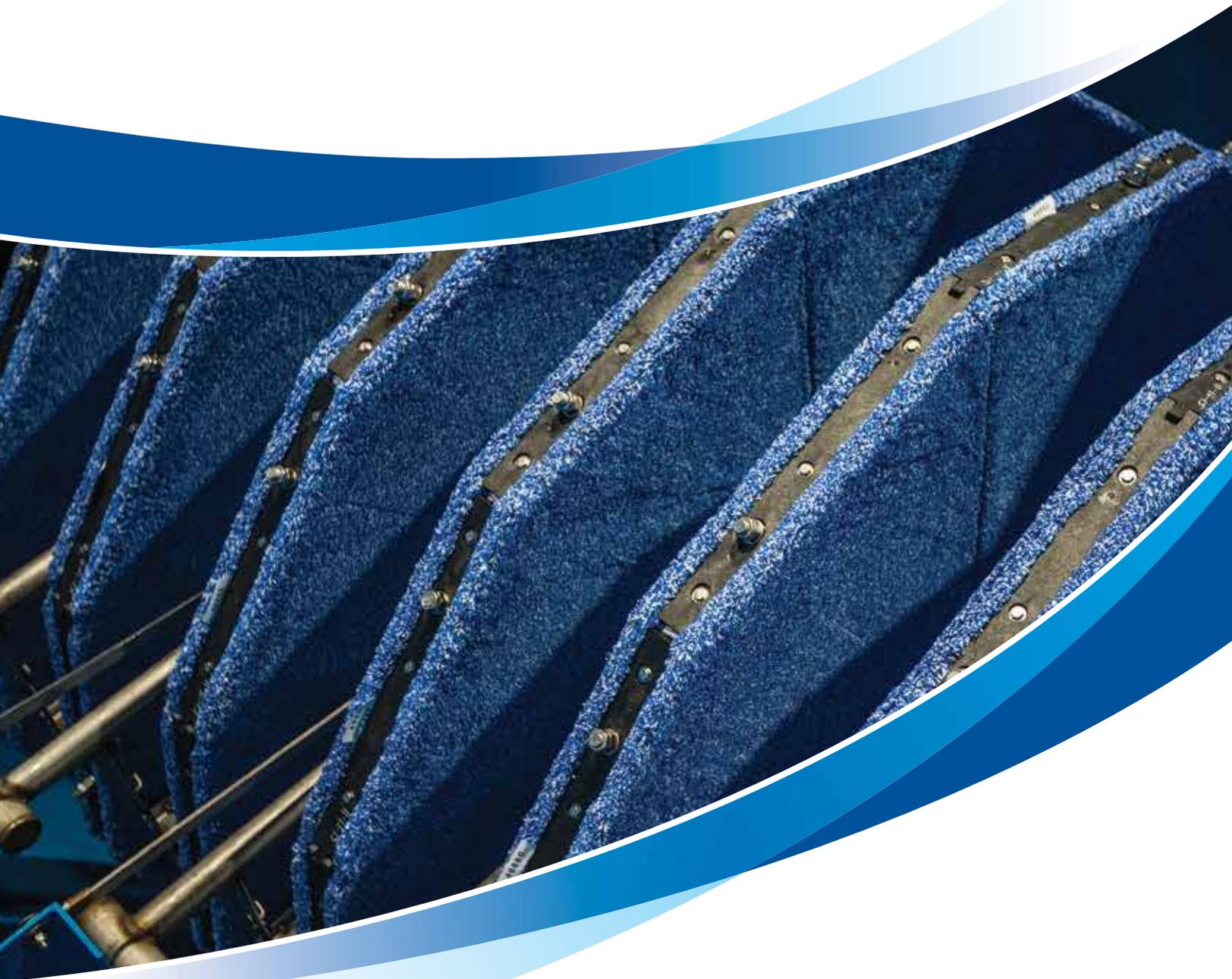


Cloth Media Filtration

Featuring OptiFiber® Pile Cloth Media



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Aqua-Aerobic[®] Cloth Media Filter Featuring OptiFiber[®] Pile Cloth Media

In the early 1990s, Aqua-Aerobic Systems revolutionized tertiary treatment by introducing Pile 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 six mechanical configurations in a variety of applications including: water reuse, low level phosphorus, stormwater and primary treatment.

Effective Depth Filtration

The original OptiFiber[®] pile cloth media is specifically engineered for water and wastewater applications and designed to maximize solids removal over a wide range of particle sizes. Deep, thick, 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 cloth media filter configurations including:

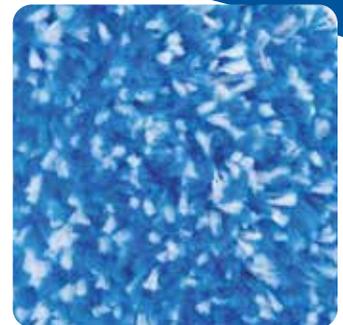
- AquaDisk[®]
- Aqua MegaDisk[®]
- AquaPrime[®]
- AquaStorm[™]
- AquaDiamond[®]
- Aqua MiniDisk[®]

OptiFiber[®] Media 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 2, 5 & 10 µm nominal pore size media
- Phosphorus removal to 0.075 mg/l or less
- Ability to handle high solids conditions



OptiFiber PA2-13[®]



OptiFiber PES-13[®]



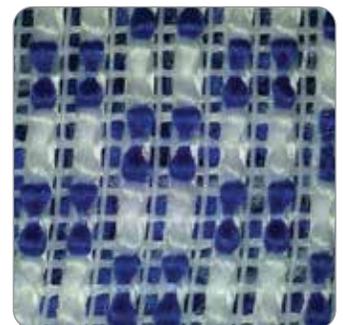
OptiFiber PES-14[®]



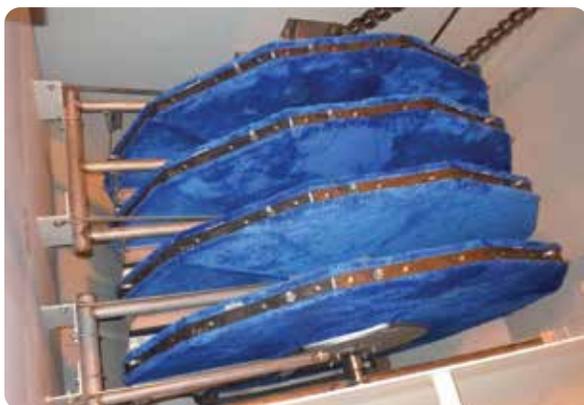
OptiFiber UFS-9[™]



OptiFiber PF-14[®]



Unique Backing Design



An AquaDisk[®] filter with OptiFiber PES-14[®] treats cooling tower blow-down.



OptiFiber[®] Cloth Filtration Media
Awarded BlueTech[®] Research Innovation Badge

Engineered Cloth Media

The media is the most important aspect in any filter design. Today's OptiFiber® pile cloth filtration media is the result of over 30 years of continuous engineering and improvement. Each aspect of the pile cloth is designed to provide an optimal design 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 Media Technology Timeline

1993	2000	2004	2006	2011	2013	2016	2017	Continued Innovation
AquaDisk® Filter	OptiFiber PA2-13® Media	AquaDiamond® Filter	OptiFiber PES-13® Media	OptiFiber PES-14® Microfiber Media	Aqua MegaDisk® Filter	AquaPrime® & AquaStorm™ Filter with OptiFiber PF-14® Media	OptiFiber UFS-9® Ultrafiber Media	

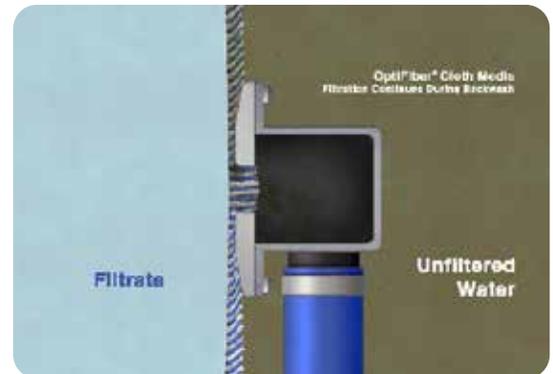
Backwash System

Effective Cleaning With Less Water and Energy

Maximum cleaning of the OptiFiber® cloth 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.

Backwash System Advantages

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



Backwash shoe makes direct contact with the media.



Shown is pile cloth media in its natural state (left) and its conditioned state (right).

Configurations

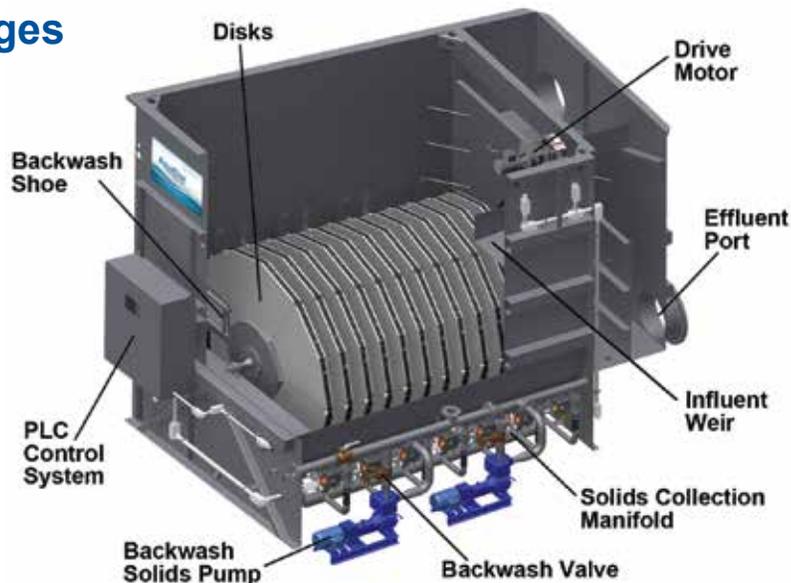
AquaDisk®

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® the tertiary filter of choice.

System 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**.



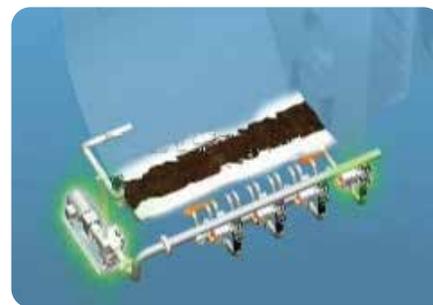
Filtration Mode

- 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.

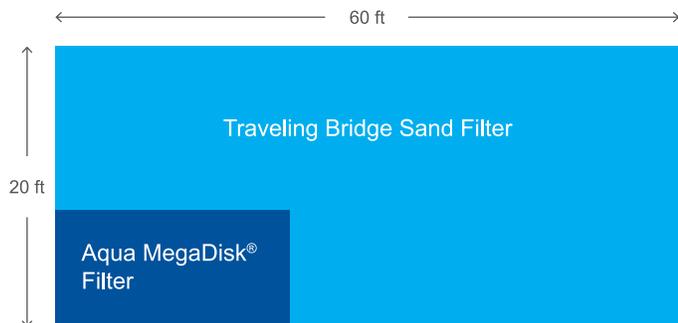
Additional Features and Advantages

- 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

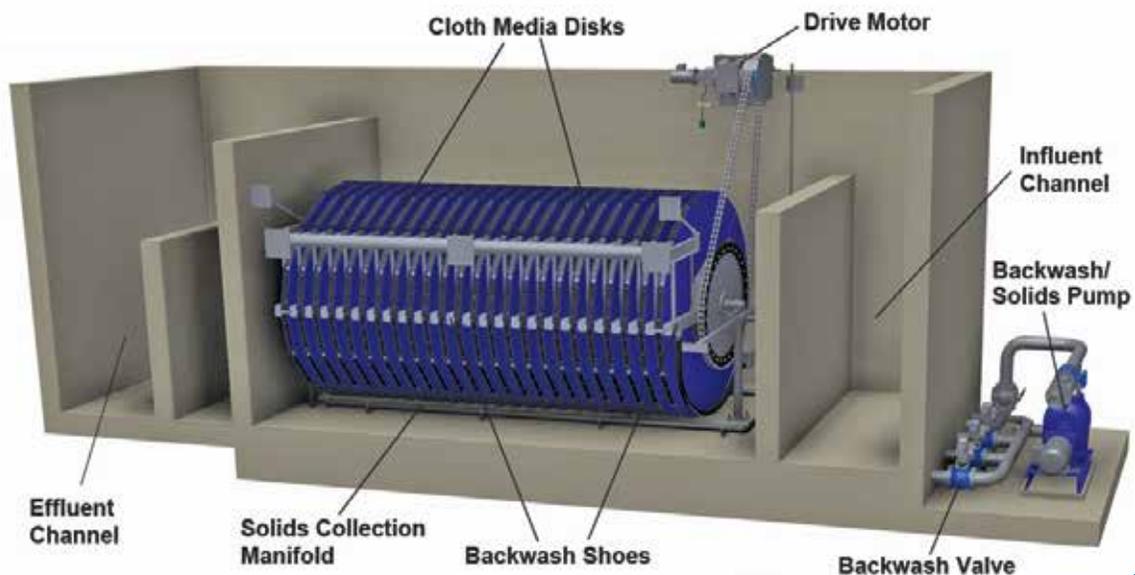


Aqua MegaDisk® (left) compared to AquaDisk® (right).

Footprint Savings Compared to Sand Filters



Internal view of the Aqua MegaDisk®



Configurations

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® cloth media 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.

Filter IntelliPro®

Filtration Optimization System

Building from a decade of experience in applying advanced process control, Filter IntelliPro® is a control system for cloth media filters that uses real time data to optimize chemical usage for phosphorus removal prior to filtration. Among its many features, the system includes automatic optimal dose selection for metal salt, polymer, and pH control.

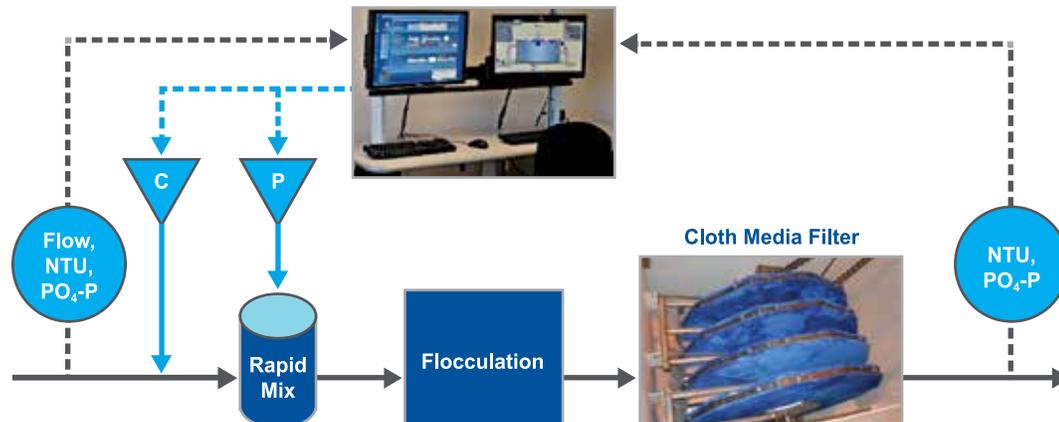
System Features

- PC with IntelliPro software developed by Aqua-Aerobic Systems, Inc.
- Network settings to allow communication between the instruments, the PLC and the PC
- Process, instrumentation and software on-site training

System Advantages

- Chemical savings through load based control
- Automatic chemical dose response curves replace jar testing
- Improved process reliability using real time information
- Multi-point analysis of key process parameters

IntelliPro® System Layout for Ultra-Low Phosphorus



AquaDiamond®

Cloth Media Filter

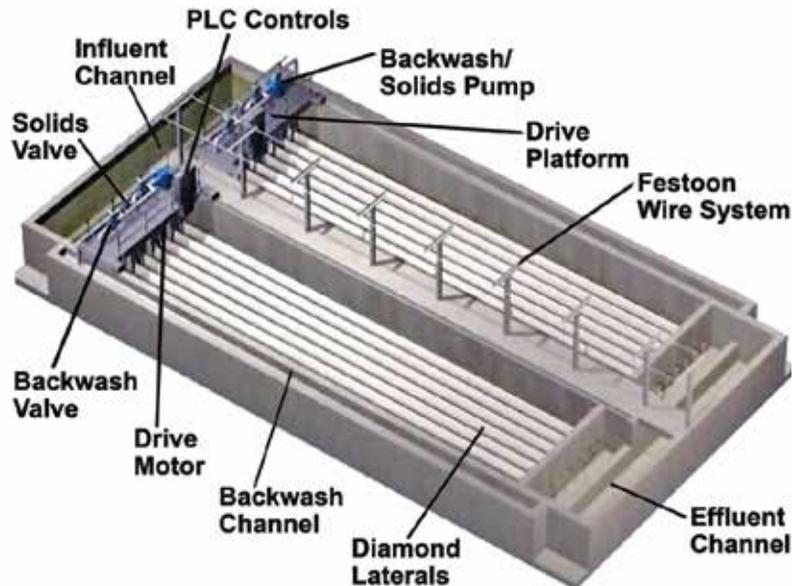
The AquaDiamond® cloth media filter is a unique combination of two proven technologies: traveling bridge and cloth media filters. The result is two to three times the flow capacity of a traveling bridge filter within an equivalent footprint, making it ideal for sand filter retrofits. The unit features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

Additional Features and Advantages

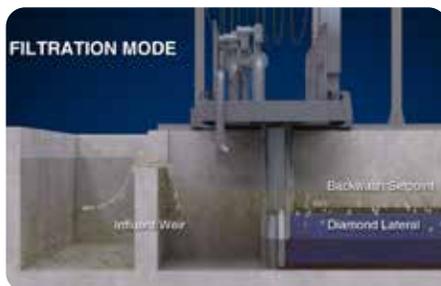
- Up to eight diamond laterals per unit
- Fits neatly into existing traveling bridge filter profile with minimal civil work
- Variable speed drive platform and backwash pump provide immediate response to influent solids excursions
- Advanced drive and tracking system prevents misalignment



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

High Solids Applications

Primary Filtration and Wet Weather Treatment

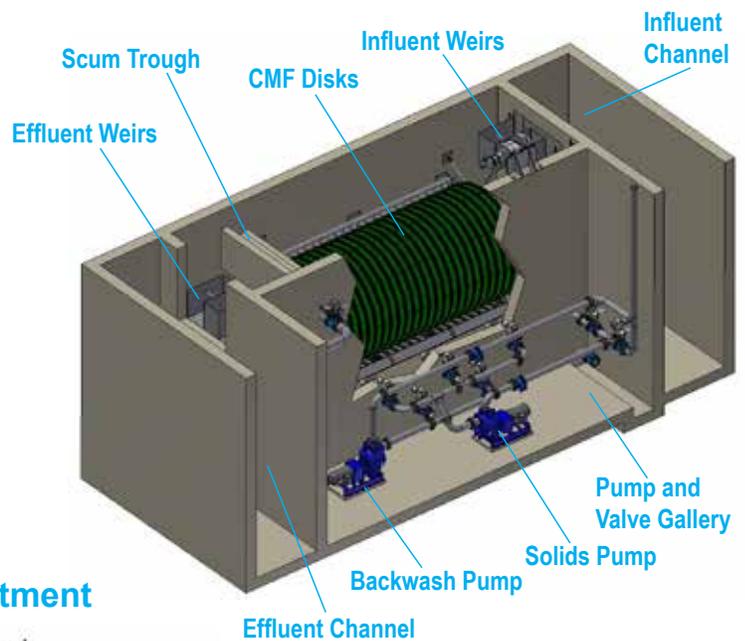
AquaPrime®

Cloth Media Filter

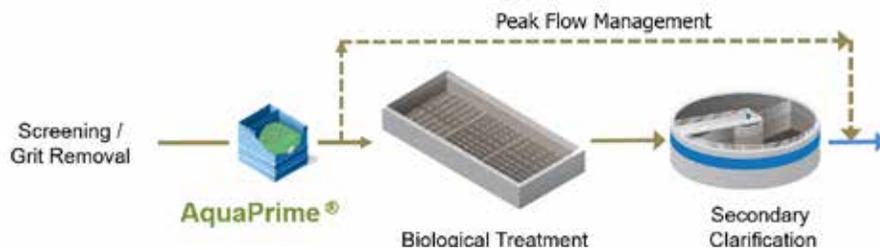
The AquaPrime® cloth media filter is ideal for primary wastewater treatment due to its proven removal efficiencies. The main advantages include extremely small footprint, reduced energy costs in the secondary process due to a reduction in organic loading and more solids for increased gas production in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

AquaPrime® Features and Advantages

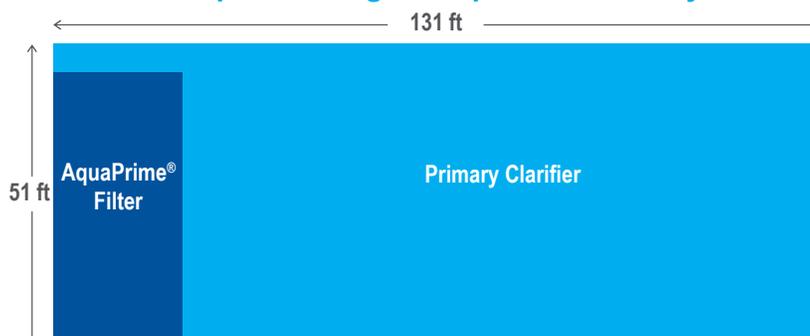
- Vertically oriented cloth media disks reduce required footprint to 15% to 20% of primary clarification
- Provides enhanced solids and BOD removal resulting in:
 - Less aeration energy for secondary process due to reduced organic loading
 - More solids for increased biogas production in anaerobic digesters
 - 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%

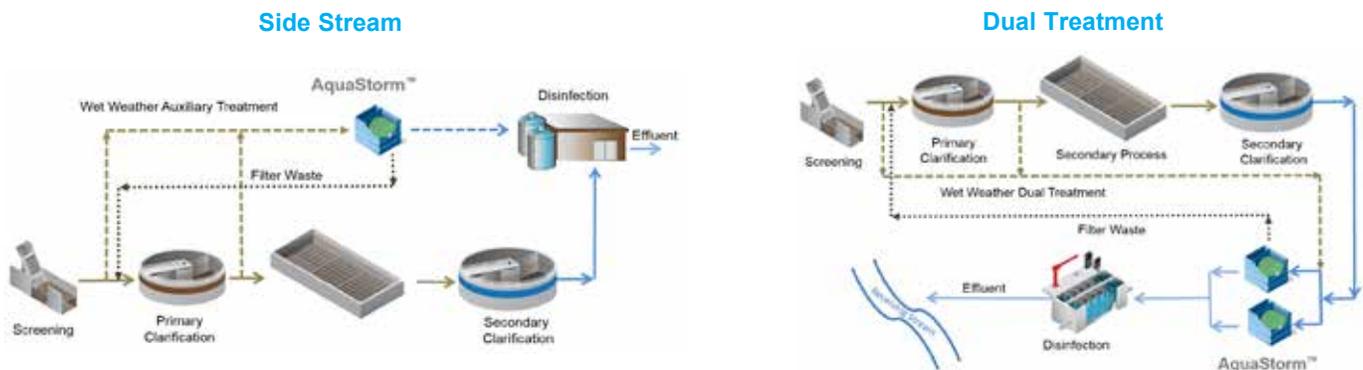
AquaStorm® Cloth Media Filter

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.

AquaStorm® 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

The AquaPrime® and AquaStorm® cloth media filtration system operates on 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



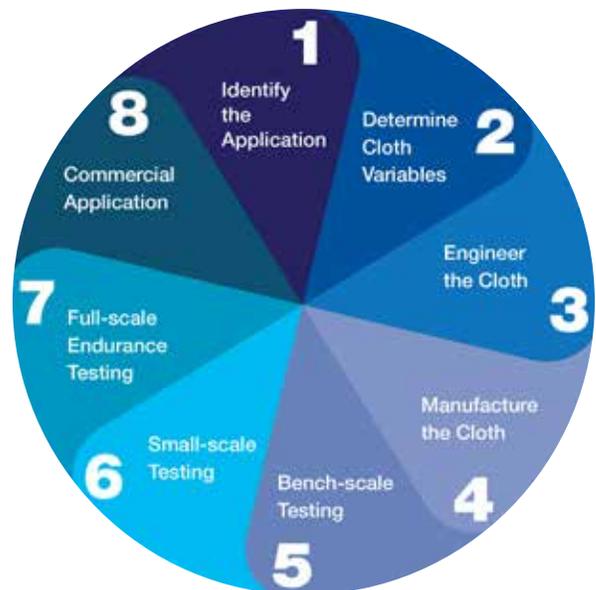
Mobile Primary Filtration Pilot System

Aqua-Aerobic Research & Technology Center

In 2011, Aqua-Aerobic Systems, Inc. in partnership with the Rock River Water Reclamation District (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 R&T 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, 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



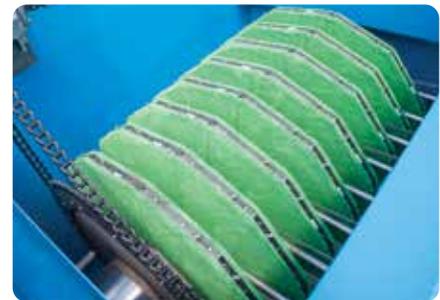
Power and Energy

- 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

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

Cloth Media Filtration Featuring OptiFiber® Pile Cloth Media

Visit our website at www.aqua-aerobic.com to learn more about the Cloth Media Filtration Featuring OptiFiber® Pile Cloth Media and our complete line of products and services.



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