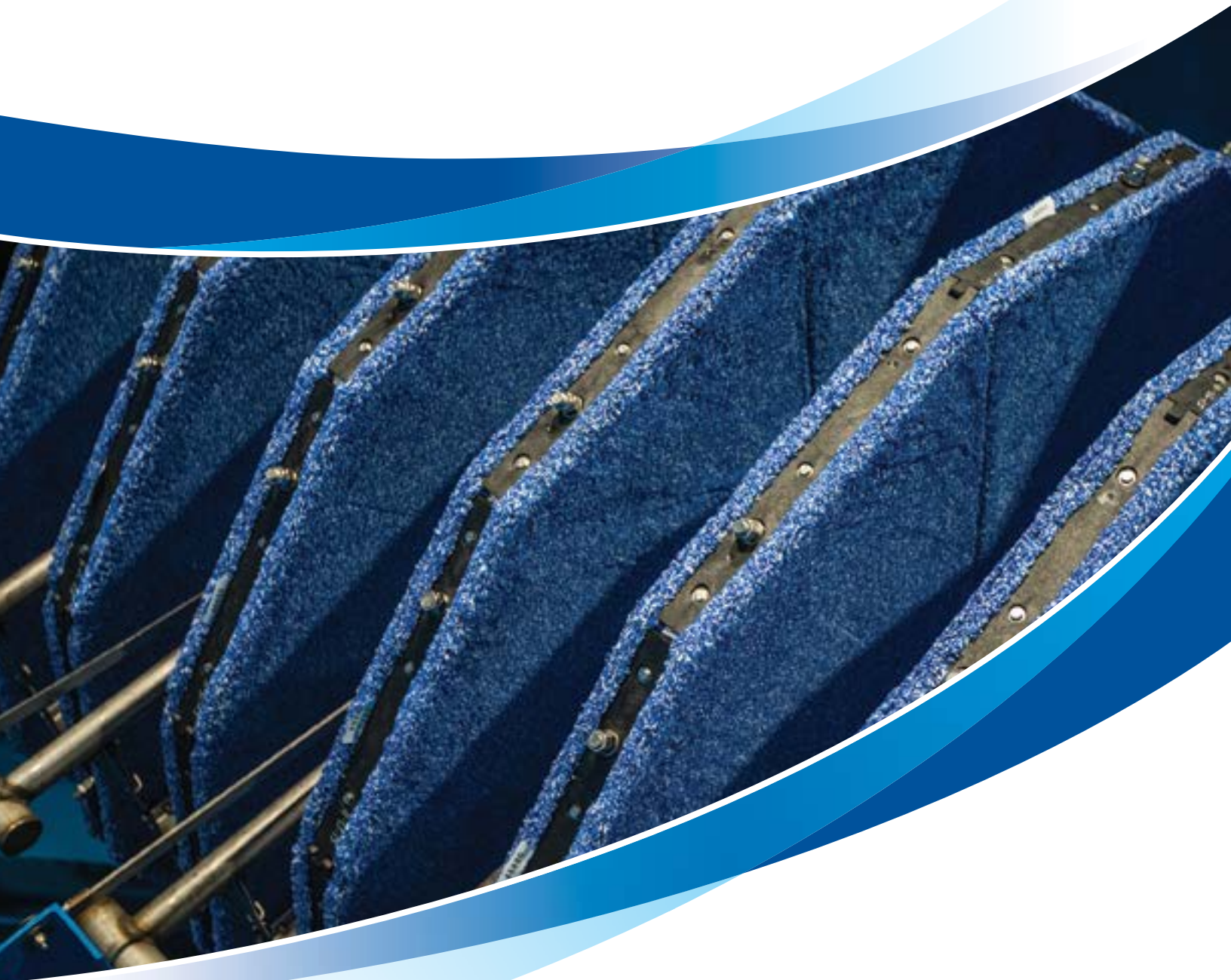


Cloth Media Filtration

Featuring OptiFiber® Cloth Filtration Media



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Aqua-Aerobic® Cloth Media Filter

Featuring OptiFiber® Cloth Filtration Media

In the early 1990s, Aqua-Aerobic Systems revolutionized tertiary treatment by introducing Cloth Media Filtration utilizing a disk configuration. Since then, over 3,000 pile cloth media filtration units have been installed worldwide, and hundreds of different media have been researched and tested with a select few that are currently being applied to seven mechanical configurations in a variety of applications including: water reuse, low level phosphorus, micropollutant, surface water, stormwater and primary treatment.

Effective Depth Filtration

The original OptiFiber® cloth filtration media is specifically engineered for water and wastewater applications and designed to maximize solids removal over a wide range of particle sizes. Many layers of pile fibers capture particles for the most effective depth filtration. Perhaps as important, the media is engineered to backwash effectively and last over time. OptiFiber media is exclusive to the entire line of Aqua-Aerobic® cloth media filter configurations including:

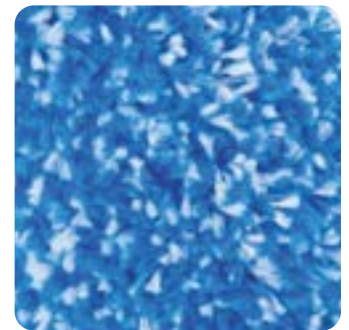
- AquaDisk®
- Aqua MegaDisk®
- AquaPrime®
- AquaStorm®
- AquaDiamond®
- Aqua MiniDisk®
- AquaDrum®
- Pressure Series

Advantages

- Woven, precision fibers provide strength and durability
- Discrete pile fibers effectively release solids during backwash
- Open backing minimizes potential for biofouling
- Low backwash volume results in water savings and energy reduction
- Variety of application-specific cloth including Standard fiber, Microfiber and Ultrafiber
- Phosphorus removal to 0.075 mg/l or less
- Ability to handle high solids conditions



OptiFiber PA2-13®
Cloth Filtration Media



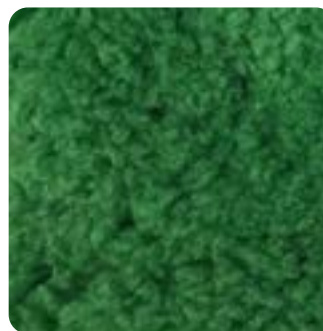
OptiFiber PES-13®
Cloth Filtration Media



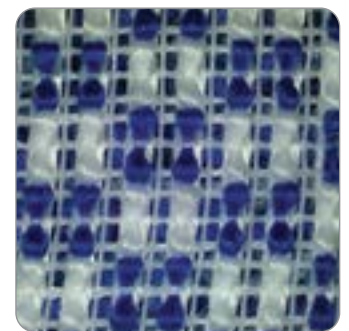
OptiFiber PES-14®
Cloth Filtration Media



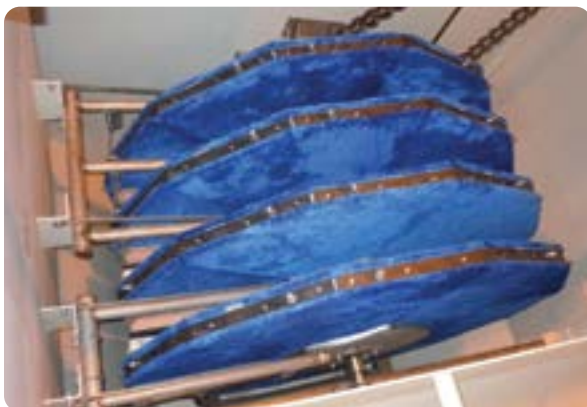
OptiFiber UF-10™
Cloth Filtration Media



OptiFiber PF-14®
Cloth Filtration Media



Unique Backing Design
Cloth Filtration Media



An AquaDisk® filter with OptiFiber
PES-14® Cloth Filtration Media

Engineered Cloth Media

The media is the most important aspect in any filter design. Today's OptiFiber® media is the result of over 35 years of continuous engineering and improvement. Each aspect of the pile cloth filter media design is engineered to maximize particle removal, allow for effective backwash, and maximize media life.

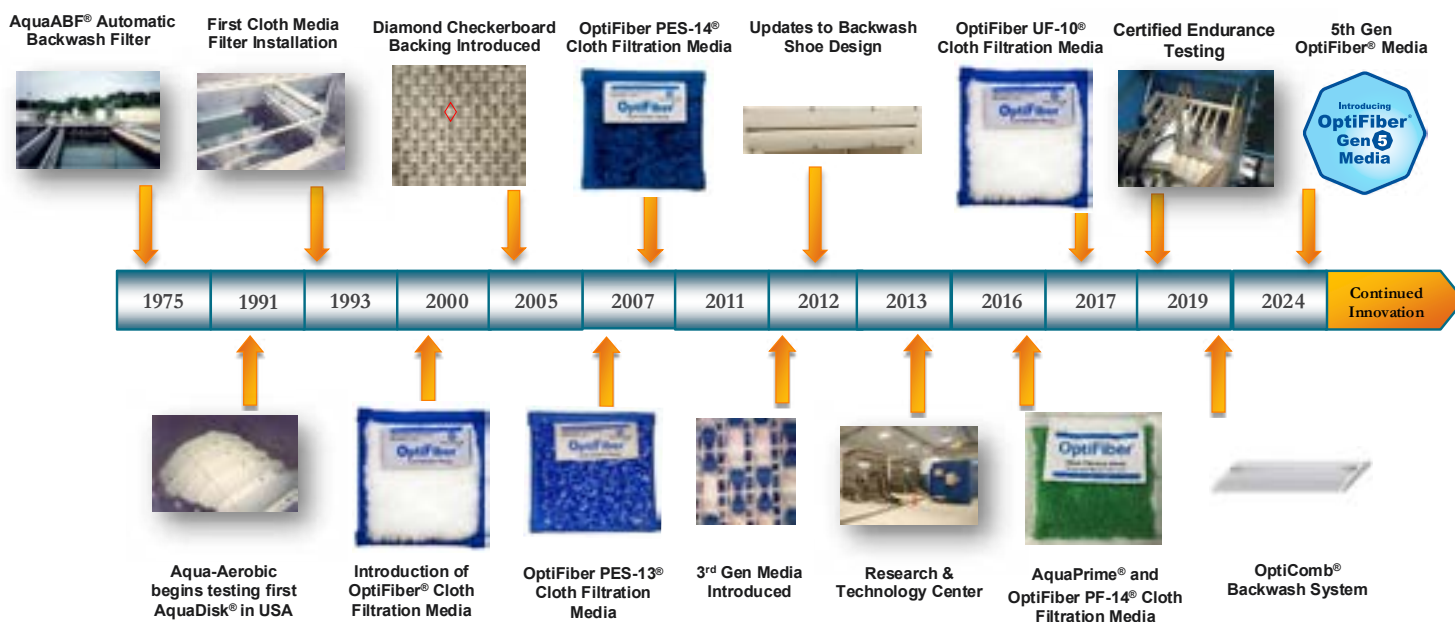
Hundreds of media options have been tested as part of this continuous development process. Only five of these options have made it through the rigorous testing process and met the quality standards set forth by Aqua-Aerobic Systems, Inc.



A cloth media display showcases samples of tested media with the far left panel featuring OptiFiber® media.

OptiFiber® Cloth Filtration Media Development Timeline

Defining Filtration Through Innovation.



Backwash System

Effective Cleaning With Less Water and Energy

Maximum cleaning of the OptiFiber® media is accomplished with a unique backwash system. The backwash shoe makes direct contact with the cloth media and solids are vacuumed from the surface. During backwash, fibers fluidize to provide an efficient release of stored solids deep within the fiber depth.

Advantages

- Filtration continues during backwash
- Less water volume required
- Initiated at a pre-determined liquid level or time
- Low energy consumption
- Low backwash rates

Gen 5 OptiFiber®

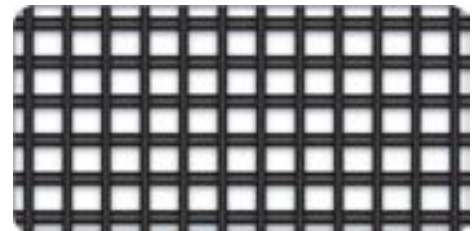
Cloth Filtration Media

Features and Advantages

- Pile Cloth Media with enlarged openings in the backing
 - More open area for less potential of fouling
 - Pore size and geometry optimized to achieve best media recovery
- Improved materials of construction
 - More resilient to damage
 - Less fiber loss over time
 - Longer cloth life
- Proven OptiFiber® pile structure
 - Excellent solids removal for superb effluent quality
 - Demonstrated to have the same or better removal efficiency compared to Gen 4 OptiFiber®



Engineered backwash shoe is optimized for complete removal of solids from the media.



Representation of previous OptiFiber® Pile Cloth Media, and the new Gen 5 media backing

OptiComb®

Backwash System

Introduced to the market in 2019 the **OptiComb® Backwash System** is now a standard feature of the Aqua-Aerobic® Cloth Media Filter family. The OptiComb backwash system decreases backwash volume by increasing the effective filter media surface area.

OptiComb for Increased Media Surface Area

After passing through the engineered slot of the OptiComb Backwash System, the clean media passes through the comb section of the shoe leaving a ruffled surface on the outer face of the media where the brush strokes are visible. The imprinted ridges and valleys create more surface area for solids collection, increasing the interval between backwash cycles and reducing overall backwash volume.

Advantages

- More filter surface area
- 30-40% reduction in backwash volume
- Higher capacity to retain solids
- Less backwashing = less energy



Comb section of the shoe in an OptiComb® Backwash System



Pile cloth media in its conditioned state with the OptiComb® Backwash System

Configurations

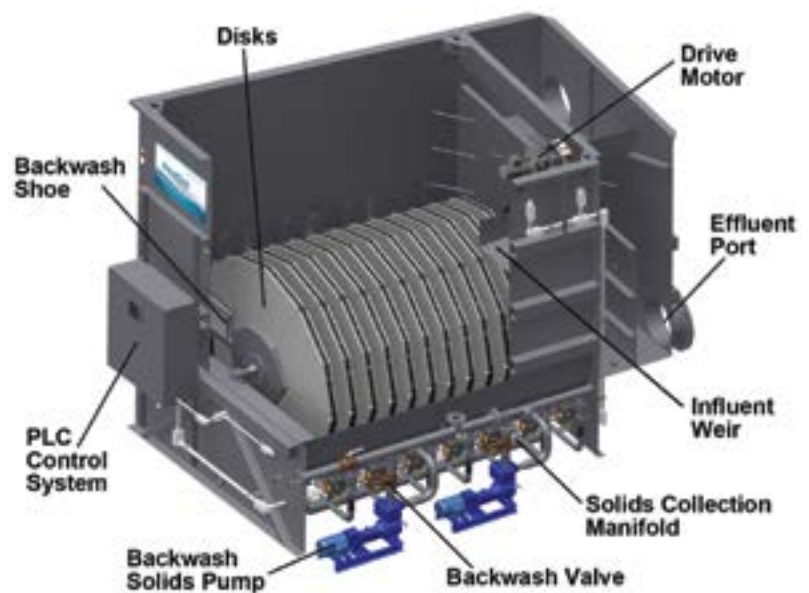
AquaDisk®

Cloth Media Filter

The cloth media “Disk” configuration was the first to enter the marketplace as an alternative to conventional granular media filtration technologies. This original configuration comprises the majority of Aqua-Aerobic cloth media filters installed today. A history of exceptional operating experience in a variety of municipal and industrial applications continues to make the AquaDisk® filter the preferred choice for a wide range of filtration applications.

Features and Advantages

- Vertically oriented cloth media disks reduce required footprint
- Each disk has six lightweight, removable segments for ease of maintenance
- Low hydraulic profile
- Higher solids and hydraulic loading rates
- Low backwash rate
- Available in painted steel, stainless steel or concrete tanks
- Fully automatic PLC control system with color touchscreen HMI
- Low cost of ownership



Modes of Operation

Aqua-Aerobic cloth media filter configurations operate on the same (3) modes of operation: **FILTRATION**, **BACKWASH** and **SOLIDS WASTING**.



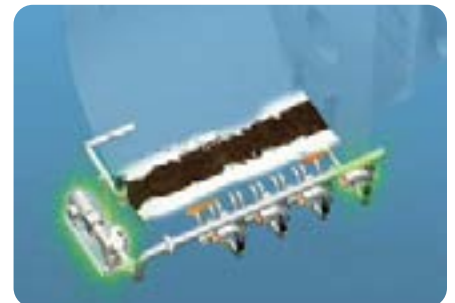
Filtration Mode

- Inlet wastewater enters filter
- Cloth media is completely submerged
- Disks are stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Tank liquid level rises
- Flow enters the filter by gravity and filtrate is collected inside the disks and discharged
- Heavier solids settle to the tank bottom



Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- Two disks are backwashed at a time (unless a single disk is utilized)
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to headworks



Solids Wasting Mode

- Heavier solids on the tank bottom are removed on an intermittent basis
- Solids are pumped back to the headworks, digester or other solids collection area of the treatment plant

Aqua MegaDisk®

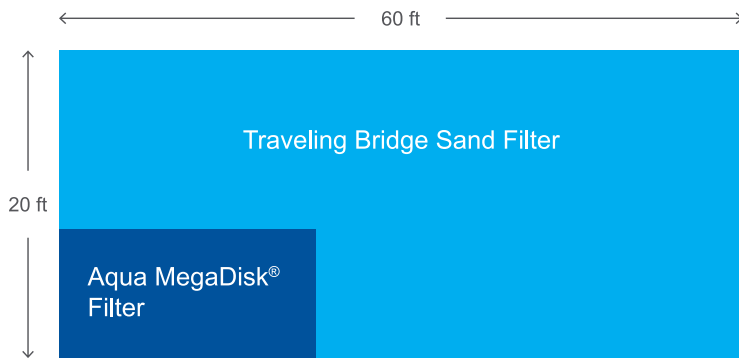
Cloth Media Filter

The Aqua MegaDisk® cloth media filter expands on the reliability and exceptional performance of the original AquaDisk filter, but on a larger scale. Each disk is approximately 10' in diameter. The unit features all of the same benefits and (3) modes of operation as the AquaDisk but with larger disks.

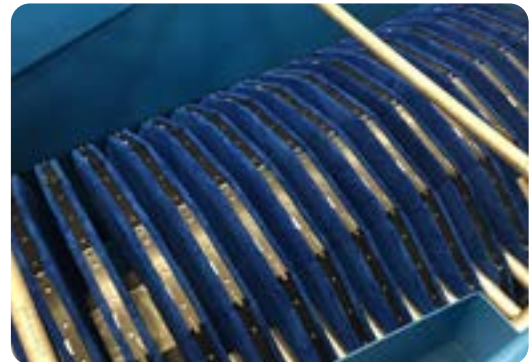
Features and Advantages

- Smallest footprint, operating in 80% less space than sand filters with comparable hydraulic capacity
- Up to 24 disks in a single filter, capable of treating 24 MGD
- Ideal for deep bed sand filter retrofits, new plants or expansions
- Lightweight segments removable without a crane

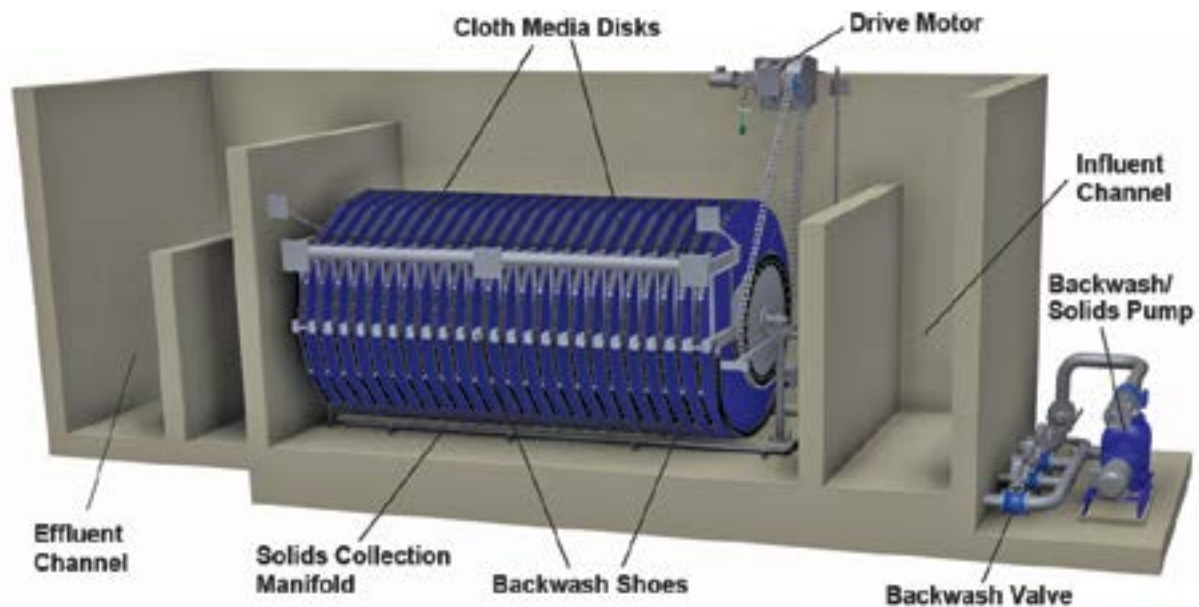
Footprint Savings Compared to Sand Filters



Aqua MegaDisk® (left) compared to AquaDisk® (right).



Internal view of the Aqua MegaDisk®



Aqua MiniDisk®

Cloth Media Filter

The Aqua MiniDisk® cloth media filter features all of the same benefits and (3) modes of operation as the original AquaDisk. The configurations are designed to provide economical treatment of smaller flows and easily retrofit into existing traveling bridge sand filters.



The Aqua MiniDisk® filter is available as packaged unit(s) or concrete basin(s).



The modular design of the Aqua MiniDisk® filter retrofits neatly into existing 9 ft. (2.74 m) wide concrete traveling bridge filter basins, providing more than two times the hydraulic capacity of the original sand filters.

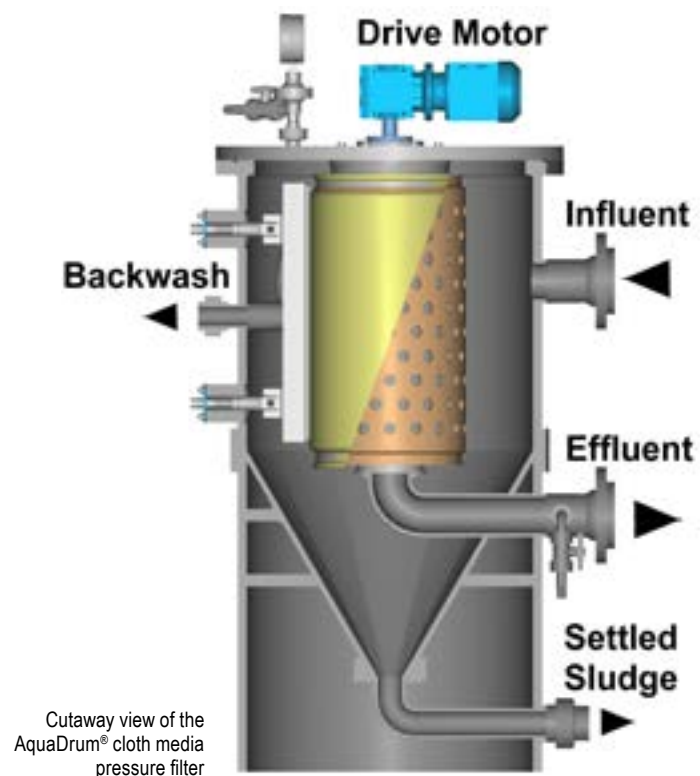
AquaDrum® Pressure Series

Cloth Media Filter

The AquaDrum® Pressure Series Cloth Media Filter is a pressurized vessel consisting of a perforated, vertically oriented drum utilizing OptiFiber media. This pressurized filtration system is engineered to effectively maximize solids removal from water and wastewater. The unit is ideally suited to fit into pressurized systems and avoids breaking pressure and repumping. Each AquaDrum unit is equipped with an independent backwash and solids removal system. Backwash occurs by simply opening a valve without the need for a dedicated backwash pump. The system is controlled via differential pressure.

Features and Advantages

- Installation in pressurized systems
- High flow rates
- High solids loading capacity
- Suitable for corrosive media (acids and more)
- Low capital and operating and maintenance costs
- Small footprint



AquaDiamond®

Cloth Media Filter

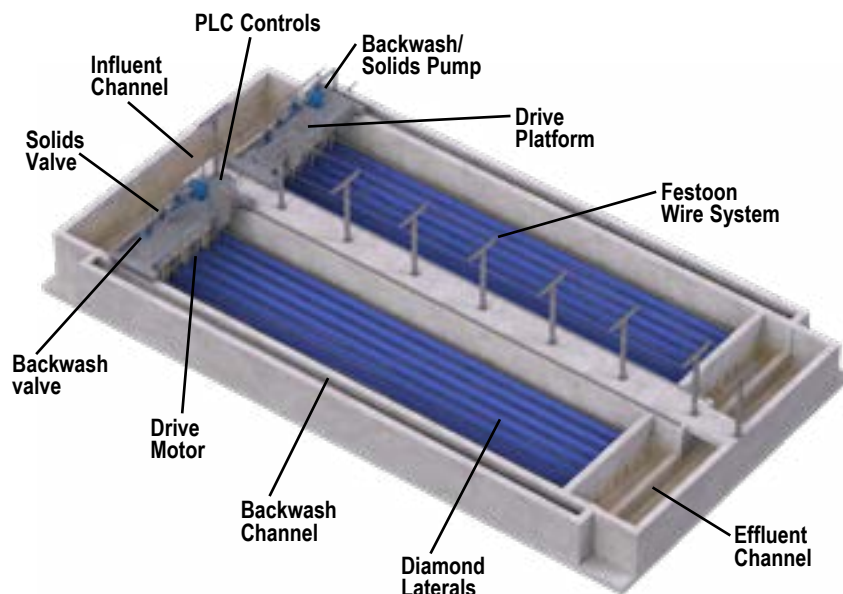
The AquaDiamond® cloth media filter is a unique combination of two proven technologies: traveling bridge and cloth media filters. The result is two to three times the flow capacity of a traveling bridge filter within an equivalent footprint, making it ideal for sand filter retrofits. The unit features all of the same benefits and (3) modes of operation as the AquaDisk filter but with vertically oriented diamond laterals and a traveling platform.

Features and Advantages

- Up to eight diamond laterals per unit
- Fits neatly into existing traveling bridge filter profile with minimal civil work
- Variable speed drive platform and backwash pump provide immediate response to influent solids excursions
- Advanced drive and tracking system prevents misalignment



An AquaDiamond® filter with microfiber cloth polishes phosphorus to < 0.1 mg/l



Modes of Operation



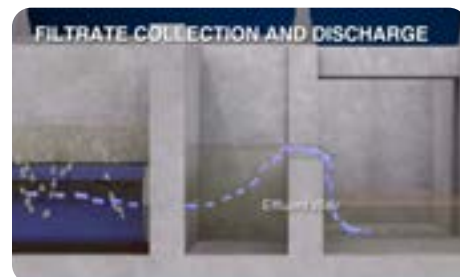
Filtration Mode

- Inlet wastewater enters the filter
- Cloth media is completely submerged
- No moving parts
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Flow enters the filter by gravity and filtrate is collected inside the diamond laterals and discharged
- Heavier solids settle to the basin floor



Backwash Mode

- Periodic backwashing is initiated by increased headloss due to solids deposits
- The platform traverses the length of the cloth media diamond laterals during backwashing
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- The platform only operates during backwash and solids collection



Filtrate Collection and Discharge

- Heavier solids on the tank bottom are removed on an intermittent basis
- Small suction headers collect and discharge settled solids
- The backwash pump is utilized for solids removal

Filter IntelliPro®

Process Monitoring and Control System

The **Filter IntelliPro®** system was developed by Aqua-Aerobic Systems, Inc. to help wastewater treatment plants meet stringent phosphorus requirements by automatically adjusting chemical dosing to optimize chemical use and ensure compliance with effluent requirements. Unlike traditional methods, such as fixed or flow-based coagulant dosing, the IntelliPro system uses an algorithm to optimize chemical addition, preventing the overdosing that can occur with other strategies.

Features and Advantages

- **Optimized Chemical Dosing**
 - Online instrumentation with feed-forward and feed-back control to enhance effluent phosphorus reliability and continuously optimize chemical addition
 - Automatically responds to changes in influent phosphorus mass loading and monitors changes in effluent phosphorus concentration for added security
- **Automatic Polymer Dosing**
 - The system finds a correlation between different polymer dosing concentrations and effluent turbidity and automatically selects the optimal dosage
 - The process effectively acts as an automatic, full-scale jar test, eliminating manual laboratory jar testing
- **Chemical Savings**
 - The system eliminates the potential for overdosing by constantly adjusting chemical dosing based on flow, influent phosphorus, and effluent phosphorus



Filter IntelliPro® Process

The Filter IntelliPro system offers a solution for reliably meeting ultra-low phosphorus limits while also providing substantial chemical savings. Its automated and continuous monitoring and control of chemical dosing ensures that the effluent phosphorus target is met with minimal chemical requirement and operator input, which can lead to a quick payback period for the investment.

Real Time Status



Reports



Real Time & Historical Trends



High Solids Applications

Primary Filtration and Wet Weather Treatment

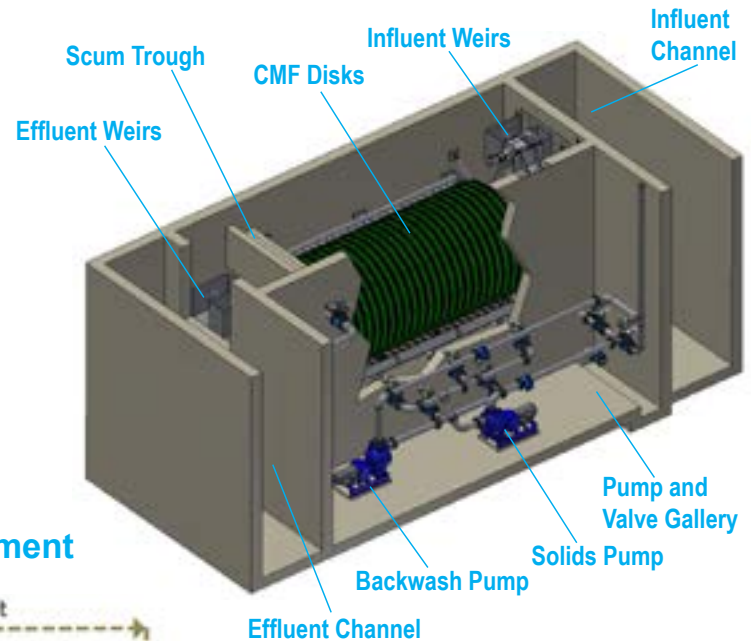
AquaPrime®

Cloth Media Filter

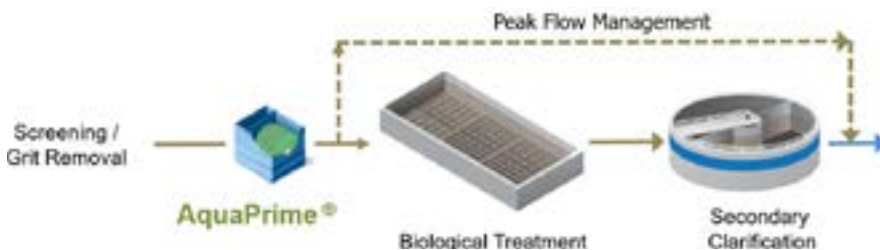
The AquaPrime® cloth media filter is ideal for primary wastewater treatment due to its proven removal efficiencies. The main advantages include extremely small footprint, reduced energy costs in the secondary process due to a reduction in organic loading and more solids for increased gas production in anaerobic digesters for primary applications.

Features and Advantages

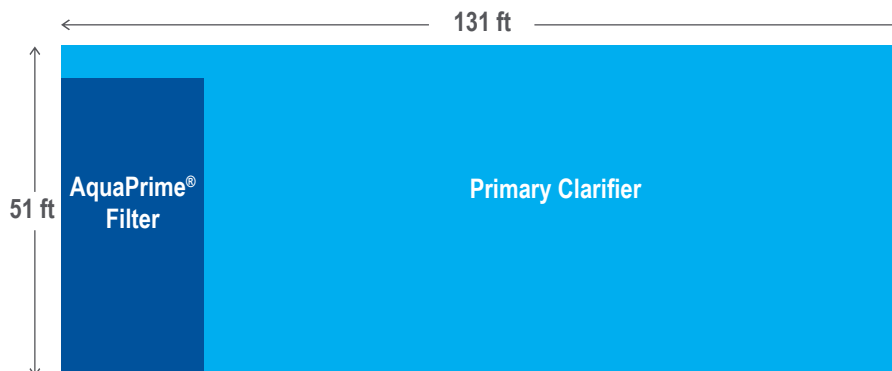
- Vertically oriented cloth media disks reduce required footprint to 15% to 20% of primary clarification
- Provides enhanced solids and BOD removal resulting in:
 - Less aeration energy for secondary process due to reduced organic loading
 - More solids for increased biogas production in anaerobic digesters
 - Increased capacity in existing secondary process basin
- Three methods of solids removal with specifically designed floatable, filtration and solids removal zones
- Dual-use applications of advanced primary treatment and wet weather treatment
- Major capital construction savings



Flow Diagram for Advanced Primary Treatment



80-85% Footprint Savings Compared to Primary Clarifier



Linda County Water District, Olivehurst, CA

- Primary filtration application
- TSS removal greater than 75%
- BOD removal up to 60%

AquaStorm®

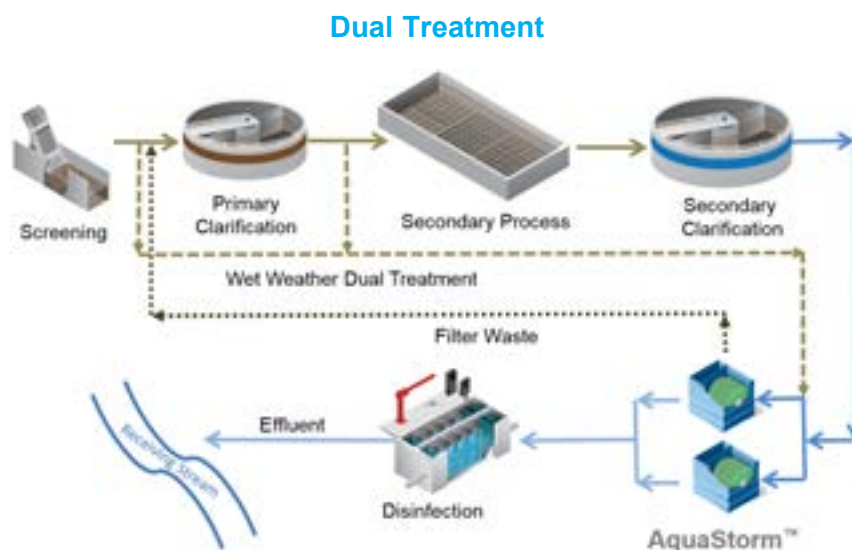
Cloth Media Filter

The AquaStorm® cloth media filter features a similar mechanical configuration as the AquaPrime filter, as well as offers inherent advantages related to wet weather treatment for stormwater, Combined Sewer Overflow (CSO) and Sanitary Sewer Overflow (SSO), including the ability to be configured for dual-use applications for tertiary and wet weather operation. Also, differences in controls specifically designed to handle intermittent operation and need for lower effluent requirements for wet weather applications.

Features and Advantages

- High quality effluent similar to secondary standards
- Use with or without chemical, depending on site-specific effluent water quality requirements
- Can be configured for dual-use application for tertiary or wet weather operation
- Simple start-up and shutdown with unattended operation for remote locations
- Provides the treatment facility with resiliency during wet weather events
- Maximizes the wet weather flows to be treated
- Protects the biological portion of the facility
- Can be used at remote CSO/SSO sites
- Improves disinfection of wet weather flows

Flow Diagrams for Wet Weather Treatment



Modes of Operation

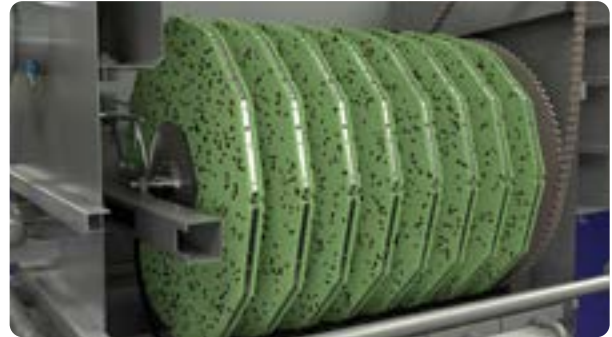
Primary Filtration and Wet Weather Treatment

The AquaPrime and AquaStorm filtration systems utilize four (4) modes of operation: **FILTRATION**, **BACKWASH**, **SOLIDS WASTING** and **FLOATABLE WASTING**.



Filtration Mode

- Inlet wastewater enters filter by gravity
- Cloth media is completely submerged and stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Filtrate is collected inside the disks and discharged
- Heavier solids settle to the tank bottom
- Tank liquid level rises



Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- 2 to 8 disks are backwashed at a time
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to the waste handling facility or headworks (AquaStorm)



Solids Wasting Mode

- Heavier solids are collected in the hoppers and are removed on an intermittent basis
- After a preset number of backwashes, a solids wasting occurs
- Backwash/Solids Pump provides suction to the solids collection manifold for wasting of settled solids
- Solids are pumped back to the waste handling facility or headworks (AquaStorm)



Floatable Wasting Mode

- Floatable scum is allowed to collect on the water surface
- After a preset amount of time, the water level is allowed to rise above the preset floatable setpoint
- As the water level increases, floating scum is removed by flowing over the scum removal weir
- Scum wasting water is directed to the plant's waste handling facility

Cloth Media Filtration

Mobile Pilot Systems

Technology pilot demonstrations can be beneficial to wastewater treatment plants by providing a snapshot of essential process operating conditions and allowing the customer to interact with the technology and Aqua-Aerobic personnel. OptiFiber cloth media filter pilot systems provide customers with the most comprehensive on-site testing and analytical services available. Our unique approach is designed to provide prompt operational feedback, allowing immediate fine-tuning of parameters for the most effective pilot/demonstration experience.



Fully Equipped Laboratory



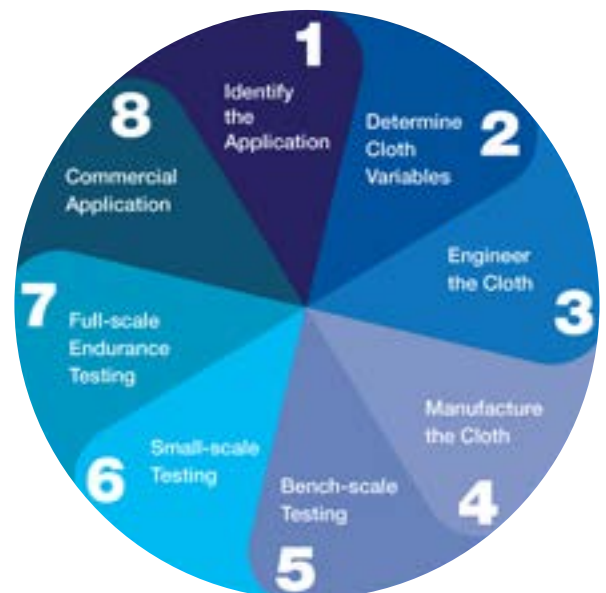
Mobile Primary Filtration Pilot System

Aqua-Aerobic Research & Technology Center

In 2011, Aqua-Aerobic Systems, Inc. in partnership with the Four Rivers Sanitation Authority (Rockford, IL) built a new Research & Technology Center at the District's central treatment plant. The facility was constructed for the purpose of conducting applied research and demonstration of new products and processes for treating wastewater. The Center is integral in developing and testing cloth filtration media for future commercialization and application, both domestically and internationally.



Customers visit the Research and Technology Center as part of the technical seminar program



OptiFiber® media development: an eight step, three year process



All Aqua-Aerobic® cloth media filtration products offer a "green" advantage including lower energy consumption and reduced water usage.

Application Profiles



Municipal Recycle/Reuse

- Hundreds of installations
- Title 22 approved
- Multiple cloths capable of producing effluent below 1.0 NTU



Phosphorus Removal

- Achieve phosphorus removal below 0.075 mg/l
- Depth of filtration means less chemical/flocculation and energy



Traveling Bridge Filter Retrofits

- 2-3 times hydraulic capacity within existing footprint
- Minimal mechanical components and no civil changes



Deep Bed Filter Retrofits

- 3-4 times hydraulic capacity within existing footprint
- Minimal mechanical components and no civil changes



Industrial

- Robust cloth media handles high industrial solids
- Applied in several industrial applications including: Energy, Food/Beverage, Mining, Textile and Pharmaceutical



Large Flows

- Ideal application for Aqua MegaDisk® and AquaDiamond® filters
- Smallest footprint when compared to hydraulic capacity
- Experience in large flow filter designs over 50 MGD



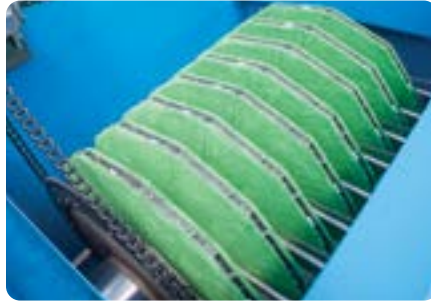
Power and Energy

- Removes coal ash and coal fines from runoff or wastewater streams
- Reduces TSS and NTU for process water
- Provides reuse water for cooling



Stormwater/CSO/SSO

- Effectively removes TSS without chemicals
- Easily accommodates varying flows
- Can provide tertiary treatment between rain events



Primary Filtration

- Reduce organic load to secondary process
- Lower energy consumption
- Replace existing primary clarifiers
- Increased biogas production



Microplastics

- Floating, sinking, or neutrally buoyant plastic
- Pellets and powders
- Fibers or other secondary microplastics



Micropollutants

- Adsorption onto carbon, followed by removal by pile cloth media filtration
- Removal of organics like pharmaceutical residuals manufacturing byproducts



Pressurized Filtration

- Eliminates multiple pumping steps for pressurized systems
- Available with any OptiFiber media



Drinking Water Pre-Treatment

- Improves performance of downstream systems like UF or GAC
- Filtration of waste streams to improve overall throughput



Emerging Contaminants

- Reduces concentration of trace particulate metals
- Combined with carbon, can reduce toxicity of organics
- Improves UVT for better disinfection

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.

PROTECTING THE WORLD'S WATER.

Aeration and Mixing

Biological Processes

Filtration

PFAS Solutions

Ozone Systems

Membranes

Aftermarket Products and Services

Rental Programs

Cloth Media Filtration

Featuring OptiFiber® Cloth Filtration Media



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