



AQUA-AEROBIC SYSTEMS, INC.

AquaMB Process[®]

MULTIPLE BARRIER MEMBRANE SYSTEM

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For more than 30 years, Aqua-Aerobic Systems has provided thousands of customers with state-of-the-art products and systems for the treatment of wastewater. Our knowledge and expertise in design and manufacturing, coupled with ongoing research and development, provides the end user with system integrated solutions for a comprehensive approach to wastewater management.

The AquaMB Process® is a multiple barrier system that integrates biological treatment and clarification with dual barrier filtration consisting of cloth media and external membrane separation. It is ideal for wastewater plants that require optimum performance and flexibility at the lowest life cycle cost. Compared to multiple unit processes and membrane bioreactors (MBRs), the AquaMB Process offers numerous advantages with the added benefit of single source responsibility.

System Features and Advantages

- Flexible design and operation to meet current and future discharge requirements
- No secondary clarifiers or return activated sludge (RAS) lines with the AquaSBR® system option
- Fewer membranes and chemicals required than with MBRs
- Enhanced biological nutrient removal (EBNR):
 - Total nitrogen (TN) < 3 mg/l
 - Total phosphorus (TP) < 0.1 mg/l
- Superior solids reduction:
 - Total suspended solids (TSS) are non-detectable (ND)
 - Turbidity < 0.1 NTU
- Alternate discharge points
- Bacteria and virus reduction:
 - Bacteria > 6 log removal
 - Viruses > 4 log removal
- Low energy consumption
- Low cost of ownership
- Comprehensive process guarantee



Typical Application

- 0.4 MGD Avg. Daily Flow, 0.8 MGD Peak Flow
- Replaced lagoon system to meet stringent regulatory agency requirements of BOD 2 mg/l, TN 5 mg/l, TSS 2 mg/l and TP 0.1 mg/l
- Treatment scheme includes a 2-basin AquaSBR sequencing batch reactor system followed by a 2-disk AquaDisk® cloth media filter and external membranes housed in adjacent buildings
- Discharges into nearby St. George Bay, which is utilized for sensitive aquaculture
- Handles variable flows and loads due to seasonal tourism

First Barrier Nutrient/TSS Removal

The first barrier of the AquaMB Process is a biological treatment system, either an AquaSBR sequencing batch reactor or an AquaPASS® phased activated sludge system. Both systems include an Aqua MixAir® system for separation of aeration and mixing, using an AquaDDM® direct-drive mixer in combination with an aeration source to promote anoxic/aerobic and anaerobic environments for BOD and nutrient removal, as well as low TSS. In addition, solids reduction is accomplished through the use of a decanter (AquaSBR) or separate clarifier (AquaPASS).

Dual Barrier Filtration

The second barrier of the AquaMB Process provides OptiFiber® cloth media filtration in an AquaDisk or AquaDiamond® mechanical configuration. The cloth media is designed to maximize solids removal over a wide range of particle sizes.

The final barrier of the process provides ultrafiltration for additional solids reduction and bacteria and virus removal with external membrane modules. The membrane modules offer easy access, automatic in-place cleaning, and do not require the air scouring that most other membrane systems need.

AquaMB Process® Operation

The multiple barrier concept of the AquaMB Process provides enhanced nitrogen and phosphorus removal in the biological reactor, allowing anoxic conditions not easily attainable with MBRs that recycle oxygen-laden water from the membrane tanks. With the biological process facilitating settling and decanting/clarification, high quality effluent is discharged to cloth media filtration (CMF), which in turn provides a low-solids feed to the membranes.

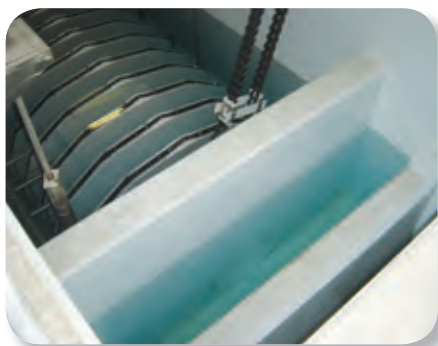
The multiple barrier layout provides the flexibility to treat different flows through each of the three systems, minimizing cloth media and membrane area and the backwash/chemical requirements. The Operator can also elect to operate the filters and/or membranes on an 'as needed' basis.

① Biological Process



Flow enters the bioreactor where a series of independent phases promote biological treatment. Separate mixing and aeration devices allow the contents of the reactor to undergo biomass conditioning and nutrient reduction by alternating aerobic and anoxic periods. Following settling, supernatant is transferred from this first barrier to the cloth media filter.

② Cloth Media Filtration



Flow enters the cloth media filter where TSS, turbidity, and particulate (insoluble) phosphorus are reduced to very low levels, achieving a high-quality effluent that can be used in many reuse applications. The filtered water is transferred from this second barrier to the ultrafiltration membranes.

③ Ultrafiltration Membranes



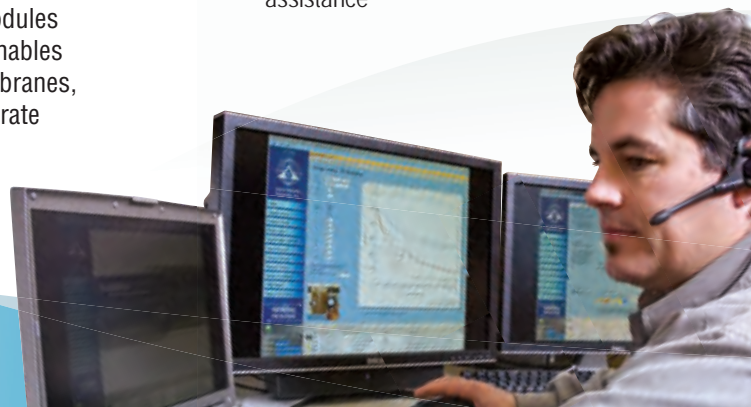
Flow enters the membrane modules where low positive pressure enables the fluid to permeate the membranes, excluding fine particulates. Filtrate is directed to final discharge or a reuse application.

IntelliPro® Process Monitoring and Control System

The IntelliPro system is a personal computer (PC) based program that interfaces with the AquaMB Process 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" 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
- Automatically regulates chemical addition to maximize nitrogen removal in the bioreactor and TSS/phosphorus reduction in the CMF and membranes.
- Online operation and maintenance support
- On-demand remote troubleshooting assistance



Providing TOTAL Water Management Solutions

Visit our website at www.aqua-aerobic.com to learn more about the AquaMB Process® Multiple Barrier Membrane System and our complete line of products and services:

Aeration & Mixing

Biological Processes

Membranes

Filtration

Controls & Monitoring Systems

Aftermarket Products and Services



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