

# Aqua MSBR<sup>®</sup>

Modified Sequencing Batch Reactor

The Leader in Biological Process Technology



Aqua-Aerobic Systems, Inc.

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## Modified Sequencing Batch Reactor

Aqua-Aerobic Systems, Inc.  
 (Aqua) is a world leader in the design and manufacture of biological systems with operating systems dating back to the 1970s. In 1990, Aqua combined the advantages of sequencing batch reactor technology with a traditional flow-through activated sludge process to produce a compact, continuous flow, low cost system - the MSBR<sup>®</sup> process.

## Applications

- Any municipal or industrial wastewater system with effluent requirements ranging from carbonaceous oxidation to enhanced biological nutrient removal
- Ideal for large scale projects >15,000 m<sup>3</sup>/day

## Features

- Constant water level
- Continuous flow
- Simple operation
- Superior performance even in low-strength, low-temperature wastewaters common in North America and Europe
- Adept at processing high-peak hydraulic flows due to storm events
- Quiescent settling prior to clarification phase
- Optimized, enhanced biological nutrient removal



One of four reactors in the MSBR<sup>®</sup> system at Shenzhen Yantian WWTP in China.



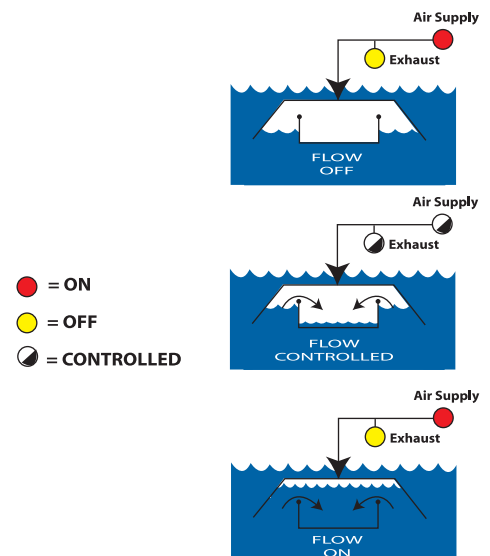
MSBR<sup>®</sup> cell at Wuxi New City WWTP in China. Shown are two AquaDDM<sup>®</sup> mixers with local control stations and an Air Weir.

## Components

- AquaDDM<sup>®</sup> mixer
- Aqua diffused aeration system
- Mixed liquor recycle system
- Phase Separator
- Waste sludge pump
- Air Weir
- Control System

## Air Weir

The patented Air Weir provides efficient effluent flow control and prevents the discharge of suspended solids and scum into the effluent.



## Operation

The MSBR<sup>®</sup> process incorporates multiple reactor cells to provide a variety of treatment mode alternatives. The design configuration may range from a simple 3-cell configuration that provides oxidation and efficient clarification to a 7-cell configuration that provides enhanced biological nutrient removal. An MSBR<sup>®</sup> system will include two sequencing cells and a variable number of specific function cells. A 7-cell MSBR<sup>®</sup> system would function as follows:

**Cells 1 & 7** - Sequencing Cells alternate four Phases. As cell 1 progresses through Phases 1-3, cell 7 will remain in Phase 4 and vice versa.

The four Phases are:

- ① Anoxic Mixing and Mixed Liquor Recycle
- ② Aeration, Mixing and Mixed Liquor Recycle
- ③ Pre-settle
- ④ Clarification

**Cell 2** - Phase Separator Cell designed to concentrate recycled mixed liquor solids feed stream to the anaerobic cell and promote an optimal environment to enhance phosphorus release within the anaerobic cell

**Cell 3** - Fermentation Cell designed to increase concentration of volatile fatty acids (VFAs)

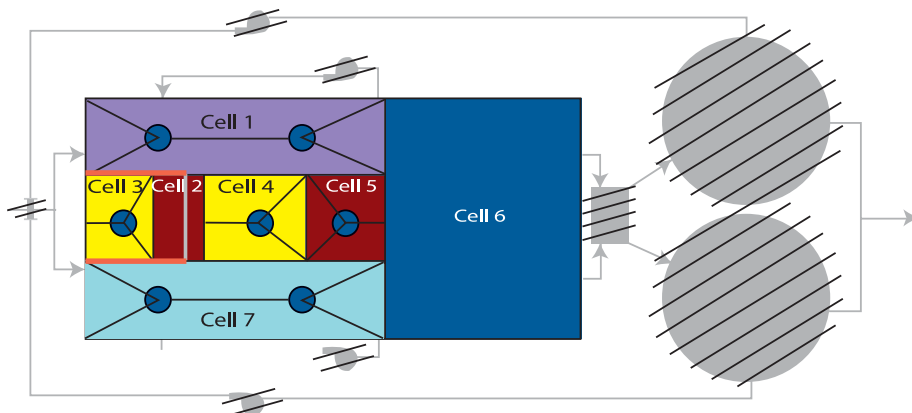
**Cell 4** - Anaerobic Cell designed to promote phosphorus release under optimized conditions

**Cell 5** - Anoxic Mixing Cell designed to provide denitrification

**Cell 6** - Aerobic Cell designed to provide oxidation of carbonaceous material, nitrification, and the biological uptake of phosphorus

The two sequencing cells are ideally equipped to assume multiple functions ranging from anoxic mixing, aerobic mixing, quiescent settling, sludge wasting and clarification and each features a patented Air Weir that effectively controls effluent flow. Each specific function cell may be designed for optimum conditions with respect to wastewater characteristics and specific effluent objectives.

### **Compact, 7-Cell MSBR System Superimposed over a Typical Activated Sludge Process**



## Advantages

- Small footprint; no separate clarifiers
- Less equipment to maintain which can be designed to be serviceable without dewatering tanks
- Fully automated control system
- Better sludge flocculation; no sludge collection mechanisms
- Low TSS discharge; effective nitrification, denitrification and phosphorus removal
- Low installation cost
- Low operating cost
- Expandability

## Aqua Controls & SCADA System Capabilities



Aqua-Aerobic Systems electrical Control Panels and Supervisory Control and Data Acquisition (SCADA) systems for MSBR<sup>®</sup> applications include:

- PLC program with timer and counter values to establish a default MSBR<sup>®</sup> process cycle based on the MSBR<sup>®</sup> system design parameters
- Operator interface includes color display and programmable function keys which include the MSBR<sup>®</sup> system status and alarm information

**Aqua-Jet®**  
Surface Aerators

**Aqua-Jet II®**  
Contained Flow Aerators

**AquaDDM®**  
Direct Drive Mixer-Blenders

**Aqua MixAir™**  
Aeration Systems

**Aqua EnduraDisc®**  
Fine Bubble Diffusers

**Aqua EnduraTube™**  
Fine Bubble Diffusers

**Aqua CB-12™**  
Coarse Bubble Diffusers

**Aqua CB-24®**  
Coarse Bubble Diffusers

**AquaSBR®**  
Sequencing Batch Reactors

**AquaMB Process™**  
Multiple Barrier Membrane Systems

**MSBR®**  
Modified Sequencing Batch Reactor

**AquaDisk®**  
Cloth Media Filters

**AquaDiamond™**  
Cloth Media Filters

**AquaABF®**  
Automatic Backwash Filters

**ThermoFlo®**  
Surface Spray Coolers

**DynaBlend™**  
Polymer Blending and Metering Systems

Contact Your Local Representative:



**Aqua-Aerobic Systems, Inc.**

6306 N. Alpine Rd. • P.O. Box 2026 • Rockford, IL 61130  
(Phone) 815/654-2501 • (Fax) 815/654-2508 • Toll Free 877/214-9625  
Email: [solutions@aqua-aerobic.com](mailto:solutions@aqua-aerobic.com) • [www.aqua-aerobic.com](http://www.aqua-aerobic.com)

The information contained herein relative to data, dimensions and recommendations as to size, power and assembly are for purpose of estimation only. These values should not be assumed to be universally applicable to specific design problems. Particular designs, installations and plants may call for specific requirements. Consult Aqua-Aerobic Systems, Inc. for exact recommendations or specific needs. Patents Apply. Patents Pending.

