Membrane Systems

Featuring Aqua MultiBore® Membranes

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Membrane Systems Installation Profiles

Ground Water

- 3.0 MGD Byesville, OH Drinking Water Plant
- Replaced failing trains with Aqua MultiBore® P-Series
- Reduced effluent turbidity to <0.03 NTU
- Treats well water containing surface water intrusion

Surface Water / Backwash Waste

- 7.0 MGD Butte, MT Drinking Water Plant
- Utilizes Aqua MultiBore® C-Series membranes
- Backwash recovery membranes reduce waste to < 14,000 gpd
- On-demand direct filtration via gravity keeps power usage low

Municipal Wastewater

- 1.8 MGD Shibaura Wastewater Plant in Tokyo, Japan
- Utilizes Aqua MultiBore® C-Series membranes
- Used for non-potable reuse
- Pre-ozonation results in high flux

Industrial Wastewater

- 0.5 MGD AbbVie Pharmaceutical in Barceloneta, PR
- Utilizes Aqua MultiBore® P-Series membranes
- Provides pretreatment for reverse osmosis (RO) systems
- Effluent reused in cooling towers and process

Seawater / Blowdown Waste

- 22.2 MGD Abu Dhabi Desalination Plant, UAE
- Utilizes Aqua MultiBore® P-Series membranes
- Provides pretreatment for seawater RO
- Treats blend of seawater and steel mill blowdown

Pilot Testing

- Complete piloting capabilities
- Ceramic and polymeric membrane systems
- 1-30 gpm flow ranges available
- Skid or trailer mounted units

Aqua-Aerobic® Membrane Systems

Featuring Aqua MultiBore® Membranes

For nearly 50 years, Aqua-Aerobic Systems has provided thousands of customers with adaptive treatment solutions in biological processes and filtration for both water and wastewater applications. Our knowledge and expertise in applied engineering and manufacturing allows us to provide highly efficient and cost effective technologies that require less energy, less maintenance and provide a low cost of ownership over the life of the plant.

Aqua-Aerobic® Membrane Systems featuring NO BREAK Aqua MultiBore® membranes are available in both polymeric and ceramic options. Each system is designed to effectively remove suspended solids, particulate phosphorus, bacteria, cysts and other harmful impurities, resulting in safe, high quality water.

Every membrane system is designed specifically for the application. The type of membrane used, polymeric or ceramic, is dependent on attributes such as waste characteristics, treatment objectives and the best economic solution for the plant.

System Applications and Advantages

Applications

- Drinking Water Systems
- Surface Water Treatment
- Well Water Source
- Industrial Water Treatment
- Pretreatment to Reverse Osmosis
- Desalination
- Reuse
- Backwash Water Recovery
- Tertiary Wastewater Treatment
- New Plants, Retrofits, Expansions

Advantages

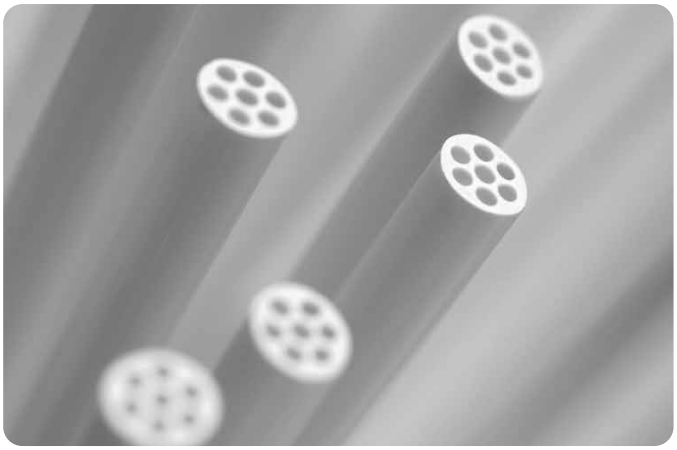
- No Break Membranes
- Less Chemical Usage
- High Water Recovery Rate
- Low Energy Consumption
- High Permeability
- Compact and Expandable
- No Basins or Lifting Equipment
- Simple Operation and Low Maintenance

Aqua MultiBore® Polymeric Membrane Installation

Aqua MultiBore® C-Series Typical Installation

Aqua MultiBore® P-Series
Polymeric Membranes

The Aqua MultiBore® polymeric membrane has been successfully applied at over 225 water and wastewater installations in the last 17 years, including those with high solids applications.

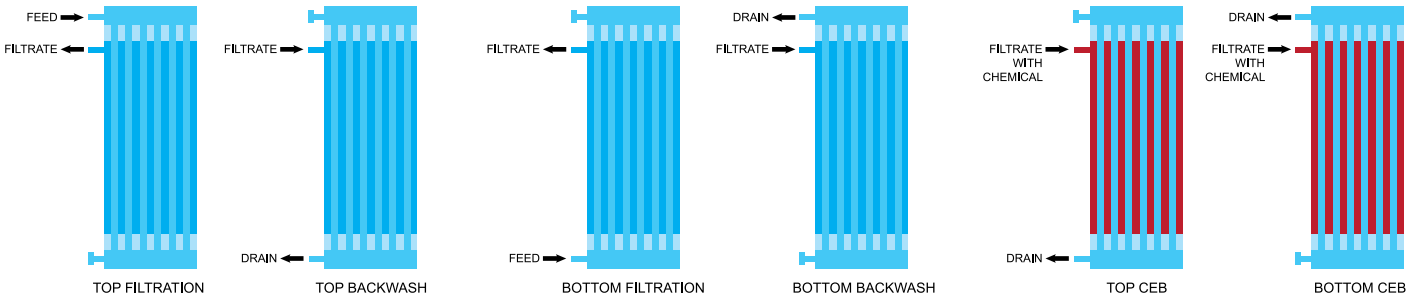


Aqua MultiBore® P-Series Polymeric Design

Polymeric Membrane Features:

- Large diameter bores
- 0.02 µ UF membrane is rated for 4 log virus removal
- Each fiber is made from one material in a single process
- Inside-outside flow path requires no air scour
- Low fouling, can be cleaned with wide pH range (1-13)
- Superior strength – No fiber breaks!

Modes of Operation



Filtration Mode:

- During top filtration, influent enters the top of each membrane module and flows down through each fiber bore
- The 0.02 µ pores allow water to pass through to the outside of the fiber but retain suspended solids, bacteria, cysts, and viruses
- During bottom filtration, influent enters the bottom of each module and flows up through the fiber bores
- The system alternates between top and bottom filtration to evenly distribute impurities along the entire fiber length
- In both filtration modes, filtered water flows from the outside of the fibers through the filtrate port on the side of the module

Backwash Mode:

- During both the top and bottom backwash modes, filtered water enters the filtrate port on the side of each membrane module and flows into each fiber
- During top backwash, water flows down through the fiber bores, into the bottom of the module and out to drain
- During bottom backwash, water flows up through the fiber bores, into the top of the module and out to drain
- The system alternates between top and bottom backwash so that impurities collected at both module ends can be efficiently flushed out
- Backwash occurs every 20 - 80 minutes, depending on influent quality

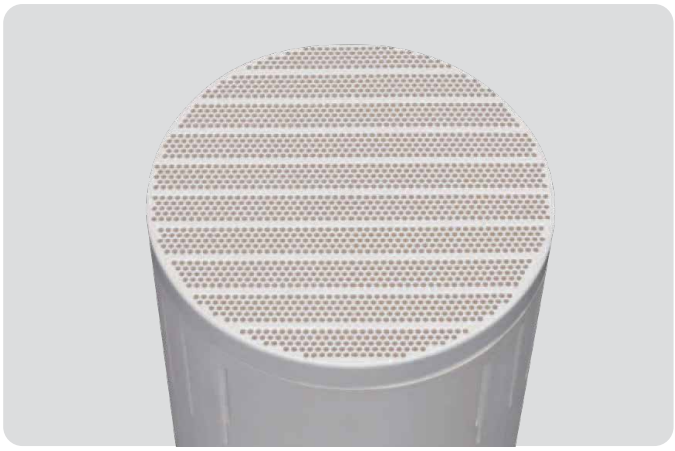
Chemically-Enhanced Backwash (CEB) Mode:

- Chemicals are periodically added to the backwash water to dissolve any impurities that were not removed during the backwash modes
- The flow paths are the same as during backwash, only small amounts of chemical are injected into the filtrate prior to entering the modules
- Caustic is used to dissolve organics, acid is used to dissolve inorganic matter, and chlorine is used for occasional disinfection
- The membranes are soaked in the chemical for 10-20 minutes before being flushed out
- A CEB is performed every 8 -168 hours, depending on influent quality

Aqua MultiBore® C-Series

Ceramic Membranes

The Aqua MultiBore® C-Series ceramic membrane has been successfully applied in both water and wastewater applications with more than 175 installed systems from pretreatment to advanced treatment of drinking water.

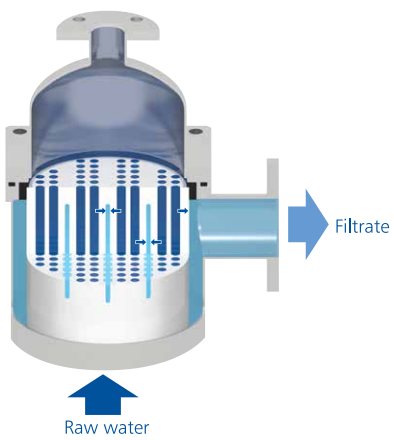


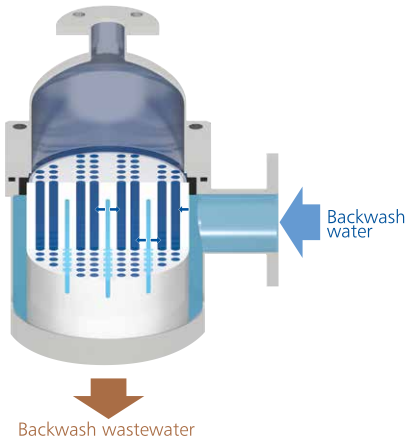
Aqua MultiBore® C-Series Ceramic Design

Ceramic Membrane Features:

- Short and infrequent backwashes result in very high recoveries
- Only 5 out of more than 20,000 elements have been replaced in 20 years
- Single-piece ceramic element with two seals is very unlikely to break or leak
- Independent 10-module rows increase flexibility and decrease footprint
- Inside-out filtration enables a high cross-flow velocity for maximum cleaning
- Material is very resistant to corrosion and high pressures/ temperatures
- Systems are simple to operate and maintain
- Extremely uniform 0.1 µ pores result in high fluxes
- Used membranes can be recycled

Modes of Operation





Filtration Mode:

- During filtration, influent enters from the bottom of each membrane module and flows up through each ceramic filtration cell
- The 0.1 µ pores allow water to pass through to the ceramic filtrate collection cells
- Collected filtrate then exits the membrane through the filtrate port on the side of the module

Backwash Mode:

- During backwash, filtered water enters the filtrate port on the side of each membrane module and flows into each filtration cell
- 70 psi filtrate detaches fouling matter within the filtration cells
- Most impurities are collected at the bottom of the module and efficiently flushed out
- Typical backwash occurs every 4 to 12 hours

Airflush Mode:

- Compressed air is injected into the top of the membrane sub-module to remove any remaining impurities that were not removed during the backwash mode
- Airflush typically takes 2-5 seconds at a maximum pressure of 30 psi
- The system is then placed back into normal filtration mode

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

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Visit our website at www.aqua-aerobic.com to learn more about the Membrane Systems Featuring Aqua MultiBore® Membranes and our complete line of products and services.

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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.

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