edition of the Drinking Water News. In this issue: · Certified Operator Responsibilities as a Circuit Rider · Preparing an Effective Renewal Application for Monitoring Waivers

· Letting the Water Run: The Importance of Flushing · Groundwater Rule Reminders Disinfectants, Disinfection Byproducts and Operational Evaluation Levels

The Pennsylvania Department of Environmental Protection (DEP) Bureau of Safe Drinking Water is proud to provide updates, information, explanations and reminders to you with this

- · Reduce DBP formation by Optimizing Pre-Filtration Processes · We're So Glad You Asked!
- Submit your feedback, suggestions and questions to dagrube@pa.gov.

- Certified Operator Responsibilities as a Circuit Rider
- Richard Kirby, Compliance Specialist, Northwest Region Many small community water systems hire a Circuit Rider to manage their facilities due to limited budgets. A Circuit Rider is a management program in which a certified operator may make process control decisions at multiple systems of different ownership. A process control decision maintains or

remote site, by using Standard Operating Procedures ("SOPs") approved by the operator in responsible charge, or by using a PLC system. When a certified operator is working as a Circuit Rider, the responsibilities remain the same as with any water system.

changes the water quality or quantity of a water system or wastewater system that may affect the public health or environment. All process control decisions must be made by an operator with the appropriate classification and subclassifications. These decisions may be made onsite, from a

Good standard operating procedures assure that water or wastewater systems are operating effectively, protect public health, and protects the operator's certification, especially if an uncertified individual fails to follow SOPs. Depending upon the contract the Circuit Rider has with the system

owner, they may visit the treatment plant daily to verify correct operation and make process control decisions, or they may only visit periodically during the month. To meet regulatory requirements, this contract between the owner and operator must include the minimum requirements outlined in 25 Pa. Code § 302.1207(e) or the General Work Plan template available through the Department's Circuit Rider webpage. A system specific management plan available on the same webpage is also required and must include SOPs and a process control plan in accordance with 25 Pa. Code § 302.1207(f). As the responsible individual for the water or wastewater system, the operator should review all operation permits and verify the system is constructed and operating in accordance with those permits, including any permit special conditions, prior to signing a contract with the owner of a water or wastewater system. A thorough evaluation of the system should be conducted, and recommendations made for any repairs necessary to comply with regulatory requirements and to ensure public health is protected.

An operator in responsible charge develops a process control plan that outlines the facilities, methods, activities, and treatment alternatives necessary to meet permit requirements, and provides long term, reliable system operations. This plan should include trigger parameters, such as high and low chlorine levels, minimum tank volumes for both water storage and chemicals, flow rates, and other monitoring and treatment requirements identified in operation permits issued to the water or wastewater system. For all tasks performed by uncertified personnel or under-certified personnel (missing a subclass or subclasses), SOPs should be developed to effectively operate the water or wastewater system. These SOPs should be detailed enough that someone with no knowledge of water or wastewater treatment can follow them to perform the daily tasks in the absence of the Circuit Rider. In accordance with 25 Pa. Code § 302.1204, standard operating procedures must: (1) include the name of the operator in responsible charge; (2) identify the personnel that may utilize the standard

operating procedures to make process control decisions; (3) state which treatment processes are covered by the standard operating procedures. For treatment processes that are not covered by the standard operating procedures, personnel must be instructed to contact the operator in responsible charge to make any necessary process control decisions; and (4) identify the trigger parameters for the treatment processes and the appropriate actions to be taken for each treatment process. Standard operating procedures shall be approved in writing and dated by the operator in responsible charge, and available at the system for review. A certified operator is required to comply with the Safe Drinking Water Act, Chapter 109, the Clean Streams Law, the Federal Water Pollution Control Act, Chapter 92, the Water and Wastewater Systems Operators' Certification Act, Chapter 302, Chapter 252 and other federal or state law or

rules and regulations applicable to the operation of water and wastewater systems to protect the environment and public health and safety. A certified operator is responsible for operation and

maintenance of a water or wastewater system utilizing available resources needed to comply with applicable laws, rules and regulations, and permit conditions or requirements. This includes reporting to the system owner known violations or system conditions that may be or are causing violations of federal or state law or rules and regulations. As stated in the regulations, the available operator making process control decisions is responsible for those decisions and consequences, unless the owner fails to respond to a report as noted above or there is a deliberate action with malice or negligence on the part of an employee under the supervision of the available operator. Any time the system owner is failing to respond to a violation or potential violation or an employee is endangering public health through malice or negligence, the operator should immediately notify the DEP (Safe Drinking Water Program or Clean Water Program) to assure the protection of public health and the environment.

Preparing an Effective Renewal Application for Monitoring Waivers

John Cairnes, Compliance Specialist, Southeast Region

DEP enables eligible community and non-transient, noncommunity water systems to apply for a waiver for the monitoring of some regulated contaminants. Waivers are not granted automatically; it

is a water supplier's responsibility to demonstrate eligibility for a monitoring waiver. A waiver application will be denied if DEP determines the water system has not provided sufficient evidence of its eligibility. Waivers have expiration dates and must be periodically renewed, a fact frequently overlooked by water suppliers. Careful preparation of a waiver renewal application can help to avoid common deficiencies that often lead to the rejection of an application by DEP. There are two types of monitoring waivers: Use and Susceptibility. Use waivers are only granted if a chemical has not been used, transported, stored or disposed in the vicinity of the source. If use waiver criteria cannot be met, the water supplier may apply for a Susceptibility waiver. However, Volatile Organic Compounds (VOCs) are eligible only for a Use waiver. Additionally, entry points supplied by surface water sources are eligible only for a Use waiver for Inorganic Compounds (IOC), Synthetic Organic Compounds (SOC), asbestos, dioxin and PCBs. Due to the prevalence of roads and the possibility of chemicals being transported within the source contribution area, it is difficult to meet the criteria for a Use waiver. To be eligible for a Susceptibility waiver, a water system should have past entry point monitoring results for regulated contaminants. The more recent the results, the better. Land use changes may lead to an increase for susceptibility to contamination. Entry points using sources that have been permitted as Reserve status and have been unused for a long time should have recent monitoring

results to be eligible for a waiver. Entry points that have treatment for a specific contaminant, such as

To demonstrate eligibility for a Susceptibility waiver, a water supplier must make a thorough examination of land use in the Zone II source water protection area (within 1/2 mile of a water source, unless a more rigorous delineation has been designated) of each water source. Failure to evaluate all potential land uses that may employ or produce regulated contaminants is a common reason for a waiver application being denied. Public records of land use alone are not sufficient; at

best they should serve as a starting point for investigating potential sources of contamination. Residential, commercial, industrial and agricultural land use, as well as other public utilities, EPA superfund sites and pollution-control facilities all may be potential sources of contamination.

Landowners should be interviewed or surveyed to determine if they use any products that contain or

The most common reason why a water system loses a monitoring waiver is the failure of the water system to renew their waiver in a timely manner. Waivers are not permanent. Waivers for IOCs and asbestos are for a nine-year monitoring period (currently 2020 through 2028). VOCs, SOCs, dioxin and PCBs can be waived for a three-year monitoring period (currently 2020 through 2022). Once granted, a waiver must be periodically renewed before it expires. It is a water supplier's responsibility

arsenic, are not eligible for a waiver for that contaminant.

produce regulated contaminants.

To flush or not to flush? That is the question.

determine the best schedule for flushing their pipes.

best flushing schedule for the system and any affected buildings.

flush or not to flush? Open those taps and let the water run.

Water Advisories (BWA) at your water system.

tank levels required by the Department.

to know when a waiver is due to expire. DEP recommends that water suppliers apply for the renewal of a waiver 3 to 6 months before the end of the waivered monitoring period. To renew a waiver, a water supplier should investigate their Zone II areas for possible land use changes that may have introduced new potential source of contamination. Land use changes can include new construction projects, remediation projects, and product changes at previously surveyed locations. This investigation should be no less rigorous that what was conducted for the initial waiver. New monitoring results are recommended but are not necessary if there have been no land use changes since the issuance of the previous waiver. Additionally, a waiver may be revoked at any time during the waiver period if land use changes occur that alter the information submitted in the most recent application. The water supplier should contact DEP if/when land use changes are noted to discuss the status of the monitoring waiver.

DEP's Technical Services division can provide addition guidance about waivers and renewals.

Letting the Water Run: The Importance of Flushing

Gina Kellett, Compliance Specialist, Northeast Region

Flushing is the process of cleaning or scouring the interior of distribution water lines by sending a rapid flow of water through the mains. This practice is an important part of maintaining a safe and healthy water system and something that all water systems should include in their operation and maintenance plans. But doesn't water flow through pipes all the time? Kind of. Under normal

operating conditions, water moves rather slowly through the pipes and sometimes not at all. This low

flow allows sediment to settle in the water lines, increases water age and degrades water quality (lower disinfectant residual, lower pH, higher TTHM/HAA5 levels, increased biofilm growth). When a water system is flushed, the water moves through at a greater flow rate, which decreases water age, removes the sediment build-up and improves water quality. A commonly used method of flushing is unidirectional. The objective of this type of flushing is to assist in maintaining or improving water quality in parts of the distribution system. When a system begins unidirectional flushing, valves are shut to isolate a portion of the distribution piping, and hydrants are opened to direct the water through the isolated pipe. This creates water pressure within the water main that is strong enough to remove sediment that has settled in the pipe. In addition to removing sediment from the water lines, flushing eliminates the stagnation of water in low use areas. Stagnant water can contain higher concentrations of contaminants such as disinfection by-products, lead and copper. Stagnant water also allows for biofilm growth, which provides an environment for opportunistic pathogens such as Legionella bacteria. Flushing helps prevent the stagnation of water, which prevents this build-up, therefore allowing safer healthier water to reach customers throughout the distribution system. Flushing is usually thought about on a large scale, like when municipal community water systems use

hydrants to open water flow throughout the transmission main, but flushing can be done on any scale. Large community water systems, small community water systems, and nontransient

During these times of global pandemic, flushing is especially important since many schools,

reduction in water usages allows the water to become stagnant, allow sediment to settle to the

noncommunity water systems can benefit from a regular flushing program. Obviously, each type of system and each individual system would have different needs when it comes to flushing. Each system should use their routine water quality test results (pH, Cl2, temperature, bacteria, etc.) to

commercial buildings, and business parks are seeing a reduction in the amount of water usage. This

bottom of pipes, and in areas that have lead/copper issues, can allow metals to leach into the water from the pipes. This allows the water to sit in the pipes and stagnate, potentially affecting the water quality. Water systems that are seeing a reduction in water usage due to lower populations served may want to test the water throughout the distribution system and at select buildings to determine any changes in water quality. Then the water quality sample results should be used to determine the

Whether it be on a small scale or a large scale, the use of a regular flushing program is a relatively simple way to ensure that water quality is maintained throughout a water system. So, when asking, to

American Water Works Association Coronavirus Information

Groundwater Rule Reminders

Angi Anderson, Water Program Specialist, Central Office

It has been over 10 years since the Groundwater Rule (GWR) took effect for Pennsylvania's water systems. As time goes on, we are still seeing violations that could probably be avoided. Let's take a look at few things that you can do to hopefully avoid violations and possibly the need to issue Boil

One of the most common violations that we see is an entry point (EP) chlorine residual reported below the required minimum level and then nothing reported until the following day. Make sure that you are aware of any specific groundwater rule requirements for your system; such as EP minimum chlorine level required, maximum flow rate through your treatment plant, or any minimum storage

• CDC Guidance for Reopening Buildings After Prolonged Shutdown or Reduced Operation

For information regarding the importance of flushing during times of low/no water use, visit:

the certified operator has 4 hours to bring the level back up. If the operator is not the person taking the daily residuals, then it should be written into the Standard Operating Procedure (SOP) that the certified operator be notified of the situation immediately after a low residual is obtained. As long as the EP remains in use, the chlorine residual should continue to be taken until the residual is restored above the required minimum. If the residual is able to be restored within 4 hours a violation is avoided. If you take the entry point off-line it should be noted in a logbook or other record as to when the entry point was on or off. If at any time the EP is in operation and the chlorine residual is non-detect this would be an immediate breakdown in treatment and you would need to call DEP within one hour of discovery and issue a BWA. You do not have a four-hour window to restore your chlorine residual once a residual is non-detect.

The first reminder: A violation does not occur until the residual is below the minimum level for more than 4 hours. When a low EP chlorine measurement (result below the required minimum) is taken,

For example: Lincoln MHP's park manager, Bonnie, is responsible for taking the daily EP chlorine residuals. On August 8, she obtains a reading of 0.43 mg/L at 6:00 pm, the peak flow period for the water system. The minimum residual allowed at this particular EP is 0.50 mg/L. She records it in the daily logbook and goes about her daily duties at the park. No other readings are taken and the certified operator, Clyde, is not notified. Clyde stops by the treatment plant early in the afternoon on August 9 and noticed a problem with the chlorine pump. He fixes the chlorinator, notes the repair in the logbook and waits for the water to move through the contact piping before taking a chlorine residual. He obtains a reading of 0.75 mg/L at 2:15 pm. At this point, it is assumed that the chlorine

residual has been below the minimum for 20 hours because no additional readings were taken and a BWA should be issued. But, if Bonnie had called Clyde when she had obtained the low reading, the chlorinator could have been fixed right away and the BWA avoided. Note: Clyde should also review with Bonnie the systems SOPs regarding the chlorine levels and when she needs to contact him. For

Disinfectants, Disinfection Byproducts and Operational Evaluation Levels

Valerie Elsasser, Sanitarian Supervisor, Northcentral Region

Community water systems and any nontransient noncommunity water systems that use a disinfectant

Two of the disinfection byproducts (DBPs) that are sampled under Stage 2 are Total Trihalomethanes (TTHM) and 5 Haloacetic Acids (HAA5). These byproducts are formed when natural organic matter combines with an added disinfectant (usually chlorine). DBP formation is affected in different ways by

You're hoping by now that you aren't the only one who forgot (or never knew) about the OEL

population, or by sample results. Quarterly monitoring for TTHM and HAA5 is required:

 If you have a surface or GUDI source and serve a population greater than 500. • If you are a groundwater system and serve a population greater than 10,000.

requirement, asking yourself "Am I supposed to calculate an OEL?" If you are a Community water system, or any nontransient noncommunity water system that uses a disinfectant other than UV, and that collects TTHM and HAA5 samples quarterly under Stage 2, then YES! Now you're probably wondering," How do I know if I'm supposed to be sampling quarterly?" It's based on system type and

 If you are currently sampling annually or triennially and have any sample result over the Maximum Contaminant Level (MCL). Keep in mind that even if only one of them (TTHM or HAA5) has a sample result over the MCL, both contaminants need to be sampled quarterly.

Let's shift the discussion back toward the elusive OEL. What does the OEL have to do with TTHM and HAA5, and why should you complete an OEL? The OEL is a calculation that will determine if you

other than UV, began sampling for Stage 2 of the Disinfectants and Disinfection Byproducts Rule (DDBPR) in 2012 and 2013. The Stage 2 requirements can be found in Chapter 109.301(12)(ii). One new (and sometimes forgotten) requirement under Stage 2 is the Operational Evaluation Level or OEL. Let's take a few minutes and refresh our memories about this requirement, starting with some

The second reminder: If the residual is restored within 4 hours and the restored residual is not

reported by the 10th of the following month so that your system does not receive a

more information on the groundwater rule, please visit our webpage.

basic background information.

contact time and water temperature.

reported, the water system will still receive a monitoring/reporting violation. Both residuals need to be

monitoring/reporting violation. Even if the residual is not restored within 4 hours, the time and result of when the residual IS restored needs to be reported, not just the next daily reading.

are likely to exceed the MCL for TTHM or HAA5 in the next quarter. You're thinking "So what?" The reason this matters: The OEL gives the water system a chance to improve DBPs in the hope that levels remain below the MCL. DBPs are regulated because of high potentials for exposure from not only ingestion, but absorption and evaporation as well. There are short term (reproductive/developmental) risks and long term (bladder cancer) risks. In addition, MCL exceedances mean having to issue Tier 2 public notice. No one (and I mean NO ONE) likes to issue public notice. Once you begin quarterly monitoring, you must complete an OEL calculation for each location, and for each contaminant (TTHM and HAA5), at the end of the third quarter of sampling, and every quarter thereafter, for the entire time your system samples quarterly. These calculations should be done as soon as the sample results are received from the laboratory. How do you complete an OEL? It seems a bit complicated at first, but basically you assume your next sample result will be equal to the current quarter and calculate the locational running annual average. Let's look at an example. OEL: How to Calculate OEL Example The OEL is a calculation that uses the 3 most recent (result from 2 grtrs prior to current grtr) + (result from previous qrtr) + 2(current qrtr result) quarters of monitoring data to predict the potential 4 for MCL violation. TTHM

2nd Q 2018

(mg/L)

0.075

LRAA

(mg/L)

0.079

OEL (mg/L)

0.086

pennsylvania

(mg/L)

0.096

(mg/L)

0.096

MCL

(mg/L)

0.080

0.096 + 0.096 + 0.078

Location

The big question: How do you know when you're out of compliance? An OEL exceedance occurs if any OEL value is above the MCL. This can be different than a Locational Running Annual Average or

OEL vs. LRAA

The result from 1st Q was 0.065 mg/L, so the most recent Locational Running Annual Average (LRAA) was < MCL.

(mg/L)

0.078

2nd Q 2018 3rd Q 2018 4th Q 2018

(mg/L)

0.078

Make sure you report your OEL data to your local Sanitarian in writing within 10 days of the end of the quarter, providing monitoring location, date notified of sample result causing the exceedance, and calculated OELs. Of course, we have a form for that! It's 3930-FM-BSDW0521 and can be found

You may remember that Tier 2 public notice is required for a LRAA MCL exceedance but what about

Evaluation (OE) of the water system is required to investigate and find solutions to reverse the trend.

Reduce DBP Formation by Optimizing Pre-Filtration Processes

Pamela Russell, EPCS/Filter Plant Optimization, Southwest Region

The safe operation of drinking water systems requires careful monitoring of the water quality from source to customer. Since the introduction of the Stage 1 and Stage 2 Disinfectants/Disinfection Byproduct Rules, community and non-transient non-community public water systems have been required to meet certain maximum contaminant levels (MCLs) for these compounds in their

distribution systems. The 2018 drinking water regulation updates requiring increased disinfectant residuals in the distribution system and Giardia and virus inactivation reporting requirements helped

Each drinking water treatment facility and its source is different, therefore no one strategy can be

• Optimization of treatment conditions to remove precursor NOM (natural organic matter)

expose the difficult balance needed to inactivate potential pathogens while also controlling the

applied to all facilities or systems. According to the World Health Organization (WHO, 2006)

disinfection byproducts prevention strategies can be generalized into four groups:

any PN for OEL exceedance? PN is not required for an OEL exceedance, but an Operational

However, failure to complete the Operation Evaluation would be a violation requiring PN.

1st Q 2018 2nd Q 2018 3rd Q 2018 4th Q 2018

(mg/L)

0.075

But the **most recent OEL** (Q2-Q4) > MCL.

(mg/L)

0.075

(mg/L)

0.065

in e-Library under Forms, then the Safe Drinking Water subfolder.

formation of Disinfection Byproducts (DBPs).

compounds.

and chlorite.

Free Cl_2

Natural

Organic matter

Figure 1. Formation of DBPs

Coagulants

Free Cl₂

3rd Q 2018 4th Q 2018

(mg/L)

0.096

(mg/L)

0.078

0.075

MCL

(mg/L)

0.080

pennsylvania

OEL

(mg/L)

= 0.086 mg/L

(result from 2 grtrs prior to current grtr) +

(result from previous qrtr) + 2(current qrtr result)

(result from Feb) + (result from May) + 2(Aug result)

LRAA MCL exceedance. Let's look at an example.

If samples were collected in Feb, May & Aug:

OEL =

• Using a different chemical disinfectant with less tendency to form byproducts (Department permits required). Using a non-chemical disinfectant (not an option in PA). • Removing DBPs prior to distribution (costly and Department permits may be required). The removal of DBPs after formation can be costly and difficult. Therefore, it is preferable for systems to optimize pre-filtration treatment processes to remove precursor NOM compounds before DBPs are formed. This article will discuss the optimization of the pre-filtration processes to help reduce the formation of DBPs through the removal of DBP-Ps (DBP-Precursors) in the WTP. It is also recommended that when making operational changes to your treatment system: · Make one change at a time Analyze the results under multiple conditions · Document all changes and results Make process control changes based on data analysis

Let's begin by discussing what disinfection byproducts (DBPs) are and how they are formed.

matter (NOM) and inorganic matter in water with chemical treatment agents during the water disinfection process. Although the mechanisms of formation for some DBPs is unclear, they are present in most drinking water supplies that have been subjected to chlorination, chloramination, ozonation, or chlorine dioxide. These disinfectants may react with fulvic and humic acids (types of organic compounds), amino acids, and other NOM, as well as chloride, iodide and bromide ions, to produce a range of DBPs such as the trihalomethanes (THMs), haloacetic acids (HAAs), bromate,

TCM

The PA DEP Safe Drinking Water program requires filtration water treatment plants to incorporate a multi-barrier approach (physical and chemical) to remove and inactivate potential pathogens before the first customer and to maintain this level of protection throughout the distribution system. Every conventional WTP has, at minimum, the following physical barrier processes for both organic and inorganic particle removal; coagulation, flocculation, clarification/sedimentation and granular media filtration. Other types of filtration plants (direct, slow sand, DE, membrane) may have some or none of these physical removal barriers before filtration. Chemical barriers can be utilized throughout the

Water Treatment Process

Treated Water Storage

Systems looking to optimize their pre-filtration processes should first take a look at their source(s). Considerations for this evaluation include: performing a source water analysis to quantify potential

examining historical water quality records for your source and WTP to identify seasonal or unusual event trends. Plants with sufficient unit process capability to meet peak flow demand requirements should have the capability of making operational improvements that can optimize performance.

Turbidity Optimization

and settled water quality.

Although PA DEP safe drinking water regulations only require conventional filtration water treatment plants to monitor for and remove DBP precursors (DBP-Ps) in the form of total organic carbon (TOC)

The level of organic matter is usually registered as the total organic carbon (TOC) or the dissolved organic carbon (DOC) concentration and ultraviolet absorbance at 254 nm (UV254). The composition and concentration of naturally present organic matter in the source water determine the types and concentrations of disinfection byproducts that will eventually be formed. A water treatment plants ability to remove DBP precursors (NOM, TOC, DOC and inorganic chemicals) before disinfection can

Coagulation is a process that works by adding a chemical (coagulant) or chemical aids (coagulant aid) that change the chemical charge of the organic material in the raw water so that they attract instead of repel each other. Achieving proper mixing so that as much chemical can come into contact with the organic matter is essential. Coagulation is affected by the type of coagulant used, dosage, pH and raw water turbidity. A good place to start is to determine the proper coagulant dosage based on raw water turbidity using jar testing. Jar testing involves exposing same volume samples of the water to be treated to different doses of the coagulant and then simultaneously mixing

the samples at a constant rapid mixing time. The microfloc formed after coagulation further

undergoes flocculation and is allowed to settle. Then the turbidity of the samples is measured and the dose with the lowest turbidity can be said to be optimum. A dosage chart can be developed to assist operators in adjusting coagulant dosage when the raw water turbidity changes. The use of a streaming current detector (SCD) can also be used to determine the optimum coagulant dose. The

as part of the enhanced coagulation treatment technique, it may benefit other types of filtration systems to monitor their water at the source and other locations within the treatment process for DBPs, NOM and inorganic precursors and evaluate whether their pre-filtration treatment processes

Effluent turbidity < 0.10 NTU

goals.

This raw water turbidity data point is necessary in order to

determine if sedimentation process is meeting optimization

Continuous, stable performance regardless of variations in raw water quality. Sedimentation performance should always show a reduction in turbidity when compared to the raw water.

Effluent turbidity <1.0 NTU, if annual average of daily maximum

Effluent turbidity <2.0 NTU, if annual average of daily maximum

Continuous, stable performance regardless of variations in raw

raw is <10 NTU (chosen from 15-minute readings)

raw is >10 NTU (chosen from 15-minute readings)

water quality issues, developing a water shed protection plan or a well head protection plan,

Flocculation

Disinfection

WTP to assist in the removal of contaminants and to inactivate potential pathogens.

Coagulation

Distribution

Figure 2. Basic Conventional water treatment processes.

Ways to optimize

Source Water

DBP

Disinfection by-products form as a result of chemical interactions between naturally occurring organic

TBM

TCAA

BDCM

MBAA

Sedimentation

Filtration

DBCM

(Linder & Martin, AWWA (2015) "Self-Assessment for Water Treatment Plant Optimization") **Turbidity monitoring** One of the easiest and most basic tools that operators can use to analyze their WTPs ability to remove contaminants is turbidity. By monitoring, recording and analyzing the turbidity of the raw, settled (top of filters), individual filter effluent (IFE) and combined filter effluent (CFE) operators can assess their plants performance at every stage of treatment. Ideally, your plant should have online turbidimeters, recording every 15 minutes, on the raw water line coming into the plant before any treatment chemicals are added and on the settled water line providing water to your filters after clarification/sedimentation in addition to the required IFE and CFE locations. If on-line turbidimeters are not an option in your plant, grab samples can be taken and analyzed at regular intervals and any time operators anticipate a change in raw water turbidity. The Departments Filter Plant Performance Evaluation (FPPE) program has developed optimization goals that can assist you in your efforts to assess and optimize your water treatment plant. It is recommended that the systems use the Safe Drinking Water Program's Web Optimization Assessment Software (WebOAS) to evaluate their plants ability to meet these optimization goals. The table below describes the Department's optimization goals for conventional filtration plants. Note that these goals are more stringent than the regulatory requirements.

Daily maximum readings for the most recent

Evaluate the 95% of daily maximum readings

Evaluate the 95% of daily maximum readings for the most recent twelve months. Daily maximum data points should be chosen

may be contributing to the formation of DBPs.

greatly reduce formation both in the plant and distribution system.

for the most recent twelve months. Daily maximum data points should be chosen

from 15-minute readings.

Filtration (IFE and CFE)

from 15-minute readings.

Coagulation

DBP-Precursors (DBP-Ps) removal

twelve months chosen from 15-minute

readings. Sedimentation

SCD measures the net surface charge of the particles and shows a streaming current value of 0 when the charges are neutralized (optimum coagulation). **Coagulation Optimization** Does your plant have mechanical or static mixers? Are these mixers located and/or operated to maximize chemical mixing & Rapid Mix performance? Is the rapid mixer functioning as designed? Is the chemical application point located to give enough time for reactions? Is the correct polymer being used for your type of process? Chemical Application Are chemical feed pumps sized to provide adjustable feed ranges? Are these pumps easily calibrated and records kept? Does facility have the appropriate equipment to perform dosage evaluations? Jar testers, SCD, ZETA analyzers, pH & Turbidimeters? **Chemical Dosage** Have dosage charts been developed to assist operators to make accurate & knowledgeable adjustments based on water quality? **Flocculation** Once the charged particles have been neutralized through coagulation, flocculation can occur. During flocculation, gentle mixing accelerates the rate of particle collision, forming larger precipitates. These larger particles are called floc. Floc particle size should be optimized according to the plant's design and specific needs of downstream processes. (Linder & Martin, AWWA (2015) "Self-Assessment for Water Treatment Plant Optimization") Parameters that affect floc formation are; mixing speed, mixing intensity, mixing time, water temperature.

Flocculation Optimization

Does the facility contain equipment to analyze floc quality?

occur?

and effectiveness?

Are the mixer speeds adjustable?

Is there adequate baffling to slow water flow?

equipment to optimize this treatment process?

Floc Basin(s)

Floc Analysis

Sedimentation/Clarification

Are there enough stages or basins to provide adequate time for flocculation to

Have written protocols been developed to characterize desirable floc size, shape

Are there SOPs in place to assist operators in assessing floc quality and adjusting

circuiting or
ance?
ocess?
ate?

We're so glad you asked!

f in D

Share this email:

Sedimentation or clarification is usually the final treatment process before filtration. There are many different sedimentation or clarification technologies used in the drinking water industry, but the end result is the same; to remove as much of the particle load before filtration. Sedimentation or clarification is one of the most important physical treatment processes used to reduce the potential for parasitic cysts to pass through to the final product. It is also an important process to physically remove as much organic matter before disinfection. One of the best ways to assess your systems sedimentation or clarification process is by monitoring the "settled" water turbidity at the end of this segment before the water passes onto or through the filters. The Department's FPPE optimization goals for settled turbidity were discussed above. Analysis of your systems ability to meet or exceed these goals will assist operators in making operational adjustments and improving the plants ability to remove Recycle Some w recomm backwash water and/or sedimentation supernatant without adequate treatment can increase tne potential risk of concentrating pathogens, DBPs and DBP-Ps through the treatment plant. If your WTP must recycle some or all of the waste stream, the Departments FPPE optimization program recommends that it does not exceed 5% of your plant's instantaneous raw water flow. The filter backwash recycle rule requires systems that recycle waste streams to keep a record of recycle flow

rates, backwash flow rates and duration and other key information. **Recycle Optimization** Determine if the recycle stream can be disposed of in some other way than recycling. Has a comprehensive analysis been performed to understand the components and most appropriate treatment for the recycle stream? Are sampling points available separate from other flows? Assess the adequacy of the recycle stream treatment process. Are flow meters calibrated and adequate to monitor the flow of the recycle stream? Ensure that all process control procedures accurately consider the impact of the recycle stream on raw water quality and treatability Develop SOPs to provide guidance regarding the use and treatment of the recycle stream to assist operators in meeting their treatment goals. Please keep in mind that any changes that you plan on making to the physical components and/or chemical injection location(s) or the type of chemical used MUST go through your region's SDW program permitting process. If your system uses any pre-filtration basins (flocculation tanks, sedimentation basins, clarifiers) to achieve your required 1.0 Giardia log inactivation (LogG), you must keep this in mind when making any operational or physical changes to these disinfection segments.

Q: I heard that EPA published the final revisions to the lead and copper rule (LCR), is that going to affect my requirements under LCR? A: You are correct that EPA published the final revisions to the LCR on January 15, 2021; the final rule can be found here. While it would be beneficial for you to look at the revised rule to understand what is being required at a federal level, PA has its own LCR and DEP has begun the process of revising the regulations to

incorporate the changes to the federal LCR. There will be some early implementation requirements in the federal rule that PA water systems will need to comply with by January 16, 2024 and PA DEP will be getting information out to water systems regarding those requirements as soon as possible. However, for the time being it is "business as usual" for PA water systems and the LCR, but keep an eye out for articles in future newsletters on this topic. Pennsylvania Department of Environmental Protection, 400 Market Street, Harrisburg, PA 17101