Volume 17 | Issue 1

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Operation Update

A Newsletter for Aqua-Aerobic Plant Operators

Low Water Level MLSS, Basin Levels, and Why They Matter

In the "Did You Know?" section of our last Operation Update newsletter, we discussed how the Mixed Liquor Suspended Solids (MLSS) concentration will vary with the water level of the basin. As typical 200-300 mg/L TSS influent enters the SBR, it dilutes the MLSS already in the basin.Depending on when a MLSS sample is taken, this can cause the MLSS concentration to vary.

To avoid erratic MLSS results, we typically recommend taking the MLSS sample around 10 minutes into the Mix-Fill Phase, after the basin has completely turned over. When a MLSS sample is pulled at this time and at this basin level, the result is called the "LWL MLSS." The LWL, or "Low Water Level," is the lowest operating level of the basin, which is typically labeled the "End Decant" level setting in the PLC. All process control data should be based upon the MLSS concentration at the LWL, as this was the original design basis for your AquaSBR® system.

Conversely, many operators prefer to pull their MLSS sample at the end of the React Phase along with their Settleometer sample, especially in systems with more than two basins. Due to logistics and timing, it can be simpler to pull the MLSS sample at the end of the React Phase, as opposed to pulling two separate samples—one at the beginning of Mix-Fill for MLSS and then another at the end of the React Phase – for the Settleometer. Pulling both the MLSS and Settlometer samples at the end of React has the drawback of yielding erratic MLSS results if not mathematically converted to the LWL equivalent. Because the MLSS is diluted with the influent, any MLSS sample taken after the first 10 minutes of Mix-Fill will have a lower concentration than if it were taken at the LWL, causing the MLSS concentration to be different with every batch. What remains relatively static, regardless of the basin level, are the pounds of MLSS in the basin—since converting a MLSS concentration into mass in pounds takes volume into consideration.

In order to illustrate the effect this can have on your MLSS results, please see the example below.

Table 1: Example Design Parameters

Avg. Design Flow =	0.508 MGD
Max. Design Flow =	0.748 MGD
# of Basins =	2 Basins
Basin Dimensions =	50 Ft X 50 Ft
LWL Height =	15 FT
HWL Height=	20 FT
LWL Volume =	0.2805 MG
HWL Volume =	0.3740 MG
LWL MLSS =	3,000 mg/L

With the example values in Table 1, a plant has a volume of 0.2805 MG at the LWL of 15 FT and a LWL MLSS concentration of 3,000 mg/L. This equates to 7,018 lbs of MLSS in the basin. The same amount of lbs at a liquid level of 17 Ft (0.3179 MG) would yield a MLSS concentration of 2,647 mg/L, illustrating the dilution of the MLSS by the influent. The way around this is to begin notating the basin level at the time of the MLSS/Settlometer sample, and then use the following "LWL Conversion" equation:

$$LWL\ MLSS = \frac{(MLSS\ mg/L\ result) * (Basin\ level\ reading\ at\ time\ of\ sample)}{(Low\ water\ level\ setpoint)}$$

Using this equation, you will see that a MLSS result of 2,647 mg/L, from a sample pulled in the React Phase with a basin level

Low Water Level MLSS, Basin Levels, and Why They Matter...

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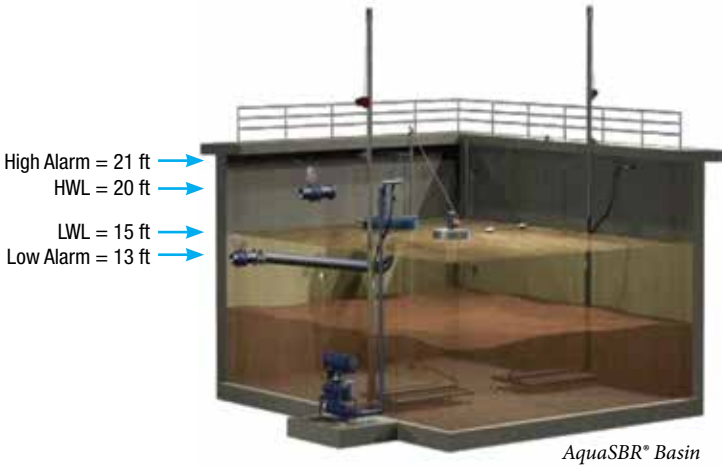
of 17.0 FT, gives a LWL MLSS concentration of 3,000 mg/L at 15.0 FT. This result is what should be used for process control calculations like F/M and SRT. Once this practice is implemented, the measured MLSS concentrations will be more consistent from day to day, enhancing process control and optimization.



AquaSBR® Basin

If you are not sure what the LWL (End Decant) or HWL (End React Fill) level settings should be, check the design and/or Control Strategy in section #3 of the AquaSBR O&M manual. In some cases, operators have modified these level settings from the design, which can not only have an effect on determining the LWL MLSS, but can also have an important effect on the hydraulic capacity of the system.

The AquaSBR hydraulic capacity is based upon four variables; the number of cycles per basin per day, the HWL setting, the LWL setting, and the number of basins online. The number of "cycles per day" per basin, or CPD, is dictated by the total cycle time, which is the sum of all the phase times. A plant operating with the following phase times: Mix-Fill = 45, React Fill = 135, React = 45, Settle = 60, and Decant = 75 has a total cycle time of 360 minutes. Dividing the number of minutes in a day by the total cycle time will give you the number of cycles per day per basin. So, a plant with a total cycle time of 360 minutes is operating at 4.0 cycles per day per basin (1440/360 = 4.0 CPD.) The number of CPD affects hydraulic capacity by processing more or less "batches" per day. The greater number of CPD, the greater the hydraulic capability. This is why we typically recommend increasing the CPD for plants that experience heavy inflow and infiltration during storm events.

The batch size is a function of both the HWL and LWL level settings, which dictate the potential size of each batch. Referring back to Table 1, you can derive the batch size by determining the difference between the HWL and LWL volumes (HWL-LWL = Batch Size). Doing this yields a maximum potential batch size of 0.0935 MG (0.3740 MG – 0.2805 MG= 0.0935 MG) or 93,500 gallons in this example. Multiplying the batch size of 0.0935 MG by 4.0 CPD yields a hydraulic capacity of 0.374 MGD for a single basin (0.0935 MG * 4.0 CPD = 0.375 MGD). In the two basin system examples, these variables give the plant a maximum hydraulic capacity of 0.748 MGD—matching the value in the design of the example plant. Therefore, if any of these values have been altered from what is depicted in the plant's design; use the following equation to determine the plant's current maximum hydraulic capacity:

$$Max.\,Hydraulic\ Flow = (HWL\ Vol - LWL\ Vol) * CPD\ Per\ Basin * \#\ of\ Basins\ Online$$

For example: If, for some reason, the HWL setting has been reduced by 0.25 ft, and the LWL has been increased by 0.25 ft, we have reduced our total potential batch size by 0.5 ft. Using the values from Table 1, these basin dimensions yield 18,700 gallons per foot, thus we have reduced each batch by 9,350 gallons. With 2 basins online at 4.0 CPD, we have reduced the system's Maximum Hydraulic capacity by 74,800 gallons per day. Using the "Max. Hydraulic Flow" equation, the plant's new maximum hydraulic flow rate is 0.6732 MGD. These seemingly small changes to our level settings have reduced the hydraulic capacity of the plant by 10%. This reduction, among other obvious implications, will increase the probability of triggering one of the three "Storm Modes" that are typically equipped with AquaSBR systems.

Modifying the LWL setting can also affect the mooring of the mixer, while modifying the HWL will potentially affect blower discharge pressure. Modifying either the HWL or LWL will affect the decanter discharge rate. For all of these reasons, it is usually recommended to not change the LWL or HWL from their original design values.

Cloth Media Filter Upgrades Available

For over 20 years, Aqua-Aerobic Systems has been designing, manufacturing, and supplying cloth media filtration systems to municipal and industrial customers. Over the course of these years, our cloth media filters have undergone many design enhancements. In order to continue to serve our customers with the latest Aqua-Aerobic® Cloth Media Filtration technology, we present you with the following enhancements available to maintain or potentially improve the operation and efficiency of your plant's filter.

OptiFiber® Cloth Filtration Media

Without question, the heart of cloth media filtration is the cloth itself. Over the course of time, Aqua-Aerobic Systems has trialed over 70 variations of media. When Aqua-Aerobic first began supplying cloth media filters, the only style of cloth available was the NF-102 Needlefelt Media. The NF-102 cloth was designed as random weave polyester, and due to its design, required both a backwash and a high pressure spray in order to keep the cloth clean.

In the early 2000's, Aqua-Aerobic Systems introduced our pile cloth media. The pile cloth media's construction alleviates the need for the high pressure spray, and utilizes backwashing as its sole mechanical cleaning mechanism. OptiFiber® Pile Cloth Media is now offered in the following three styles:

OptiFiber PA2-13®

PA2-13

Nominal 10 micron pore size with nylon fibers on a polyester backing material. This cloth is all white in appearance, and is not chlorine resistant.

OptiFiber PES-13®

PES-13

Nominal 10 micron pore size with polyester fibers on a polyester backing material. This cloth is blue and white in appearance, and is chlorine resistant.

OptiFiber PES-14®

PES-14

Nominal 5 micron pore size with polyester microfibers on a polyester backing material. This cloth is all blue in appearance and is also chlorine resistant.

A plant's cloth selection should be based on a combination of targeted effluent quality, and whether chlorine usage is allowed at a facility (for the sake of being able to clean the cloth if needed).

Valves

When cloth media filters were first introduced, Aqua-Aerobic utilized pneumatic valves for backwash, sludge, influent, and high pressure spray drain valves. Over the last 15 years, Aqua-Aerobic utilized electric valves for these same purposes. Now with the advent of pile cloth media, there is minimal need to close the influent valve, and no need for a high pressure spray drain valve. As a result, cloth media filters are now installed with manual valves on the influent lines and no high pressure spray drain valve. Backwash and sludge valves are typically supplied as 2" electric ball valves with TCI valves and RCI actuators on cloth filters, or with Milliken valves and Auma actuators on AquaDiamond® cloth media filters. Upgrade kits from either pneumatic to electric valves, or from vintage suppliers to current Aqua-Aerobic valve suppliers are available.

Existing Pneumatic Influent Valve

Current Standard Electric Valve

Level Sensors

The original AquaDisk® filters were often supplied with bubbler sensors which measured water level differential, and occasionally with level sensing conductance rods. As plants have

Cloth Media Filter Upgrades Available... *continued from page 3*

moved away from pneumatic valves, they also began moving from bubbler sensors to pressure transducers. The current Aqua-Aerobic standard for the AquaDisk filters is the IFM Efector Pressure Transducer, or a pressure transducer from KPSI.

Controls

Besides upgrading cloth media, valves, and level sensors, control panel components have also undergone many transformations.

Obsolete Operator Interface

Vacuum fluorescent displays have been upgraded to touch screen operator interfaces. Control logic changes have been made to account for procedures such as Pump VFD control, or monitoring the basin water level based on feedback from pressure transducers. Additionally, today's control panels can monitor backwash frequency, and can even alarm if vacuum readings are high. This is often used as a way to gauge whether the cloth media needs cleaning.

Aqua-Aerobic Systems' new standard for control panels has reduced the number of lights and switches on the panel face. We have also added stainless steel covers over the interface itself to minimize damage to the panel from UV light. Our current standard for PLCs is the Allen Bradley Micrologix or Compact Logix, and the current standard for the operator interface is the Allen Bradley Panelview Plus 6 Model 700. For plants that are running on Direct Logic or other non-Allen Bradley PLCs, upgrades are available to an EZ-Touch operator interface. Aqua-Aerobic recommends that plants consider budgeting to upgrade their obsolete operator interfaces, because if their interface is no longer available and happens to fail, then there is no way to monitor the filter or make adjustments to its operation.

Current Standard Operator Interface

Regarding the controls, some of the operator interfaces that were supplied on earlier cloth media filter models are no longer commercially available. Examples include interfaces from Horner Electric, or the Allen Bradley Panelview 550. If these interfaces were to fail, then there is no a direct replacement available. This may require modifications to the control panel face by either installing an EZ-Touch or Panelview Plus operator interface, or rewriting the control program to work with the new interface.

Updated Support Information Available

Not only has Aqua-Aerobic Systems upgraded certain mechanical components, but we have also updated many procedures including changing out cloth media, installing a V-ring seal, and taking a filter out of service. Our troubleshooting guide for cloth media has also been updated. Aqua-Aerobic is in the process of contacting each of our installations to ensure your filters are running efficiently. In the meantime, if you would like a copy of our updated maintenance procedures or would like to discuss your filter further, please contact Paul Klebs at 815/639-4466, or PKlebs@Aqua-Aerobic.com.

The Future of Cloth Media

Aqua-Aerobic Systems is the industry's leader in the development and application of cloth media filter technology. We continue to perform research to find ways to improve the offering to our customers. In the future, we will certainly be introducing additional cloth styles to augment our current offering. Additionally, we are performing tests at a number of sites to determine if an AquaDisk filter can be utilized as a primary solids removal device in lieu of a primary clarifier, and early results are promising.

If you are currently in need of technical support from Aqua-Aerobic Systems, please contact our Customer Service Team at anytime at 800/940-5008. We can offer:

- Operator Training
- Maintenance Instructions
- Filter Mechanical Inspections
- Turnkey Rebuilds
- Equipment Upgrades
- Process Assistance
- Equipment Buybacks
- Expansions

We look forward to a continued successful relationship with all of our cloth media customers.

Did You Know?

Section 3 of the O&M Manual has Your Plant's Design Info?

The design information for your SBR or filter system should be available in Section 3 of your O&M manual. The process control description that defines your control logic should also be in Section 3 of the O&M manual. If you are unable to locate your current process design or control description, please contact Aqua-Aerobic and we will send you a copy.

Aqua-Aerobic Offers Lifetime Process Assistance?

For the life of your SBR or cloth media filter installation, Aqua-Aerobic Systems offers process assistance over the phone, or via email, free of charge. If you need assistance in optimizing your treatment process, please contact our Customer Service Department at 800-940-5008.

On-site Assistance is Always Available?

In addition to process support via phone or email, we also offer on site assistance at your facility. If the situation at your facility is one that requires more direct assistance than can be offered over the phone, please contact us. Our on-site support can be in the form of process training, mechanical inspections, maintenance agreements, or mechanical training.

Meet Your Customer Service Representative

Daniel Lockhart
Customer Service Process Specialist

Daniel has been a licensed wastewater treatment plant operator for 16 years and loves helping plants solve their treatment issues. If you are having trouble meeting effluent permit requirements or just want to fine-tune your process to be more efficient, you can reach him by email or phone. Remember, Aqua-Aerobic Systems offers free process assistance over the phone, or via email for the lifetime of your equipment. For process optimization, Daniel is your go-to-guy. To reach Daniel, call him directly at 815-639-4520 or email him at Dlockhart@aqua-aerobic.com.

CONGRATULATIONS
2015 PLANT PERFORMANCE AWARD RECIPIENTS

CUSTOMER NAME	PRODUCT	CITY	STATE
Big Coppitt WWTP	AquaSBR System	Big Coppitt	FL
City of Deland Wiley M. Nash WRF	AquaABF Filter	DeLand	FL
Eustis WWTF	AquaDisk Filter	Eustis	FL
Leesburg (City of) - Canal Street WWTP	AquaDisk Filter	Leesburg	FL
Lynn Haven WWTP	AquaSBR System & AquaDisk Filter	Lynn Haven	FL
Harlem WPCP	AquaSBR System	Harlem	GA
Itasca WWTP	AquaSBR System	Itasca	IL
Clear Lake Sanitary District	AquaSBR System	Clear Lake	IA
Grundy Center WWTF	AquaSBR System	Grundy Center	IA
Marshalltown Water Pollution Control Plant	AquaSBR System	Marshalltown	IA
Cullen (Town of) WWTP	AquaSBR System	Cullen	LA
Prince Frederick WWTP	AquaSBR System	Prince Frederick	MD
Taneytown WWTP (City Of)	AquaSBR System	Taneytown	MD
Lee WWTP	AquaSBR System & AquaDisk Filter	Lee	MA
Norfolk WWTP	AquaSBR System	Norfolk	NE
Sidney WWTP	AquaSBR System	Sidney	NE
Sparta WWTP	AquaSBR System	Sparta	NC
Abbottstown Paradise Joint Sewer Authority	AquaSBR System	Abbottstown	PA
Atglen Borough STP	AquaSBR System	Atglen	PA
Bloomfield Borough WWTP	AquaSBR System	New Bloomfield	PA
Bonneauville (Borough of) STP	AquaSBR System	Bonneauville	PA
Centre Hall Potter Sewer Authority	AquaSBR System	Centre Hall	PA
Colver STP/Cambria Township Sewer Authority	AquaSBR System	Colver	PA
Conewago Township Sewer Authority WWTP	AquaSBR System	York	PA
Duncannon Borough Municipal Auth. WWTP	AquaSBR System	Duncannon	PA
Earl Township Sewer Authority	AquaSBR System	New Holland	PA
East Berlin WWTP	AquaSBR System	East Berlin	PA
East Hanover Township - Dairy Lane WWTP	AquaSBR System	Grantville	PA
Eastern York County Sewer Authority WWTP	AquaSBR System & AquaDisk Filter	Hellam	PA
Fredericksburg Water & Sewer Authority	AquaSBR System	Lebanon	PA
Jackson Township Authority	AquaSBR System	Myerstown	PA
Jenks Township	AquaSBR System	Marienville	PA
Leacock Township Sewer Authority	AquaSBR System	Intercourse	PA
Lower Mahanoy Township Municipal Authority	AquaSBR System	Dalmatia	PA
Lykens Borough Authority	AquaSBR System	Lykens	PA
Marietta-Donegal Joint Authority WWTP	AquaSBR System	Marietta	PA
Millersville Borough WWTP	AquaSBR System	Millersville	PA

2015 Plant Performance Award Recipients...*Continued from page 6*

CUSTOMER NAME	PRODUCT	CITY	STATE
Monroe Valley STP	AquaSBR System	Jonestown	PA
North Codorus Township WWTP	AquaSBR System	York	PA
Northwestern Lancaster County Auth. STP	AquaSBR System	Manheim	PA
Oley Township Municipal Authority	AquaSBR System	Oley	PA
Quarryville Borough Authority WWTP	AquaSBR System	Quarryville	PA
Revloc STP/Cambria Township Sewer Authority	AquaSBR System	Revloc	PA
Silver Spring Township Authority	AquaSBR System	Mechanicsburg	PA
South Coatesville STP	AquaSBR System	Coatesville	PA
Stewartstown Borough Authority	AquaSBR System	Stewartstown	PA
Twin Boroughs STP	AquaSBR System	Mifflin	PA
West Hanover Township WWTP	AquaSBR System	West Hanover	PA
Wind Gap Municipal Authority WWTP	AquaSBR System	Wind Gap	PA
Womelsdorf Sewage Treatment Plant	AquaSBR System	Womelsdorf	PA
Winfield MUD No. 4 - Sunfield WWTP	AquaDisk Filter	Buda	TX
Parham Landing WWTP	AquaDisk Filter	West Point	VA
Quechee WWTF	AquaDisk Filter	Quechee	VT

"Send us your data and win"
Contest Winners Announced

Since 2014, our Customer Service team has conducted an annual Treatment Plant Award Drawing as a "thank you" to those plants that send in their operating data.

Congratulations to this year's contest winners!

1st prize – Stewartstown, PA AquaSBR

2nd prize – Sidney, NE AquaSBR

The 1ST Prize Winner Receives:

Two free days of on-site assistance from an Aqua-Aerobic Field Service technician (travel to and from site included, and the plant must be in the US or Canada). The days on site can be used within a calendar year of the drawing and can be utilized for process or mechanical training, or equipment inspection.

The 2ND Prize Winner Receives:

$250 credit towards replacement /spare parts available through our Aftermarket Sales Department.

Aqua-Aerobic is grateful to all of our plants that have sent in their operating data for 2015, and in previous years. The data is very useful to our process engineers in the event your facility contacts us with process concerns. The data allows us to access how your system is loaded relative to the original design and assists us in formulating our process recommendations.

If you have not yet sent us your 2015 data, please send it to **ProcessData@Aqua-Aerobic.com**. To qualify for the next drawing, we request a minimum of 6 months of data in the calendar year, with a minimum of the information below:

- Influent average and maximum flows (Required)
- Effluent Data (Required)
- Influent data (If available)
- Daily operating information such as MLSS, Settleability, pH, etc (if available)

Thanks to all for sending in your plant data, and please continue to do so as the drawing is an annual event.

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YOUR CUSTOMER RESPONSE CENTER:
TOLL-FREE 800.940.5008

SAVE A TREE - HELP US GO PAPERLESS

Aqua-Aerobic Systems is going paperless with the *Operation Update* newsletter to help protect the environment. Included below are many interesting facts supporting our effort. To continue receiving the newsletter in its electronic format, please email **pklebs@aqua-aerobic.com** with the words **Operator Newsletter** in the Subject line and include your first and last name, plant name, location, and type of Aqua-Aerobic product or system at your facility.

Consider some of the environmental impact of using paper in our business:

- Cutting trees that release oxygen for our environment
- Energy usage and release of harmful gases in the pulp and paper industry
- Fuel consumption by air, rail, and road transport distributing paper stock and sending documents via courier services
- Manufacturing printers, ink and toner cartridges

Consider the environmental impact of just 10 million pages:

- 2,500 trees
- 56,000 gallons of oil
- 450 cubic yards of landfill space
- 595,000 KW (kilowatts) of energy

Consider the following facts about the paper and ink industry:

- Paper consumption has tripled since 1960 and Americans generate 85 million tons of paper into the waste stream
- The U.S. pulp and paper industry is the second largest consumer of energy
- EPA estimates that more than 400 million ink and 100 million toner cartridges end up in landfills each year
- The average U.S. officer worker prints 10,000 pages per year

(Data Source: www.gopaperless.com/Green-Commitment)