



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

AquaPrime™ Cloth Media Filter Operational Description

The AquaPrime™ Cloth Media Filter features an outside-in flow path which allows for three zones of solids removal that are shown in Figure 1. These zones are especially critical in primary and wet weather applications due to the high solids typically associated with primary treatment and the first flush following a wet weather event.

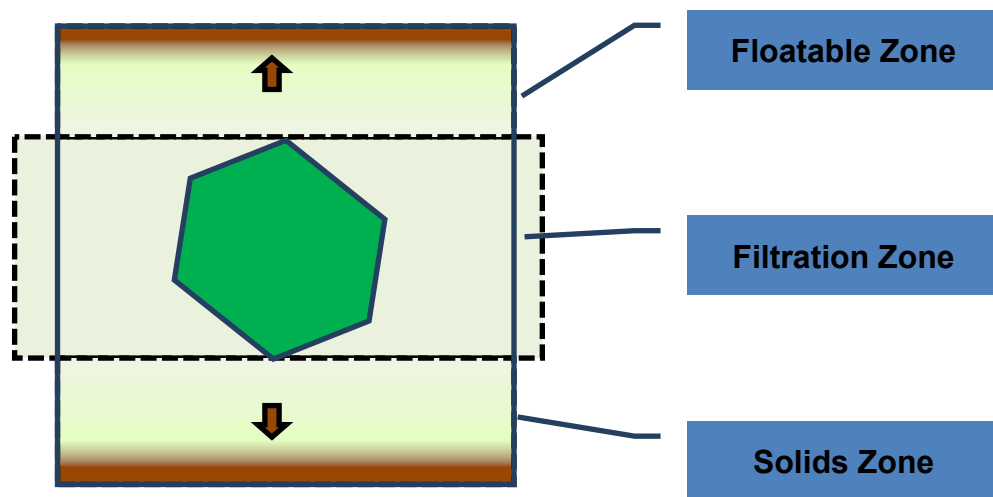


Figure 1: AquaPrime™ Process Diagram

Floatable Removal Mode

The top zone is the “floatable zone” where surface materials such as fats, oils and grease are allowed to collect on the water surface. Solids are removed from this zone by allowing floating material to overflow a scum weir several times each day. Figure 2 shows the removal of the floatable material.

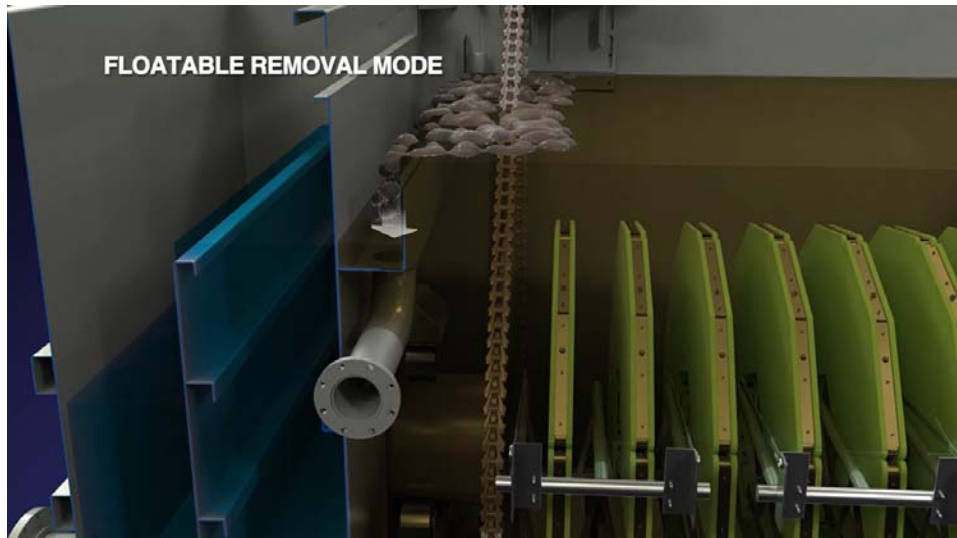


Figure 2: Floatable Removal Mode

Filtration Mode

The middle zone is the “filtration zone” where solids are removed through filtration. Here, solids deposit on the outside of the cloth media, forming a mat as filtrate flows through the media. Figure 3 shows the filtration of solids on the cloth media through the outside-in process.



Figure 3: Filtration Mode

Backwash Mode

The buildup of solids on the media creates hydraulic resistance to flow through the media and causes the water level in the tank to rise. Upon reaching a specific basin level or elapsed time period, the disks will begin to rotate and backwash mode will be automatically initiated to clean the pile cloth media (Figure 4).



Figure 4: Backwash Initiation

The backwash pump draws filtered water from the inside of the disk through the media and removes solids from the media's surface. Solids are backwashed from the pile cloth media surface by liquid suction through backwash shoes positioned on both sides of each disk (Figure 5). These spring loaded backwash shoes contact the pile cloth media to provide the necessary suction for optimum cleaning efficiency (Figure 6).

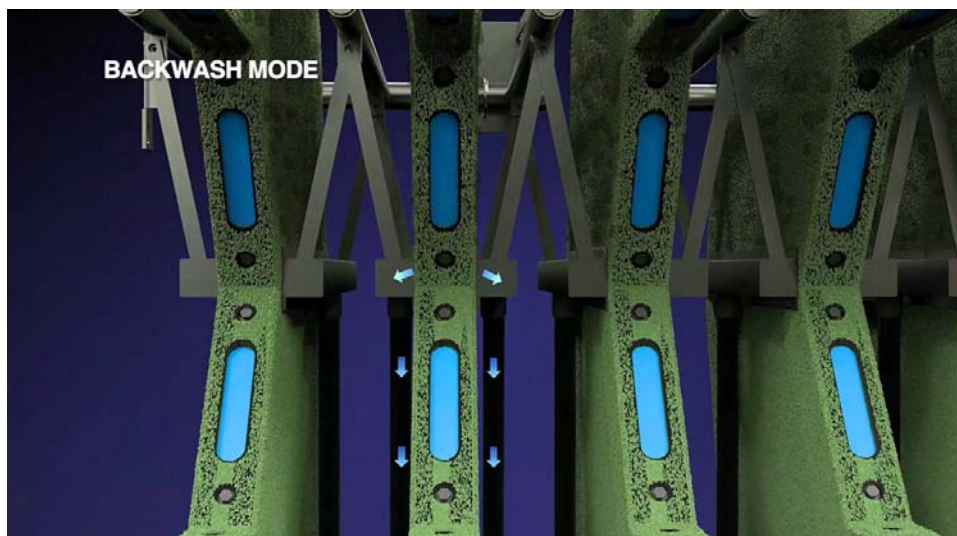


Figure 5: Backwashing from the Inside-Out



Figure 6: Backwashing and removal of solids

During backwash disks rotate slowly while a backwash/waste pump (not shown) draws filtered water from the centertube through the pile cloth media on an inside-to-outside, or reversed, flow path. This provides effective cleaning of the pile cloth media over the entire disk. By the end of the backwash cycle, the basin water level returns to its normal operating level.

The backwash process fluidizes fibers to provide an efficient release of stored solids deep within the fiber. An illustration of the backwash mechanism is shown in Figure 7.

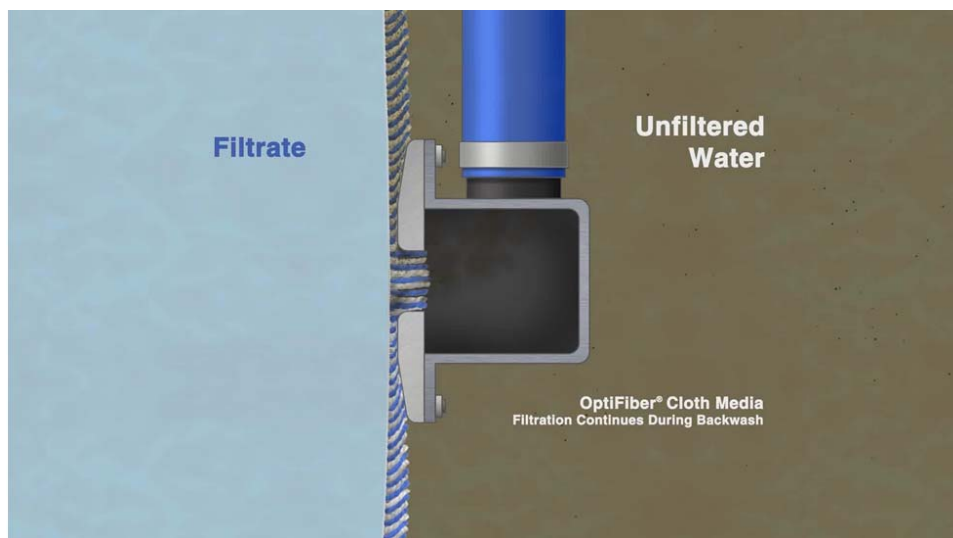


Figure 7: AquaPrime™ Backwash Illustration

Settled Solids Removal Mode

The quiescent environment during filtration combined with the outside-in flow path allows heavier particulates to settle to the bottom of the basin. Upon reaching a specific number of backwash cycles performed or an elapsed time period, the solids waste

mode will be automatically initiated. This mode utilizes the backwash/waste pump to provide suction of the settled solids through a perforated solids collection manifold in the hoppers. The solids are pumped on an intermittent basis, typically to the thickener (Figures 8 and 9). Filtration continues during solids waste mode, allowing continuous filtration while maintaining efficient performance.



Figure 8: Solids Removal Mode – Pumping of Solids out of System



Figure 9: Emptying of Hoppers

Control System

AquaPrime filter operation is automatically controlled by a programmable logic controller (PLC). These PLC based control systems are frequently networked with the plant SCADA system for monitoring or intercommunication purposes.

PLC Equipment Description

The PLC system monitors, regulates and sequences all automatic functions. As a standard, PLC controllers are Allen-Bradley MicroLogix Controllers. PLC inputs are via 16 point (120 VAC) discrete or 8 point (4-20mA) analog input modules, while outputs are via 16 point discrete (Relay) or 4 point (4-20mA) analog output modules. In the case of a power loss, the system will resume operation at the point from where they left off as soon as power is restored. On power-up, any multiple motor starts will commence at 10-second intervals. The PLC processors are equipped with a battery to provide ladder program and data table memory support in case of a power failure.

Automatic Operation

PLC systems allow the AquaPrime filter system to perform all the standard functions and provide maximum flexibility for variation in control strategies. Aqua-Aerobic Systems, Inc. provides all standard and customized programs through our in-house Electrical Engineering group. For the AquaPrime filter, these systems are level based with time overrides. They also provide a complement of fully adjustable set points in addition to filter system monitoring.

Manual Override

Aqua-Aerobic Systems control panels are equipped with Hand/Off/Auto motor switches that will allow for switching the respective hand switch from auto to the desired position to operate any motor independent of the current PLC command.

Local Operator Interface Panel

Each PLC control panel is equipped with a Panelview Plus Human Machine Interface (HMI) unit manufactured by Allen-Bradley. The operator interface unit features a color LCD touch screen display and communicates directly to the PLC. This HMI unit will allow the changing of counter and timer values to adjust the various plant controls. The ability to monitor basic system status throughout the plant is also provided at this unit.

This display contains various display pages used to provide the operator with filter status and alarm information. There are also pages from which the operator enters changes to process variables and timers to control the automatic sequencing.

Interface Operation

Some of the various screens available through the local operator control panel are listed below:

- System status
- Backwash interval/duration adjust
- Sludge waste interval/duration adjust

- Floatable wasting interval/duration adjust
- Elapsed time meters and totalizers (motors and process)
- Backwash interval history
- Alarm display
- Alarm history

Controls Programming Documentation

As a standard procedure, Aqua-Aerobic Systems will provide a written control strategy with the equipment submittal information. In addition to the control strategy, we can also provide the PLC programming documentation for onsite troubleshooting purposes. Due to the proprietary nature of the program, a confidentiality agreement is necessary if this information is provided.

Typical Arrangement

Figure 10 illustrates a typical arrangement of an AquaPrime unit

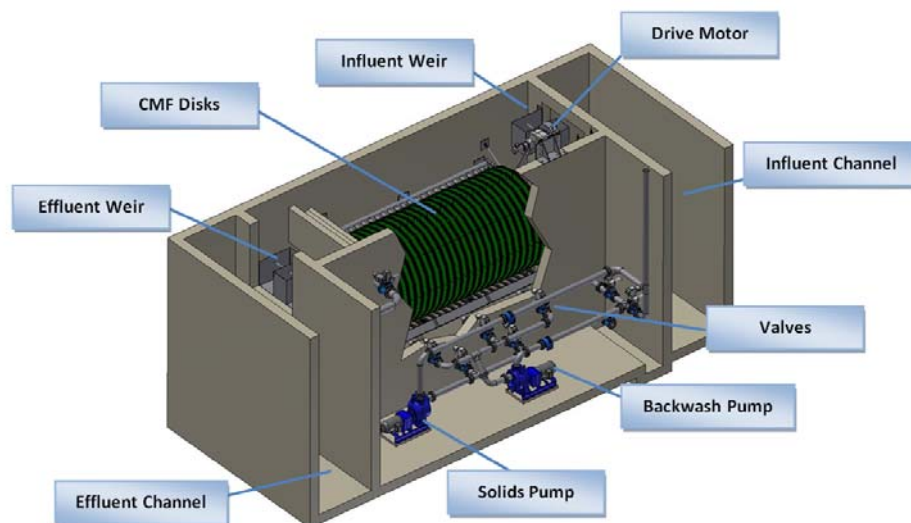


Figure 10: AquaPrime™ 24 Disk Unit.

AquaPrime™ Advantages for Primary and Wet Weather Treatment

- Utilizes engineered OptiFiber® cloth filtration media
- Produces extremely consistent, high quality effluent
- Reduces energy costs associated with secondary treatment by reducing the aeration requirements
- Removes more solids for increased biogas production in anaerobic digestion

- Designed to handle extreme variation in TSS loadings
- Instant startup and instant high quality effluent
- Eliminates the need for chemical addition
- Low waste volumes
- Simple to operate and maintain
- Unmanned operation at remote sites

Vertical oriented disks reduce the footprint, resulting in small overall site requirement