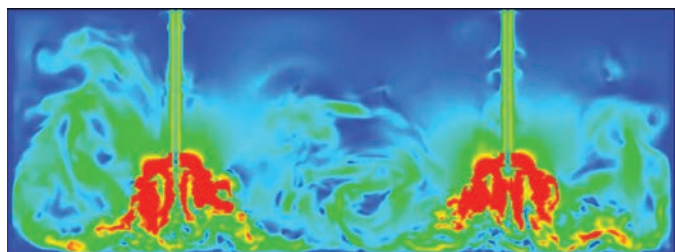
Our optimized solution uses less horsepower, less energy and fewer bridges.

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

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



Traditional Configuration—**Two Mixers**





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 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.

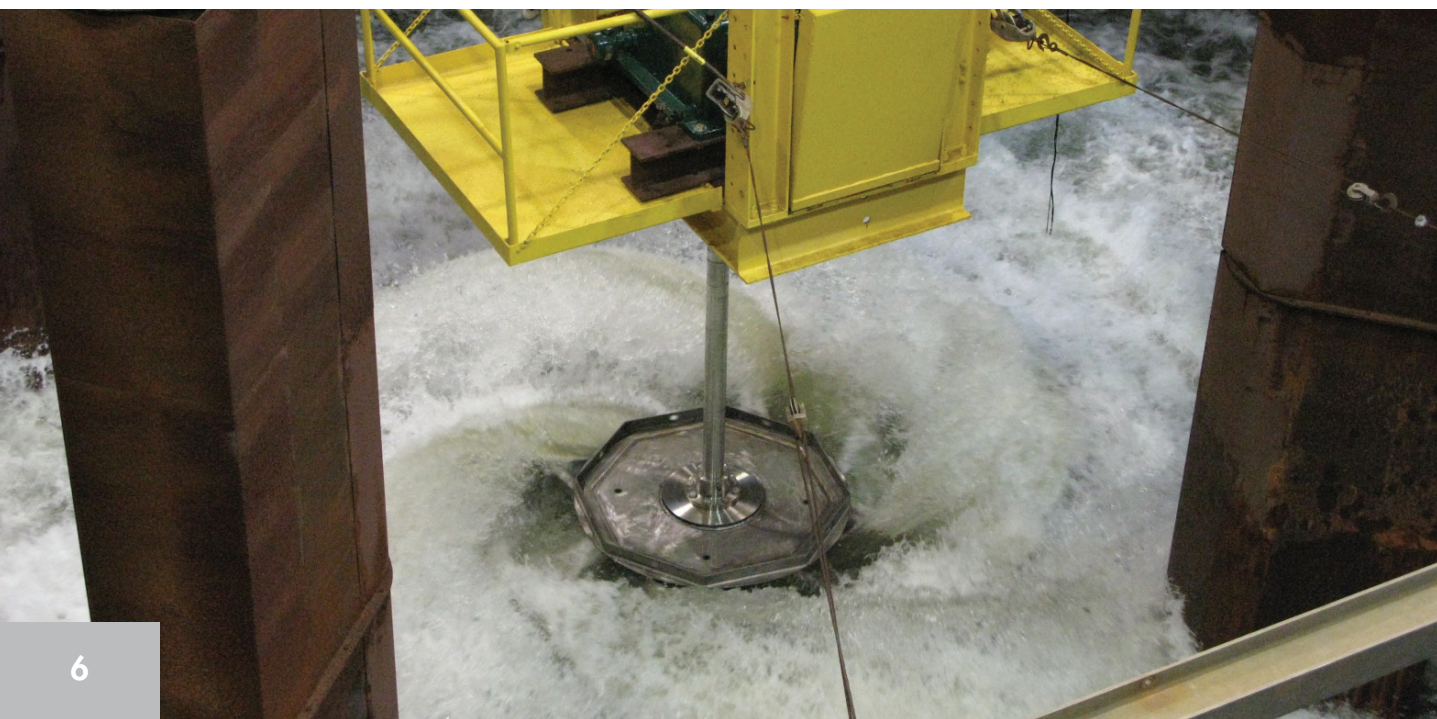
MAINTENANCE COST SAVINGS

The ARI 2 impeller is configured to resist the accumulation of fibrous solids on the impellers during operation—ragging. 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.



AERATION IN BIOLOGICAL NUTRIENT REMOVAL

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.



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.



Unifirst 4000 Series
Mixer Drive



Anti-Ragging
(Submerged
Turbine Aerator)

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.

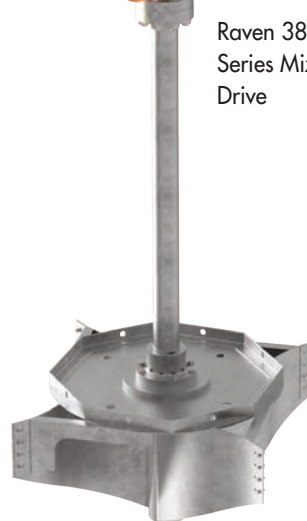
Our low speed surface aeration solution provides the following advantages:

- 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.



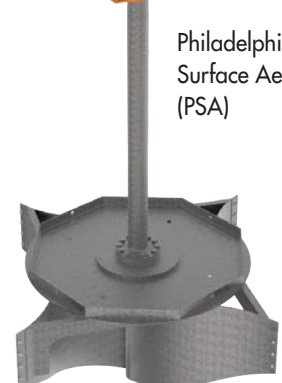
Raven 3800
Series Mixer
Drive



Talon™ Low Speed
Surface Aerator



Philadelphia
Surface Aerator
(PSA)



Talon™ Low Speed
Surface Aerator



Represented by:



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An Employee Owned Company

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