AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Operation Update

A Newsletter for Aqua-Aerobic Plant Operators

Spring 2018

In This Issue

How to Troubleshoot Input/Output Problems on Your PLC

Aqua-Aerobic Systems' Customer Service Department occasionally receives inquiries regarding control panel related issues on an AquaSBR® or Aqua-Aerobic® Cloth Media Filter. Aqua-Aerobic has staff in-house that are able to support these situations. An example of one of these situations concerning an AquaSBR component is presented below, and the same procedure outlined below should be followed for cloth media filters.

Let's say your AquaSBR influent valve #1 opened, the control panel indicates the valve is open, but the influent valve for SBR #2 won't close. This could be caused by a bad input module. Input and output problems can be caused by many things including a loose terminal, failed power supply, or a bad input/output (I/O) card.

Beyond the influent valve example listed above, there are other components around your AquaSBR or filter that may also not operate properly if an input or output card has failed. When considering analog signals and their related cards, this could affect equipment that receives 4-20 ma feedback from items such as D.O. probes, pressure transducers and VFDs. When considering digital signals and their related cards, a failure of the card could affect operation of valves or motors.

Determining whether an input module is good or not can be as simple as looking at the input card and seeing if the Light Emitting Dial (LED) corresponding to the failing equipment is on or off. Usually if the LED is on, the PLC sees it is on. Output modules aren't that simple. There are fuses involved, leakage currents and other situations with output cards. The simplest method to determine if a module has failed is to replace it. You should understand that some other device, such as a control relay, could have caused the module to go bad, so if you suspect this, you may want to check the other devices first.

PLC Rack

Another way to troubleshoot an I/O module is with a volt meter. Depending on the situation, you may want to confirm voltage to the input or voltage coming from the output. With a volt meter, you can confirm if you have voltage coming from a switch or relay contact going into the input card at the card terminal. You can also determine if you have voltage coming out of the output card, going to the relay or device you're trying to engage, whether it be a relay, light or other source.

If the problems you're having are all related to inputs or outputs on a particular module, you should check the power supply to the suspected module before replacing it. If you don't have a spare input or output module, you should be able to swap input or output cards with one another. Replacing an input or output card should be done without the power on the PLC or wires on the terminals.

If you're operating an AquaSBR plant, you may want to wait until one basin has just started the mix-fill phase. In the case of an Allen-Bradley PLC, just leave the wires connected to the terminals, loosen the two terminal block, release screws, and pull the entire terminal block and wires off. Press the releases at the top and bottom of the module and slide the module out of the chassis slot. Slide the replacement module on the card guides until the retaining clips are secured. Re-attach the terminal strip and tighten the two terminal block release screws. Reapply power to verify that the problem has been repaired.

If you feel that the issues you are working through require further assistance, please call our Customer Response Center toll free at (800) 940-5008.

Cloth Media Filtration for Your Wet Weather Treatment

Case Study

As part of its program to eliminate untreated Combined Sewer Overflow (CSO) discharges into the Flatrock River, the City of Rushville, IN has completed the final phase of its CSO Long Term Control Plan (LTCP) implementation program. This final phase was originally designed as an approximate one (1) million gallon storage tank to store wet weather flow in excess of the Rushville Wastewater Treatment Plant (WWTP) peak flow capacity of four (4) million gallons per day (MGD). This tank size was selected to store the excess flow for a 1-year, 1-hour rain event for full treatment at the WWTP.

Early in 2015, representatives from Aqua-Aerobic Systems, Inc. made a proposal to the City of Rushville to pilot test its nominal five (5)-micron cloth filtration media utilizing the AquaPrime® Cloth Media Filter (CMF) for treatment of CSO discharges at its WWTP. The City of Rushville was interested in exploring new technologies that showed the potential to reduce the cost to implement the final phase of its LTCP program to eliminate untreated CSO discharges. A pilot test program was conducted for five (5) wet weather events during which CSO discharges occurred between May 16, 2015 and July 13, 2015. The influent flow rate to the pilot filter system was set to 40 gallons per minute (gpm) or 3.7 gpm/ft^2 for the first CSO event and 70 gpm or 6.5 gpm/ft^2 for subsequent CSO events. Alum was fed to the influent wastewater as a coagulant at a dose of 4 mg/l of aluminum for the first two CSO events and no alum was fed for the remaining events to determine its impact on the performance of the cloth media filter. A summary of the collected average pilot test data for BOD_5 and TSS is as follows in Table 1:

CSO Event	Date	Average BOD_5 Data			Average TSS Data		
		Influent	Effluent	Removal %	Influent	Effluent	Removal %
1	05-16-15	87 mg/l	3.5 mg/l	96 %	142 mg/l	5.2 mg/l	96%
2	06-30-15	37 mg/l	4.3 mg/l	88%	114 mg/l	4.8 mg/l	96%
3	07-07-15	55 mg/l	18.2 mg/l	67%	136 mg/l	4.9 mg/l	96%
4	07-12-15	60 mg/l	14.5 mg/l	76%	74 mg/	3.8 mg/l	95%
5	07-13-15	73 mg/l	18.1 mg/l	75%	24 mg/l	2.0 mg/l	92%

Table 1: Pilot Summary Results

Rushville, Indiana's initial long term control plan was for a 1 MGD storage tank along with the sewer separation where viable. In March 2016, the City and engineer met with IDEM Permits Section and proposed the following:

- Filtering all secondary effluent
- To feed alum to meet in advance future total P effluent limits
- Filtering all the wet weather flows

As part of the meeting, the engineer presented the information shown in Table 2 (page 3) that compared the various options to the City.

In March 2016, IDEM accepted use of CMF technology for use in the Rushville, IN facility based on the following:

- Filters to be continuously used for both dry and wet weather flows
- Alum to be fed for removal of both fine CSO particles and phosphorus treatment

Cloth Media Filtration for Your Wet Weather Treatment

Case Study *continued from page 2*

Treatment Scenario	Eff Flow (MG)	$CBOD_5$ Load (lbs)	TSS Load (lbs)	P Load (lbs)	Comments
2015 Annual Avg Daily WWTP Discharge	1.54	32.3	70.4	47.52	
2015 Total Annual WWTP Discharge	562	11,790	25,696	17,345	No P removal in existing permit
Avg. Annual CSO in LTCP	38.2	19,721	30,584	414.2	LTCP est annual CSO vol
2015 Annual WWTP & Average Annual CSO Discharge	**600**	**31,510**	**56,280**	**17,759**	**Avg NH3-N discharge ≈ 3.4 lbs/day**
CSO Storage Basin Discharge+15.8 MG drained back to WWTP	22.4	3,685	7,717	58.8	15.8 MG gets full treatment at WWTP
2015 Annual WWTP + Storage Basin Facility Discharge	**600**	**15,474**	**33,413**	**3,809**	**With future WWTP P eff ≈ 0.8 mg/l**
Annual Disc Filter Trt of CSO Flow	38.2	956	1,752	38.2	UV disinfection & 1.9 mg/l NH3-N CSO effluent
2015 Annual WWTP + Disc Filter Treatment of CSO Flow Only	**600**	**12,746**	**27,448**	**3,789**	**With future WWTP P eff ≈ 0.8 mg/l**
CSO Disc Filter Reduction over CSO Storage Basin Facility		18%	18%	1%	Avg NH3-N discharge ≈ 3 lbs/day
2015 Total Annual WWTP Eff with Tertiary Filter Treatment	562	8,842	7,709	1,406	Assumes alum added for P removal & eff=0.3 mg/l
2015 Annual WWTP Filtered Eff + Disc Filter Treatment of CSO Flow	**600**	**9,798**	**9,461**	**1,445**	**Avg NH3-N discharge ≈ 3 lbs/day**
Disc Filtering of all Flow Reduction over Storage Basin Facility		37%	72%	62%	

Table 2: Estimated Discharge Table to River Under Various Treatment Scenarios

Design of the AquaPrime® Cloth Media Filter system was initiated in June of 2016 for a maximum flow rate of 12 MGD and a peak filtration rate of 5.53 gpm/ft^2. The design includes two 14-disk units with each disk being 6.6 feet in diameter. Each disk has an effective area of 53.8 ft^2 with a total filter area of 1,506.4 ft^2.

The flow scheme for the Rushville CSO / Tertiary filtration system is as shown below:

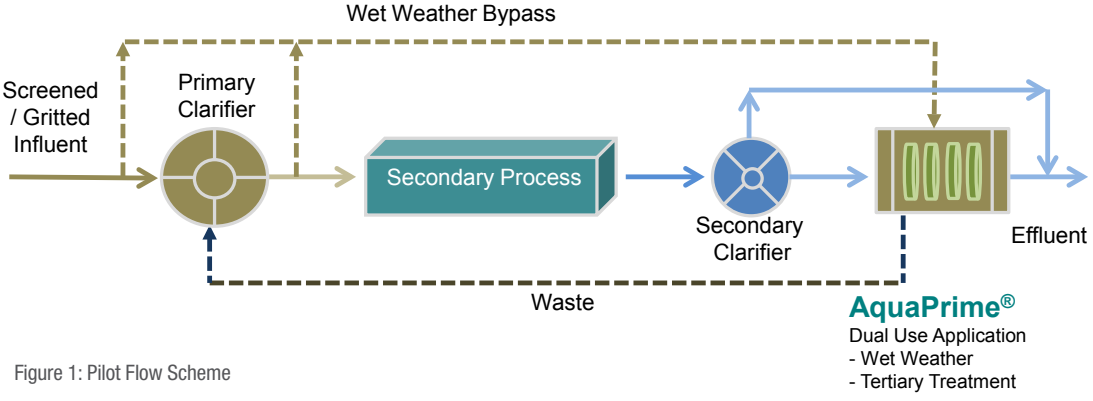

Figure 1: Pilot Flow Scheme

Status and Performance

The filter portion of the installation was substantially complete in July 2017. Since startup of the filter portion of the installation, the filters have been operating in tertiary filtration mode until the first wet weather events which occurred in October and November of 2017. Table 3 (page 4) is a summary of the performance of the treatment plant operating in wet weather mode which includes full treatment of the flow up to 4 MGD and remaining excess flow being treated as shown in Figure 1 above.

Cloth Media Filtration for Your Wet Weather Treatment

Case Study *continued from page 3*

Parameter	10/05/17 Event	11/05 - 06/17 Event	11/19-20/17 Event
Rainfall	2.81 in	2.86 in	1.57 in
Event Peak Eff Flow	6.2 mgd	13.53 mgd	8.25 mgd
Avg. Daily Flow	2.5 mgd	2.74 / 6.45 mgd	4.1 / 3.3 mgd
Inf / Eff CBOD5	72 / 4 mg/L	25 / 3 mg/L	42 / 1 mg/L
Inf / Eff TSS	104 / 5 mg/L	52 / 14 mg/L	58 / 3 mg/L
Inf / Eff Ammonia	5.1 / 0.51 mg/L	3.2 / 0.33 mg/L	2.0 / 0.08 mg/L
Inf / Eff Total P	-- / 1.4 mg/L	-- / 0.43 mg/L	1.02 / 0.18 mg/L
Inf / Eff E. Coli	-- / 3 colonies	>200,000 / 2 colonies	-- / -- colonies
Notes:	- Dosage of alum was not adjusted with flow during event.	- Rain in 2 hours & > 20 yr. event	- Rain in 6 hrs. - Disinfection season end Oct. 31st

Table 3: Summary of Wet Weather Event Performance

It is important to note that the AquaPrime filters have provided treatment in excess of the design capacity within the first few months after startup. Also, the filters have provided the ability to treat for the duration of an event which can last for multiple days. Due to the continuous treatment capacity, no overflows have occurred. If the storage had been used, overflows would have occurred during the November 5-6th event due to the long duration.

If you would like more information on AquaPrime cloth media filtration for your wet weather or primary filtration needs, please contact John Dyson at (815) 639-4506 or e-mail JDyson@aqua-aerobic.com.

Would You Like to Reduce Your Filter's Backwash Frequency?

Aqua-Aerobic Offers a Type 2 Cloth Media

Aqua-Aerobic continues research and development efforts to improve our cloth media filter offering. One of the outcomes of this investment is the development of a new 'Type 2' cloth media that offers reduced backwash relative to the cloth we have provided historically (known as 'Type 0' cloth), while preserving high quality effluent. There are several steps that Aqua-Aerobic can employ to improve your filter's performance. If your cloth filter is suffering from lack of throughput or frequent backwash, one of the first steps is to perform a chemical cleaning. If the chemical cleaning is ineffective, another option is to replace the cloth. If your plant has historically struggled with fouled filter media, then an upgrade to the Aqua-Aerobic Type 2 cloth media may be in order. Due to the nature of the manufacturing process utilized to produce this cloth, we have observed reductions in backwash up to 20% in plants that have converted to Type 2 cloth.

Some points to note in regards to the Aqua-Aerobic Type 2 cloth are:

- Type 2 cloth is available in PA2-13 nylon (nominal 10 micron non chlorine resistant), PES-13 polyester (nominal 10 micron chlorine resistant), and PES-14 microfiber (nominal 5 micron chlorine resistant).
- Type 2 cloth fits on the same frames as the original Type 0 cloth
- Type 2 cloth is the same price as the original Type 0 cloth
- Conversion to the Type 2 cloth requires changing out the backwash shoe nozzle plates, unless your filter is an AquaDiamond®. This is to deliver a more forceful flow of backwash water to the cloth as it is being backwashed
- The Type 2 cloth is available for Aqua MiniDisk®, AquaDisk®, AquaDiamond® and Aqua MegaDisk® filters
- New filters that Aqua-Aerobic is providing today are all outfitted with Type 2 cloth

In general, the feedback from plants that have converted to our Type 2 cloth has been positive. If you are interested in reducing your backwash frequency, restoring filter capacity, or dealing with fouling issues on your existing cloth media filters, then consider converting your cloth to Type 2 media.

Did You Know...?

Bench Top Testing is Available

During the operation of our cloth media filters, there is the occasional need to determine why a filter is not passing its intended flow. In these situations, it is often that there is an organic or inorganic substance that is plugging the media. Aqua-Aerobic has a bench top filtration apparatus and an analytical lab that can interpret the source of fouling or plugging of our cloth media. Free of cost to our customers, we will perform microscopic and photographic analysis of the cloths, as well as test various cleaning agents to determine the best method for restoring the cloth's capacity. We simply request that you send us a damp cloth media sock for analysis. Upon completion of the analysis, Aqua-Aerobic will send you a summarizing report of our findings along with recommendations on proper cleaning or maintenance procedures to restore the cloth's hydraulic capacity. To take advantage of this service, please contact our Customer Response Center at (800) 940-5008.

Aqua-Aerobic Offers Cloth Media Filters for Rent

Aqua-Aerobic has built up a fleet of rental cloth media filters available for your temporary use. Our rental fleet currently consists of three 6-disk Model 54 package filters, each with an average capacity of 1.5 MGD. We also have one 12-disk Model 54 package filter, with an average capacity of 3.0 MGD. If you are interested in utilizing a rental AquaDisk® filter, please contact Jeff Ogle at (815) 639-4424 or JOgle@aqua-aerobic.com.

Control Updgrades are Available

Many of you may have received our recent flyer in regards to your AquaSBR® and filter control, detailing the fact that certain controls-related components, such as the Allen Bradley Panelview series of operator interfaces, are obsolete and not commercially available. In addition, the Allen Bradley SLC series of PLCs, such as the SLC 5/04 and SLC 5/05 are soon to be discontinued by Allen Bradley. Aqua-Aerobic Systems has the ability to work with you to identify if your PLC and HMI are obsolete, and to propose replacement components. In addition, we can program your new PLC, and provide turnkey installation services if desired. Note that your PLC is a critical component to keeping your AquaSBR® or filter operating automatically. If you would like to determine if your PLC and HMI are on the list of obsolete components, would like a copy of our Controls Upgrade flyer, or want a proposal for a controls upgrade, please contact one of our Aftermarket Sales representatives.

Aqua-Aerobic will Perform Mechanical Inspections on Your AquaSBR® or Cloth Media Filters

As your AquaSBR® or cloth media filter ages, some of the components will reach a point where they will need to be repaired or replaced. Prime examples of this include fine bubble diffuser sleeves or mixer motors in an AquaSBR, or V-ring seals or cloth media in the filter. In order to assist you in determining if your equipment is at an age where it is due for replacement, Aqua-Aerobic offers a service where we perform mechanical inspections on your system. For this inspection, typically a factory trained service representative is sent out to document the condition of the equipment and take photos. Aqua-Aerobic then utilizes the feedback from the Field Service Technician, as well as the photos obtained during the visit to draft a report. Our customers use that report along with a proposal for the needed repairs to justify the expense for replacing or repairing the system's equipment as needed. This approach has been successful for many of our customers in keeping their plants running efficiently. If you would like to schedule a visit by an Aqua-Aerobic Field Service Technician to inspect your system, please contact one of our Aftermarket Sales representatives.

AquaSBR® Process Training is Available

As part of the startup of a new AquaSBR® system, a process startup trip is typically provided. With that being said, staff turnover occurs, and there are occasions where new staff members would benefit from receiving training on the AquaSBR process and operation of the equipment. Aqua-Aerobic Systems has the ability to provide on-site AquaSBR training for new or existing staff. If interested in this opportunity, please contact us for a proposal.

Did You Know...? *continued from page 5*

AquaSBR® and Cloth Media Process Data Review

Many of you are aware of the fact that Aqua-Aerobic provides Plant Awards on an annual basis for our customers that send in 12 months of data each year. We also offer the support to our AquaSBR® and cloth media installations to have them send their data in for review so that we can offer process assistance. If your plant is struggling with issues such as lack of nitrification, filaments and poor settling, or solids passing through your cloth filter, then send us your data so that we can review it and offer assistance via phone and email to improve your operating conditions. We offer this level of assistance free of charge to our customers, for the life of the facility.

Cloth Media Operation and Maintenance Training

Much like the AquaSBR® product line, Aqua-Aerobic Systems has the ability to provide training on the operation and maintenance for our cloth media filters. Whether your needs are maintenance related or process related, training provided by a qualified Aqua-Aerobic Systems' field service technician can make your system run more efficiently. We provide training on topics ranging from changing out cloth media to optimizing nutrient removal and much more. Flexible training available on-site or via an interactive webinar.

Congratulations
2017 Plant Performance Award Recipients

CUSTOMER NAME	PRODUCT	CITY	STATE
West Montrose Sanitation District	AquaSBR System	Montrose	CO
Big Coppitt WWTP	AquaSBR System	Big Coppitt	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
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
Itasca WWTP	AquaSBR System	Itasca	IL
Spencer (Town of) WWTP	AquaSBR System	Spencer	IN
Lee WWTP	AquaSBR System & AquaDisk Filter	Lee	MA
Boonsboro WWTP	AquaSBR System & AquaDisk Filter	Boonsboro	MD
Clinton WWTP (Village of)	AquaDisk Filter	Clinton	MI
Sparta WWTP	AquaSBR System	Sparta	NC
Norfolk WWTP	AquaSBR System	Norfolk	NE
Sidney WWTP	AquaSBR System	Sidney	NE
Riverhead WWTP	AquaSBR System	Riverhead	NY
Biglerville Borough WWTP	AquaSBR System	Biglerville	PA
Bloomfield Borough WWTP	AquaSBR System	New Bloomfield	PA
Bonneauville (Borough of) STP	AquaSBR System	Bonneauville	PA
Branch Cass WWTP	AquaSBR System	Pottsville	PA
Centre Hall Potter Sewer Authority	AquaSBR System	Centre Hall	PA

2017 Plant Performance Award recipients

continued from page 6

CUSTOMER NAME	PRODUCT	CITY	STATE
Colver STP / Cambria Township Sewer Authority	AquaSBR System	Colver	PA
Conewago Township Sewer Authority WWTP	AquaSBR System	York	PA
Earl Township Sewer Authority	AquaSBR System	New Holland	PA
East Hanover Township - Dairy Lane WWTP	AquaSBR System	Grantville	PA
Eastern York County Sewer Authority WWTP	AquaSBR System & AquaDisk Filter	Hellam	PA
Jenks Township	AquaSBR System	Marienville	PA
Jonestown WWTP - Northern Lebanon County	AquaSBR System	Jonestown	PA
Lower Mahanoy Township Municipal Authority	AquaSBR System	Dalmatia	PA
Lykens Borough Authority	AquaSBR System	Lykens	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
Penn Township WWTP	AquaDiamond Filter	Hanover	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 & AquaDisk Filter	Mechanicsburg	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
Parham Landing WWTP	AquaSBR System & AquaDisk Filter	West Point	VA
Quechee WWTF	AquaSBR System & 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 - Twin Boroughs, PA

2nd prize - East Berlin, PA

The 1ST Prize Winner Receives:
Two free days of on-site assistance from an Aqua-Aerobic Field Service Technician. 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 over the past several 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 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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Process Control

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