

Challenge of VT ANR Issued NPDES Permits

*Copy of email sent to VT's Congressional
Delegation 10/26/17 by Shaun Fielder*

VRWA is very concerned with the recent challenge to several NPDES permits (4 recently issued by VT ANR). Our concern to be clear is with the challenge not VT ANR. Unfortunately in press items quoting CLF from this week it would appear those in charge of the given direct discharge facilities are going to be allowed to increase the amount of phosphorus they are discharging under new permits. This is not an accurate assessment of the situation. A key point to be aware of is in 3 of 4 instances for the new permit issuances the allowed phosphorus discharge limit has been reduced in the new permits. It is also a key point these reductions were put into the permit standards following a very lengthy and comprehensive evaluation by VT ANR officials with input from stakeholders at all levels and the approach / permits had the clearance of EPA Region 1 (R1 has final authority on LC TMDL as I am sure you know).

Another point is that for these four systems the facilities and personnel involved at all levels have worked diligently up to this point to strive for phosphorus discharge standards better than previous permit parameters and they were prepared to accept, build out for, adjust operations to the new permit parameters (as challenged this week).

(Continued on page 11)

Ice Pigging

Paul Sestito, Water Systems Specialist


I recently attended, along with other VRWA staff members, the National Rural Water Association WaterPro Conference in Reno, Nevada. The three-day conference has a trade show with many exhibits as well as a full slate of classes held daily to attend and learn about many topics related to the water and wastewater industry. One class that I was curious about was a lecture on ice pigging. It is a topic that I had heard about, but wasn't terribly familiar with.

Ice pigging is a process of removing unwanted debris, such as sand, sediment, and scale, from a pipe. The process, invented in England, involves sending a slurry of ice through a pipe to clean the pipe and remove the unwanted material. It has been used in industries such as food manufacturing, water, and wastewater.

To perform ice pigging, ice needs to be made either on or nearby the site where the work is to be performed. The ice is crushed and mixed with a solution of salt water to create the slurry. The slurry can be pumped into a water line at any open point in a water system, such as a hydrant or valve. The slurry is then "pushed" through the pipe using system pressure, cleaning the pipes as it travels. The slurry can be removed through another opening in the system, again a hydrant or valve, and disposed of properly.

There are a few reported disadvantages to ice pigging. Since ice is the main component, the ability to make ice is required. This involves energy and cost and temperature can be a factor when performing the operation. Also, the ice needs to be continuously cooled and churned, also requiring more energy. Finally, ice pigging is a relatively new method for cleaning pipes in the water and wastewater industry, and the process is not readily available in all regions of the country. However, this could easily change as the process becomes more widespread, and it appears as though this is the case.

There are also many reported advantages to ice pigging. Unlike traditional pigging, ice pigging uses already existing access points to pipe, so exposing pipe is not required. The ice pig can be used in all types of pipe and in different size pipes-the pig conforms to the structure it travels in and it can travel through valves and bends. If the pig becomes stuck in a pipe, time and temperature will melt it, eliminating the need to search for a lost or stuck pig. It also requires less water than flushing. Overall, it can potentially be less labor-intensive and costly than some other cleaning methods.

There is a great deal of information on ice pigging and other line cleaning methods available from many resources. No matter the method you choose, line maintenance is an integral part of the operation and maintenance of your system. 

Who We Are

Since 1982, Vermont Rural Water Association has supported water and wastewater systems across the state. We provide many services, including training, source water protection planning, and onsite assistance.

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News Leaks is the official publication of VRWA. It is published quarterly for distribution to operators, owners, managers and board members of water and wastewater systems in Vermont, as well as to association members, water and wastewater service providers, regulators, and other friends. Opinions expressed in the newsletter do not necessarily reflect the views and policies of VRWA.

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Letters

Vermont Rural Water Association

From: Tim Mills <bethelwwtp@comcast.net>
Sent: Friday, August 11, 2017 12:20 PM
To: vrwa@vtruralwater.org; Greg Maggard; Kelly Hill
Subject: VRWA support letter

I would like to introduce myself, my name is Tim Mills, chief operator of the bethel WWTP. I am also the water and sewer director for the town of bethel. I came to bethel in 1987 to operate the newly constructed WWTP for the town. For as far back as I care to remember Vermont Rural Water Association has been an integral part of our operation. From the early days of Vinnie Melendez who would come by on a moments notice to assist me if called or just plain stop by on his way through the area just to see if everything was running well. His opening line was always "hows things" and they were actually a comfort to hear, because he was sincere and he was there to help. The relationship continued after Vinnie changed the area he covered, new faces came on board at VRWA but the mission goal was the same, to assist an operator with whatever means they could. Through the towns history with VRWA, we have utilized nearly every service on their list. Whether it is attending there training courses to stay up to date on the latest techniques or maintaining our CUE's. Attending a course put on by Matt Guerino for the drinking water side of things, wastewater training with Wayne Graham or a host of other guest speakers. Wayne Graham and Aaron Perez were instrumental in helping us locate two different water leaks in the system the summer of 2016. Both leaks were not only causing a great stress on the water system for lost water, but the lost water was also infiltrating into the Wastewater Collection system which alone was totaling 55,000 GPD. Within two weeks both leaks were located, repaired and we were back to normal. They also offer Smoke testing with Wayne Graham, which covers both storm water collection systems and sewer lines for cross connections. The recent smoke testing allowed us to finish mapping out our storm water collection system. They also offer camera work on the sewer lines through Wayne Graham which has helped us find infiltration and do line inspections. Aaron Perez has been an immense help for our drinking water system with water line leak detection and water system pipe location which we as many other systems have been a victim to an ageing system and institutional knowledge. Even when the electronic filing of our WR-43's became mandatory, Elizabeth walker came to the plant and spent the entire day giving me a crash course on electronic filing including creating a WR-43 master sheet for me to work from each month, not an easy task since I have been filling out the forms by hand for 30+ years. At the head of it all you have Shaun Fielder, the Executive Director for VRWA. Shaun continues to go above and beyond time and again, fighting for funding to keep VRWA fluid and funded. Fighting for the ability to continue to support us, the water and wastewater operators of Vermont. To make sure we have the opportunity to acquire our CEU's, have onsite field support and to keep us performing at the level that we all do, and for that I know I am not alone when I say I am grateful for everything VTRW has done for myself and the other water and wastewater operators of Vermont.

Tim Mills
Water and Sewer Director
Town Of Bethel Vermont



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News on Tap

VRWA Welcomes New Team Member

We are pleased to announce Diana Butler has joined VRWA November 7 as Water System Specialist. Diana will be managing our EPA water program and responsible to assist with ongoing continuing education training VRWA is conducting. In addition she will offer onsite assistance to supplement the services offered by our team members at this time. Her focus will be with the public water systems not in the category of fire district, town, municipal and as an example would include schools, mobile home parks, and condo associations to include many non-transient non-community systems. Diana has a background in surface drinking water operations as well has served in inspection and support role in another state for work tied to public water, wastewater, and stormwater assistance. In addition she is a laboratory operations expert. Diana is excited to joining VRWA and looks forward to working with systems moving forward.



USDA's Water and Environmental Program Funding Opportunities

Call for applications for water sector infrastructure in rural Vermont.

- State pool deadline (competitive): **December 1, 2017.**
- National pool deadline (competitive): **April 13, 2018.**

Applicants are encouraged to apply by earlier state deadline. Applications received between December and April 13 will compete in the larger national pool. To submit a competitive application, please contact a Rural Development specialist in your area. More information is available at this link: rd.usda.gov/vt

VT DEC Drinking water and clean water funding opportunities

Federal Fiscal Year 2017

- PER due December 31, 2017.
- Bond Vote deadline (DW/SRF) April 15.
- Project Complete by Fall 2019.

Federal Fiscal Year 2018 (dates shown for 2018)

- Project priority list application deadline: February 16.
- Draft intended use plan and hearing notice: March 2.
- Public Hearing: April 5
- Public Comment Ends: April 20.
- Final intended use plan released: May 4.
- Preliminary engineering report deadline (DWSRF): December 31
- Bond Vote deadline (DWSRF): April 15, 2019.

More information at this link:

dec.vermont.gov/facilities-engineering/water-financing/srf/intended-use-plans

VRWA Annual Conference and Trade Show

Mark your calendars and be sure to save the date for our 2018 conference and trade show event. We are looking forward to returning to the Lake Morey Resort on May 9 & 10, 2018. More information on registration for our associate contacts as well as individuals will be released soon.

Thank You

As we close out another year, thank you to all we have interacted with this year. It is an honor to work alongside you at the grassroots level on initiatives to support your operations and all activities associated with a vibrant water sector here in Vermont. A special thank you to our members at the system and company level—your commitment to support the association is respected and appreciated. To our partners, we look forward to continued collaboration into the future. Best wishes to all of you this holiday season!

Donations Appreciated

Please consider making a donation to VRWA to help us further our mission. With your support, we work to promote public health and protect the local environment by providing support to water and wastewater systems.

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<http://vtruralwater.org/about/donations.php>

MONITORING BASIC PARAMETERS CAN OPTIMIZE PACKAGE PLANT OPERATION

Submitted for publication by Matt Guerino, Training Specialist

Today there are a large percentage of package water treatment plants that operate using obsolete or inefficient backwash methods. These methods can be improved upon by monitoring basic parameters to initiate a clarifier flush and a filter backwash based upon a set time intervals, head-loss across the media, and effluent turbidity. To save time and money, the water treatment plant must rely upon instrumentation that accurately monitors these parameters while producing high quality effluent, minimizing waste and optimizing net production.

A common package plant configuration is a clarification step followed by a filtration step. Chemicals such as a coagulant and one or more polymers are used to make contaminants insoluble so that they can be captured in the clarifier or filter. Basic instrumentation includes devices such as: influent and effluent turbidimeters, differential pressure transducers, or switches and gauges.

Many plants, initiate clarifier flush and filter backwash based upon a set-time. Typically this set-time is measured in minutes or hours by the PLC program. This method works well when water quality stays consistent or if it is fairly stable, such as ground water or ground water under the influence or when the flush, backwash, and downtime; occur while the demand is low.

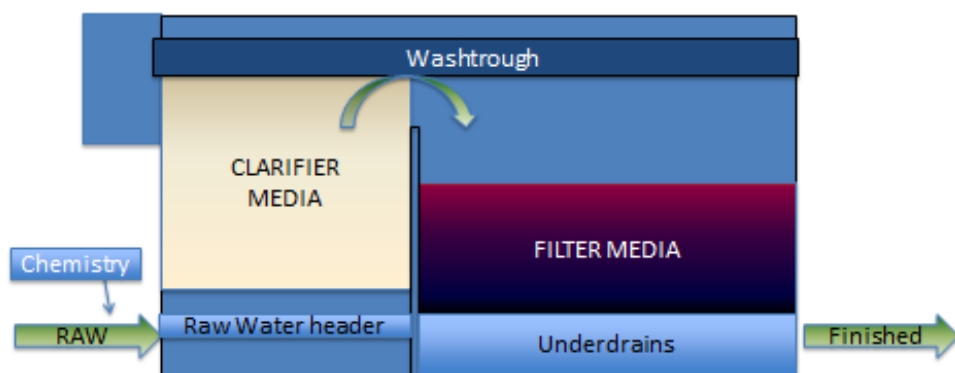
However, surface water can be variable and influenced by seasonal changes, run off, or rain events which affect raw water turbidity. Increases in raw water turbidity increases solids loading and can shorten clarifier and filter run times. Initiating clarifier flush and filter backwash based on a set-time can be costly. If too often, more flushes and backwashes create more waste and fill the waste storage basins or lagoons too frequently. Time spent cleaning them is lost time and may even prevent the plant from producing usable water.

If the clarifier flushes too infrequently, excessive solids collect in the clarifier and spill over onto the filter. The filter then develops an increase in headloss. This is called breakthrough and causes the process to operate inefficiently. Breakthrough occurs when the solids holding capacity of the clarifier media or filter media is exceeded and solids pass through the media. In some cases, excessive headloss developed in clarifiers can damage the equipment and creating unnecessary downtime and expense for repairs. And with the filter there is the risk that effluent water quality could be impaired.

There are a number of parameters that can be monitored to show how well the process is working and will help to optimizing the overall package plant. The Influent turbidity is one parameter measured and typically higher than raw water turbidity as it contains the turbidity of the raw water, chemistry additions, and any coagulated particles, and can also be referred to as coagulated turbidity. Another is called settled water turbidity or inter-stage turbidity, which is the turbidity out of the clarifier or onto the filter. It is not necessary to continuously record the inter-stage turbidity. Of course filtered effluent water turbidity is needed, as well as a headloss across the clarifier and filter. For the clarifier, the pressure under the clarifier media is monitored over time which correlated to the solids load captured. Since this parameter is a gauge pressure, psig, then it is recorded as the clarifier differential pressure. Filter headloss is another common parameter monitored, also a gauge pressure in psig. Depending on how the plant monitoring devices are configured, filter headloss reading may be shown as negative or a vacuum pressure.

PROCESS COMPONENTS

What makes up a Package Plant?



Most all of the parameters cited are commonly recorded either on a log sheet or continuously monitored through a plant SCADA system. Inter-stage turbidity can be obtained as a grab sample when necessary. Even without a SCADA monitoring system, manual logs can be just effective.

A table like that shown can be used to collect the data.

Optimizing clarifier and filter performance							
TIME (hr)	Clarifier			Inter-stage Turbidity	Filter		
	Coagulated Turbidity	Clarifier Headloss	Percent Solids Removed		Effluent Turbidity	Filter Headloss	Percent Solids Removed
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							

The parameters for the clarifier and filter are shown as column headings. The time at which time the data is taken is shown on the left. The time interval can be more frequent, such as each half hour, to provide better resolution. The intent is to compile and plot the data in enough detail that trending can be seen. Data collection that is too coarse may not show the same picture of headloss and turbidity spiking as a data set that has more points collected. This especially evident near the time which the clarifier flushes or filter backwashes. Frequent sampling would be more reflective of the actual events occurring prior to the backwash or clarifier flush.

One manufacturer suggests:
For the best characterization of the performance of the clarifier, make turbidity readings on the influent and effluent at least once per hour throughout a run. It is important to do this frequently since, under certain conditions, the removal across the clarifier can change significantly throughout a run.

The filter effluent turbidity (if not recorded continuously) should be checked frequently; as often as once every half-hour for an in-depth characterization.

Computing Solids Removal:

With the data collected, other items can be computed to thoroughly understand the processes. For instance, knowing the inter-stage turbidity is helpful to determine the percent solids removed. By subtracting the inter-stage turbidity from the coagulated turbidity and dividing the difference by the coagulated turbidity, the percent solids captured or removed

in the clarifier is determined. For the filter, take the difference of the inter-stage turbidity and effluent turbidity and divide this by the inter-stage turbidity, the percent solids captured is determined. In many cases, if the chemistry is properly dosed, percent of solids removed can be fairly high. Many regulators require turbidity of 1.0 NTU or less on top of the filter.

For example for the Clarifier at hour 3:

$$(7.2 - 0.7) / 7.2 = 0.903 \text{ or } 90.3\%$$

And for the filter

$$(0.7 - 0.06) / 0.7 = 0.914 \text{ or } 91.4\%$$

By reviewing the current operation of an existing water treatment plant using the parameters as noted, the best

time to flush the clarifier or backwash the filter can be determined based on minimizing breakthrough.

Optimal Operation

The graph shows the ideal operation of a filter, which can also apply to a package plant clarifier. The blue line uses the headloss axis on the left as a function of time on the lower axis. As time goes forward, headloss across a clarifier or filter can be steady for a period of time then increase until it reaches a terminal headloss. At which time a clarifier flush or filter backwash is initiated.

Optimizing clarifier and filter performance								
TIME (hr)	Clarifier			Inter-stage Turbidity	Filter			
	Coagulated Turbidity	Clarifier Headloss	Percent Solids Removed		Effluent Turbidity	Filter Headloss	Percent Solids Removed	
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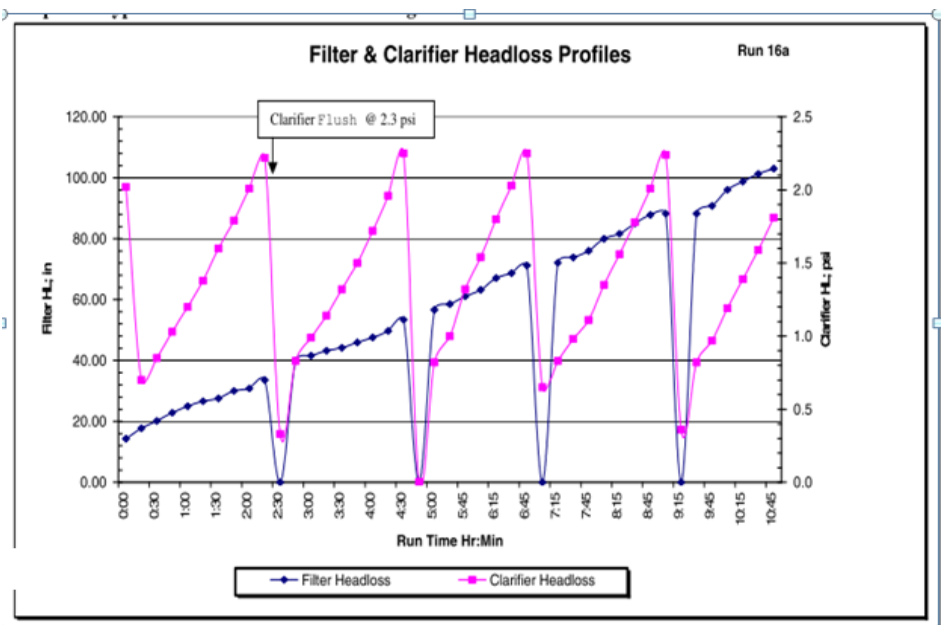
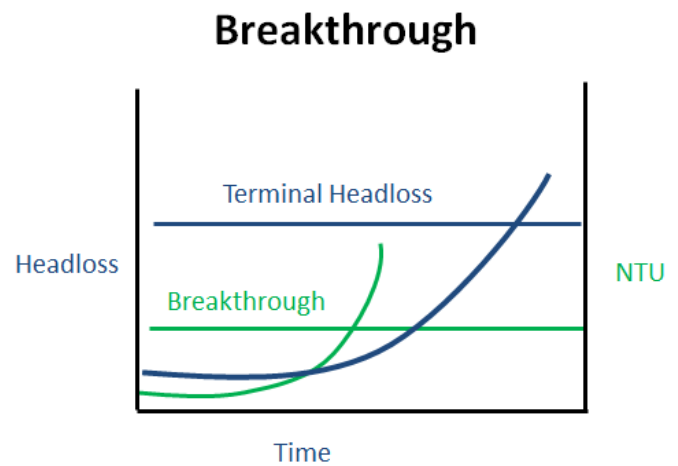
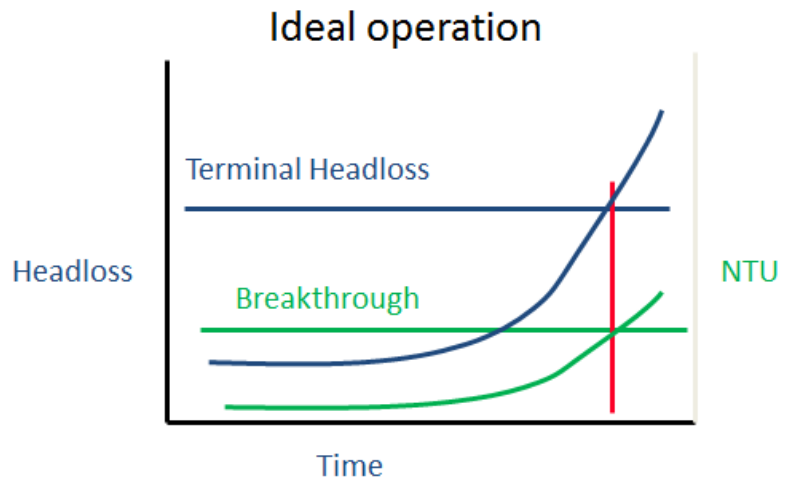
The green line represents the turbidity out of the clarifier or out of the filter and as show if fairly steady over time until it cannot hold any more solids. It is at the point when both terminal headloss and breakthrough occur that the system is running at maximum efficiency, shown by the red vertical line. The goal is to get as close to the breakthrough point as possible without exceeding it.

Breakthrough occurs when the rate of turbidity change increases. Headloss in blue on the left vertical axis, turbidity on the right in green and time along the horizontal axis. While the terminal headloss had not changed, breakthrough occurred much sooner than termaml headloss was achieved and is seen as a sudden spike or “hockey stick profile” in the curve.

Headloss Monitoring and Review

When reviewing an operating packaged water treatment plant, monitoring head-loss across a clarifier or a filter, is very useful as seen on the graph (below) that was done using a data logger and SCADA system. The same graph could have been generated using the table previously mentioned.

The graph shows both clarifier headloss and filter headloss versus time. Headloss is reported as inches of water column. The clarifier is flushing about every 2- 3 hours. Since influent turbidity is not shown here, changes in raw water turbidity between these events can reflect some variability. For the clarifier, the headloss after each event returns fairly close to the initial setting, indicating that it is being adequately cleaned. The filter shows corresponding changes in headloss, because flow to the filter stops during the clarifier flush. The spike at 10 hours would indicate the headloss has increased and likely to trigger a back-wash soon. Collecting filter headloss data for more than 10 hours would provide a better profile.



Turbidity Monitoring and Review

This graph shows run time in hours and minutes on the horizontal axis and turbidity on the vertical axis and is a good example of the difference between raw water turbidity (dark blue) and coagulated turbidity (green). The coagulated turbidity is often higher than the raw water turbidity due to the added chemistry used coalesce solids or treat color. The yellow line shows the inter-stage turbidity and the light blue, the effluent turbidity. None of these curves reflect any turbidity breakthrough.

In the normal operation of any plant there comes a point, noted by turbidity breakthrough, when the media can no longer hold any more solids. These values should be kept on file and used when treating similar waters and chemical treatment.

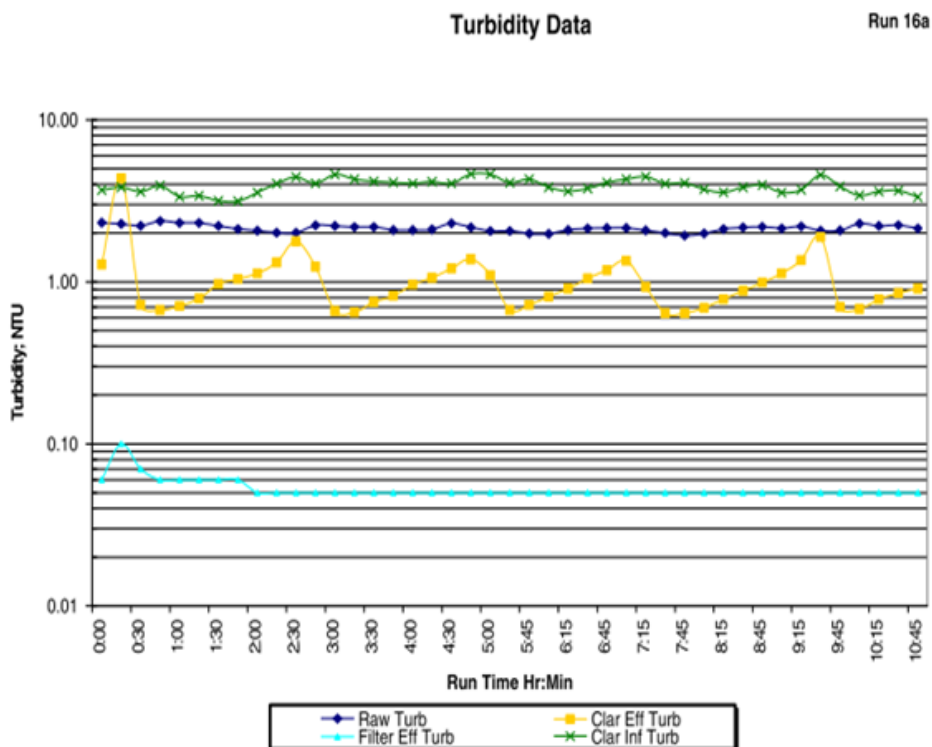
Optimizing:

- Once the data has been collected and plotted, there are a number of things that can be done to improve the operation
- Consider adjusting the time between clarifier flushes and filter backwashes. This can be done in most of the PLC programs.
- In conjunction with the time adjustments, adjust the headloss switches used to initiate the clarifier flush and filter backwash. This can be done by adjusting the switch settings.
- Reviewing the percent solids removed in both the clarifier and filter can uncover which process has more room for adjustment. Note that the goal is to optimize the overall plant which may or may not result in both clarifier and filter being optimized.
- Consider modifying the dosage or type of coagulant or polymer being used. Consult with your chemical supplier who can conduct on site jar testing of various options.
- Consider cleaning or replacing the media. Media analysis can be conducted by the manufacture or media supplier to determine if the media is worn or contaminated.
- Keep various turbidity and headloss profiles based on seasonal operations to check the impact of changing coagulant or polymer dosages.

In all cases, before making any major change to your full scale operations, contact your local regulators or rural water association. Optimizing operations will save days of potential backwash time and money on an annual basis.

One example regarding improvement of operation in waste volume, could be if a clarifier run time was extended an additional hour. A one MGD package plant that flushes the clarifier every 4 hours and backwashes the filter every 8 hours, could reduce the waste volume produced by 10%, if the clarifier ran 5 hours between flushes. The increase of just one hour between flushes reduced the number of flushes per day from 6 to 4.8. Furthermore, assuming a flush duration that takes 15 mins, the plant will extend the run time such that an additional 10,500 gallons can be produced.

This simple method of monitoring the performance of the steps within the overall treatment process will produce the least amount of waste, optimize use of chemistry, and maximize utilization or net production.




Waste Volume Calculation				
based upon 1 MGD plant				
	Waste Volume	Frequency (hrs)	number of flushes per day	Total Waste Produced
Clarifier Flush	3500	5	4.8	16800
Filter Backwash	7000	8	3	21000
		Total		37800
Alternate				
	Waste Volume	Frequency (hrs)	number of flushes per day	Total Waste Produced
Clarifier Flush	3500	4	6	21000
Filter Backwash	7000	8	3	21000
		Total		42000

Conclusions:

- Operators must be focused on calibrating the instrumentation, properly operating the equipment, and periodically checking performance to ensure optimized operation. These duties are performance by qualified instrumentation technicians and enhanced by a good preventative maintenance program.
- Changing water quality or chemistry can upset the process and system may need to run a performance test.
- The breakthrough point can be directly associated with clarifier and filter headloss. The goal is to get as close to the breakthrough point as possible without exceeding it.
- Maximizing solids holding capacity is paramount to understanding the optimal performance of the package plant.
- Optimizing the process to operate with less frequent clarifier flushing and filter backwashing can reduce waste water production
- Keeping, and reviewing, results of multiple tests are useful to optimizing the system's performance on a long term basis.
- This test is independent of clarifier types, filter media types, underdrains system, or backwashing techniques.
- Consult with the manufacturer for additional thoughts and suggestions on how to further optimize the process.




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Gearing Up for Rally

VRWA looks forward to heading to Washington this February to meet with Vermont's Congressional delegation to advocate for rural water program funding. This grassroots advocacy gives us the opportunity to showcase the value and need for rural water program funding. To support this effort if you are interested in providing a letter of support detailing how VRWA is important to you and your system please submit to Shaun Fielder (Executive Director).



l. To r. Ed Savage (VRWA President), Congressman Peter Welch, Rod Lamothe (VRWA Vice President)

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“A key point to be aware of is in 3 of 4 instances for the new permit issuances the allowed phosphorus discharge limit has been reduced in the new permits. “

“Challenge of VT ANR issued NPDES Permits” continued from cover

To now have to be put on hold in regards to what is going to happen on permits due to dragged out litigation processes does nothing to support ongoing good work by these folks – with their end goal being work to promote significant environmental protection. Bear in mind this week there has been nothing noted in the challenge in regards to what these facilities have done collectively over the past 20 plus years for advancements in this area. In a nutshell a sector that has done the most in reducing phosphorus contributions overall.

Looking forward and in the event the standard is further reduced, as a sector we would be approaching upgrades to treatment processes / operations demands that cannot be met within practical budget limitations and frankly if implemented will not make a measurable difference toward receiving water quality.

Please recall it is documented that all direct discharges combined contribute a very small portion of total phosphorus load to Lake Champlain basin (approximately 3%). This point should not be taken to mean facilities are not interested in doing more, they are but that has to be within the bounds of a good prioritized investment that offers a good return on investment. This would mean most gain in phosphorus reduction loading in a given community when looking at all possible source inputs not just the direct discharge.

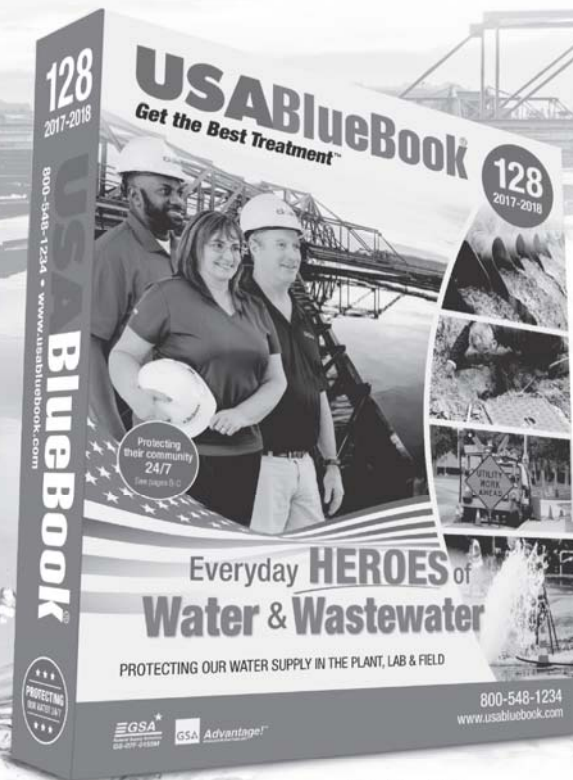
To pull a bullet point back into the discussion from VRWA comment letter to EPA Region 1 on development of the Lake Champlain TMDLs, dated October 15, 2015,

“The data available does demonstrate focusing efforts in areas other than point source will lead to more significant phosphorus loading reductions. Without clearly defined direction to prioritize investments in non-point source, an unsustainable economic situation could be created for direct discharges and for the state collectively in the future. Without getting into the exact financial details, ratcheting down discharge standards toward zero via enforcement tactics and not focusing efforts in other non-point source areas would cost hundreds of millions of dollars. Since the direct discharges only account for approximately 3 percent of the total load to Lake Champlain overall this would not be a wise investment. Tying up the hundreds of millions, a majority of capital available, to reduce the 3 percent would prevent any chance of hitting the required 34 percent reduction of phosphorus loading to Lake Champlain.”

I would add, the comment above was pulling in the regulatory framework and in VRWA's opinion the final resulting TMDL plan(s) and now most recently issued permits were on target. They would allow NPDES permit holders to implement and get going on the improvement processes (even given some big costs expected). It is interesting to note now you could substitute the word litigation in place of enforcement mid-paragraph above and our point from October 2015 stands.

Making sure this point is not lost in the narrative, operators VRWA works with and represent in high majority are striving to do better on discharge parameters than actual permit standards. Burdening them with an unachievable discharge standard, assuming the challenge is successful, is doing nothing to promote the Vermont's "all in." mantra and totally discredits 1000's of hours of stakeholder input and program development in these recent years and final plans cleared by VT ANR and EPA Region 1. ■





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