

# AquaSBR<sup>®</sup>

Sequencing Batch Reactor



AQUA-AEROBIC SYSTEMS, INC.  
A Metawater Company

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## Sequencing Batch Reactor

For over 35 years, Aqua-Aerobic Systems has led the industry in sequencing batch reactor technology with performance proven and cost effective treatment systems capable of effectively removing nutrients and reducing phosphorus with the flexibility of process control that adapts to changing demands.

The AquaSBR<sup>®</sup> sequencing batch reactor provides true batch technology with all phases of treatment accomplished in a single reactor. All components are easily accessible and the advanced decant system ensures optimum quality effluent withdrawal. Treatment can be optimized with the IntelliPro<sup>®</sup> process monitoring and control system to further reduce operation and maintenance, energy costs and improve performance.

## System Features and Advantages

- Independent aeration and mixing with the Aqua MixAir<sup>®</sup> system provides process advantages and lower energy consumption
- A true-batch system utilizes Mix-Fill, React-Fill, React, Settle and Decant phases within a single reactor
- No secondary clarifiers and return activated sludge (RAS) lines
- All components of the AquaSBR system are retrievable and easily accessible
- Hydraulic fluctuations are easily managed through the flexibility of a time managed process operating strategy
- Enhanced biological nutrient removal:
  - Anaerobic period during Mix-Fill phase to achieve low biological phosphorus requirements
  - Minimize metal salt usage with automated addition after biological luxury uptake to achieve <0.5 mg/l TP
- Ideal for low total nitrogen requirements:
  - Flexibility to modify aeration cycling for TN removal under changing conditions
  - Achieves total nitrogen levels down to 3.0 mg/l
- Low cost of ownership



### Aqua MixAir<sup>®</sup> System

The AquaSBR sequencing batch reactor utilizes the Aqua MixAir<sup>®</sup> system by providing separate mixing with the AquaDDM<sup>®</sup> direct-drive mixer and an aeration source such as the Aqua-Jet<sup>®</sup> surface aerator or Aqua-Aerobic diffused aeration. This system has the capability to cyclically operate the aeration and mixing to promote anoxic/aerobic and anaerobic environments with low energy consumption. In addition, the Aqua MixAir system can achieve and recover alkalinity through denitrification, prevent nitrogen gas disruption in the settle phase, promote biological phosphorus removal, and control certain forms of filamentous bacteria.



### Advanced Decanter

The Aqua-Aerobic floating decanter follows the liquid level, maximizing the distance between the effluent withdrawal and sludge blanket. It is an integral component to the AquaSBR system and provides reliable, dual barrier subsurface withdrawal with low entrance velocities to ensure surface materials will not be drawn into the treated effluent. The decanter is easily accessible from the side of the basin and requires minimal maintenance.

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## Phases of Operation

The AquaSBR sequencing batch reactor system features time-managed operation and control of aerobic, anoxic and anaerobic processes within each reactor including equalization and clarification. The AquaSBR system utilizes five basic phases of operation to meet advanced wastewater treatment objectives. The duration of any particular phase may be based upon specific waste characteristics and/or effluent objectives.

### 1 Mix-Fill



- Influent flow enters the reactor
- Mixing is initiated with the AquaDDM mixer to achieve complete mix of the reactor contents in the absence of aeration
- Anoxic conditions are created which facilitate removal of any residual nitrites/nitrates ( $\text{NO}_x$ ) via the process of denitrification
- In systems requiring phosphorus removal, the Mix-Fill phase is extended to create anaerobic conditions where phosphorus accumulating organisms (PAO) release phosphorus then ready for subsequent luxury uptake during aeration times
- Anoxic conditions assist in the control of some types of filamentous organisms

### 3 React



- Influent flow is terminated creating true batch conditions
- Mixing and aeration continue in the absence of influent flow
- Biological/chemical oxygen demand (BOD/COD) and ammonia nitrogen ( $\text{NH}_3$ ) reduction continue under aerated conditions
- Oxygen can be delivered on a "as needed" basis via dissolved oxygen probes while maintaining completely mixed conditions
- Provides final treatment prior to settling to meet targeted effluent objectives

### 4 Settle

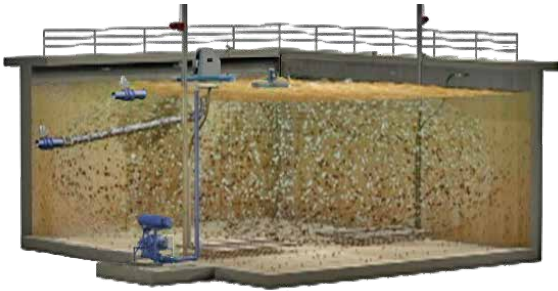


- Influent flow does not enter the reactor
- Mixing and aeration are terminated
- Ideal solids/liquid separation is achieved due to perfectly quiescent conditions
- Adjustable time values allow settling time to match prevailing process conditions



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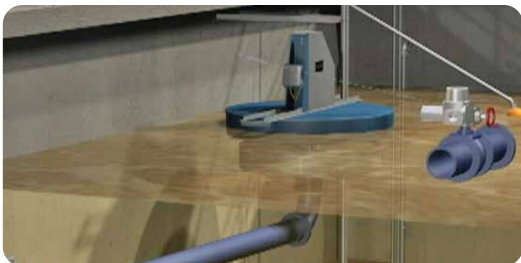
## React-Fill



- Influent flow continues under mixed and aerated conditions
- Intermittent aeration may promote aerobic or anoxic conditions
- Biological/chemical oxygen demand (BOD/COD) and ammonia nitrogen ( $\text{NH}_3$ ) are reduced under aerated conditions
- Luxury uptake of phosphorus is produced under aerated conditions
- $\text{NO}_x$  is reduced under anoxic conditions
- Separation of aeration and mixing allows the aeration source to be turned down during low flow conditions to conserve energy while the system's flexibility allows nitrification/denitrification to be easily managed

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## Decant/Sludge Waste



- Influent flow does not enter the reactor
- Mixing and aeration remain off
- Decantable volume is removed by subsurface withdrawal
- Floating decanter follows the liquid level, maximizing distance between the withdrawal point and the sludge blanket
- Small amount of sludge is wasted near the end of each cycle

# IntelliPro<sup>®</sup>

## Process Monitoring and Control System

The IntelliPro system is a personal computer (PC) based program that interfaces with the AquaSBR system's programmable logic controller (PLC) via a network connection to assist operators in optimizing the treatment process of the plant and further reducing operating costs.

## System Advantages

- Real-time, online monitoring and control
- "Active Control Mode" which automatically receives, interprets and proactively adjusts in-basin instruments and process variables including biological nutrient removal, chemical addition and energy
- Reduces the operator's sampling time
- Real-time and historical graphical trending of process parameters
- BioAlert™ process notification provides corrective action to eliminate operational interruptions and upsets
- Assists in the optimization of enhanced nutrient removal
- Online operation and maintenance support
- Remote troubleshooting provides on-demand troubleshooting assistance



# Typical AquaSBR® Applications



## Biological Nutrient Removal

- 1.65 MGD Avg. Daily Flow
- Replaced flow-through activated sludge system for enhanced biological nutrient removal (EBNR) to meet Chesapeake Bay Initiative



## Phosphorus Removal

- 2.7 MGD Avg. Daily Flow
- Dissolved oxygen control optimizes power consumption
- Process control achieves 98% removal of total influent phosphorus



## Nitrification

- 0.8 MGD Avg. Daily Flow
- Dual basin system utilizes process control via IntelliPro® system



## Reuse

- 2.0 MGD Avg. Daily Flow
- 3-basin system followed by (2) AquaDisk® cloth media filters produces reuse quality water



## Industrial Pretreatment

- .075 MGD Avg. Daily Flow
- Treating high strength dairy waste since 1991



## Retrofit

- 0.88 MGD Avg. Daily Flow
- Dual basin retrofit uses existing oxidation ditch to provide treatment flexibility and power savings

**Since 1969**, Aqua-Aerobic Systems, Inc. has led the industry by providing advanced solutions in water and wastewater treatment. As an applied engineering company serving both municipal and industrial customers, we work collaboratively with consulting engineers, owners, plant managers, and operators to design and manufacture the best treatment solution with the lowest lifecycle cost.

# Providing **TOTAL** Water Management Solutions

**Aeration & Mixing**

**Biological Processes**

**Filtration**

**Oxidation & Disinfection**

**Membranes**

**Controls & Monitoring Systems**

**Aftermarket Products and Services**

## **AquaSBR<sup>®</sup>** **Sequencing Batch Reactor**

Visit our website at [www.aqua-aerobic.com](http://www.aqua-aerobic.com) to learn more about the AquaSBR<sup>®</sup> Sequencing Batch Reactor and our complete line of products and services.



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[www.aqua-aerobic.com](http://www.aqua-aerobic.com)  
6306 N. Alpine Road, Loves Park, IL 61111-7655  
p 815.654.2501 | f 815.654.2508 | [solutions@aquaaerobic.com](mailto:solutions@aquaaerobic.com)

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