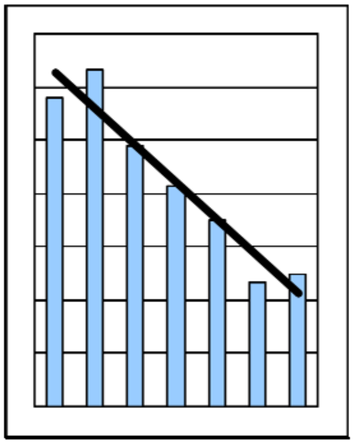

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

September 26, 2017

Volume 9, Issue 2

Drawing The Graph

Alabama's Optimization Program

Inside this issue:

DWB Reminders

- All distribution samples should be using the physical address not names.
- OELs are due 90 days from when you receive your sample results.
- Parent System OELs are due within 90 days from the consecutive system receiving results resulting in a MCL violation.
- UCMR4 monitoring is starting in 2018
- Next issue of "Drawing The Graph" tentatively for April 2018.

Alabama Department of Environmental Management

20th Annual Surface Water Meeting Alabama Activity Center October 25 & 26, 2017

The ADEM Drinking Water Branch is proud to announce that its 20th Annual Surface Water Meeting will be held on October 25th and 26th 2017, at the RSA Activity Center in downtown Montgomery.

This year's meeting will cover a wide variety of topics similar to previous years. The topics covered this year vary from a traditional Drinking Water Update and will focus on new regulatory requirements that will affect your water system and other issues that may affect your water system.

Please plan on attending this year's meeting to make sure that you are up-to-date on all the latest requirements. Space is limited, see registration form for details.

19th Annual Surface Water Meeting, October 2016

Data Integrity

Data integrity in the optimization community has been on the radar for quite some time now. Many states, including Alabama, have reported data integrity issues with their water systems. One state, at the 2017 National AWOP Meeting, reported that less than 80% of the turbidimeters in the state were properly calibrated. The results for chlorine and pH calibration were even lower. So what is data integrity and how does it affect your water system's data?

Wikipedia defines data integrity as "in its broadest sense to mean the data is trustworthy over its entire life cycle." In the Area Wide Optimization Program (AWOP) community, the term data integrity describes whether the data are correct and consistent from the point of sample collection through analysis to storage and reporting to the state. So where does the integrity of the data at your water system begin to break down? This article will cover some of the most common causes of data integrity concerns and how they can be addressed.

Most ADEM inspectors over the years have verified and re-verified that sample taps are located in the proper location. However, in addition to sample tap location, the tap itself must be installed correctly. Most taps should either be made at zero or ninety degrees on the pipe. In either case a quill should be inserted to extend the tap to the center of the pipe to prevent issues with the sidewall of the pipe or to ensure the tap is always immersed in water.

Next, after the tap, the pipe transferring the water to the continuous unit could be interfering with proper analysis. If the pipe is too large it can allow sediment to accumulate and be released at a later date. If the pipe is too small, the flow to the unit may be inadequate for proper readings to occur. Additionally, pipe material and condition can impact sample analysis. Consider the following: what material is the pipe made from? Is it clear plastic that is not so clear anymore? When is the last time this pipe was replaced?

The instrument maintenance, calibration and verification are also important considerations to ensuring data integrity. Turbidimeters require cleaning at various frequencies to minimize issues from sediment or algae growth. Depending on sample conditions (e.g. raw, settled or filtered) the frequency of cleaning can vary from every few hours (highly turbid water) to every couple of weeks (very low turbidity, e.g. > 0.1 NTU). Chlorine and pH monitors cleaning frequency varies depending on the specific unit and water conditions. Most units require a calibration or verification (using a primary standard) at least every three months, or more frequently if the required weekly verifications (using a primary or secondary standard) show the unit to be outside of the allowable verification limits. In general, the allowable range is 15% for chlorine, 10% for turbidity and ± 0.1 unit for pH – and it's important to correct the issue if you find it in your system!

Another issue that has also recently arose is related to sample analysis when utilizing benchtop analyzers (turbidity and spectrophotometers) and how critical proper glassware is to sample results. In one water treatment plant, all but four of their turbidity sample bottles had to be discarded. The four that remained had to be indexed to provide proper results. In a second water treatment plant, the bottles that were being used for benchtop chlorine analysis had to also be discarded. So what was wrong with the bottles? Scratches! The sample bottles were so severely scratched that even using silicon oil would not restore their needed optical transparency. In both cases, the operators were not taking proper care of the bottles. Bottles should be stored in a manner to prevent scratching and under no circumstance should normal paper towels be used to wipe the bottles . Normal (household) paper towels are rough enough that over time the repeated scratching causes problems that interfere with sample analysis. There are special wipes created for use on glassware to prevent scratching.

When reporting turbidity data to the State, how do you get the data? Is it downloaded from the turbidimeters, stored on a memory card or in the SCADA, or does the SCADA system automatically generate a report? Most water systems either have to manually go through the data looking for the highest turbidity for the day or they get a report from their SCADA system which shows the highest turbidity for each day. Using only the daily operational log to report the highest turbidity or lowest chlorine does not meet the requirements of ADEM's regulations. However you find the data, does someone recheck either the manual review or the SCADA report for accuracy? People make mistakes all the time, either through missing the decimal point or ignoring high readings because it only occurred for one fifteen minute reading and these readings may be caused from pathogenic particles passing through your plant!

Sample invalidation is an issue that every water operator faces in their career. Sometimes samples are invalidated because the results did not match the previous results and the sample was rerun to check for a procedural mistake. Other times, a sample is ignored because it does not fit with the sample results surrounding it. A good example is filtered water turbidities, which the state regulations require to be recorded at least every fifteen minutes. The recordings are automatically done in most water treatment plants by SCADA systems or chart recorders. Typically the fifteen minute readings are only reviewed each day for the previous day or at the end of the month when filling out the state report.

What do you do when you have a suspicious (high) turbidity result? Ignore it? Report it? Or do you investigate why the high turbidity reading occurred? Also, consider this: if you take one sample every fifteen minutes, what might happen in between the readings? A turbidity spike can occur between the fifteen minute readings that operators may never see unless they are looking at the unit or a SCADA screen which maintains a real time reading. High turbidity readings cannot just be ignored because you do not like the result. If a high turbidity reading occurs it has to be reported unless the sample was invalidated. This emphasizes the importance of having an invalidation procedure, which includes acceptable reasons why a sample can be invalidated. Some examples would be a turbidity reading during calibration or maintenance of the unit, someone bumped the unit or sample line, or flushing the sample line to restore proper flow.

As you can see, data integrity is vital in the water treatment industry. This is an industry that must stand on integrity. Operators must police themselves as they are the last line of defense to protect public health. This integrity requires the due diligence of every operator to ensure that the samples are collected properly, equipment is maintained and calibrated, the data is transferred across different mediums (e.g. paper, electronic) correctly, and reports are filled out correctly. How does your water system stand in regards to insuring data integrity? Hopefully you will take time to look at data integrity in your water system.

The Hidden Problem: Insufficient Corrosion Control

Recently the water industry has been scrutinizing corrosion control as it applies to the Lead and Copper Rule. The mere mention of Flint, Michigan starts all kinds of discussions about what happened. However, corrosion affects more than lead and copper sampling. Amongst many problems, corrosion can damage pipes, lead to discolored water complaints, and also affect the results of disinfection byproduct (DBP) monitoring.

Corrosion control in the beginning was raising the pH and alkalinity to a sufficient level that a thin film of lime was deposited on the inside of a pipe, thus forming a protective layer. Many older operators will remember the Baylis Curve and where it required them to set the pH leaving the water treatment plant for optimum corrosion control. Other corrosion monitoring programs used the Langelier Index, Ryznar Index or utilized a phosphate feed.

In the past two decades, many water systems have switched to a phosphate blend for corrosion control. The primary driving factor was not for lead and copper control, but for reducing the pH leaving water treatment plants to lower Total Trihalomethane (TTHM) levels in the distribution system. This strategy was very successful as some water systems saw a fifty percent decrease in TTHM levels by reducing finished water pHs above 9 to around 7. However, this lower finished water pH is having consequences that many water systems are unaware of.

The consequence is the corrosion rate in the distribution system has changed and remains a mystery to most water operators. Operators generally associate proper corrosion control with the lead and copper rule and look to these results to determine if they have employed proper corrosion control. This has led to a false confidence that there is minimal corrosion occurring in the distribution system. While lead and copper corrosion has been minimized, there are still many other metals (e.g. cast iron) which are still corroding at an undesirable rate. Recently several water systems have detected high pHs, greater than 9, in their distribution system though the water treatment plant is leaving with a pH around 7 and they utilize a phosphate blend for corrosion control. So, why is the pH changing in the distribution system?

Corrosion rates in the distribution system vary with type of pipe material, age of the pipe, chlorine residual and water age along with other parameters. The corrosion of concern is generally occurring in metal and cement lined pipes. Either the cement lining, if present, is dissolving or the chlorine residual is interacting with the metal and elevating the pH. The increase in pH can be quit severe. One water system, with a water treatment plant effluent pH of 7.2, detected pHs of 9+ in their distribution system at multiple locations. The sites with high pH moreover had high (> 150 ppb) TTHM levels and low or no chlorine residual.

The original solution to the high pH values and low chlorine residuals was to control water age. Through the use of auto-flushing systems, water systems were able to reduce water age. The reduction in water age was accompanied by lower pH values, higher chlorine residuals and lower TTHMs. However, the pH was generally still above an 8 and a failure of the auto-flushing system could spell disaster.

The disaster lurking around the corner is a failure in an auto-flushing station, especially right before disinfection byproduct monitoring. Auto-flushing systems can fail for a number of reasons, the most common have been: dead battery, being turned off by a "Good Citizen", vandalism, and being run over by a large truck. Regardless of the cause, a non-functional auto-flusher allows the water quality to revert back to the levels seen before it was installed. In some instances, this reversion has occurred in only a few days. This has happened to a couple systems where the auto-flushing system failed a week or two before disinfection byproduct monitoring and resulted in high numbers being reported. To help with the problem, one water system looked at their corrosion control program and asked if it could be improved to help with the distribution system issues.

The water system made a major change and switched from a poly-orthophosphate blend to a zinc orthophosphate. The effect was dramatic after being fully implemented. The pH at the end of the system was stable and near the pH leaving the water treatment plant, TTHMs were lower, chlorine residuals were higher, and most auto-flushing stations saw reductions in flush times.

This was an extreme case. Another water system is utilizing the optimization approach to determine their optimal corrosion control. They are monitoring fifteen locations each month for a variety of water quality parameters (e.g. orthophosphate, pH, chlorine, and conductivity). Each parameter tested for is being tracked and any changes in values are being examined. After one year of monitoring, the system plans on making adjustments to the corrosion feed rates and continue to monitor to see the effect the change has on their distribution system. Their hope is to reduce the corrosion rate, stabilize the pH in the distribution system and improve the overall condition of the distribution system.

Corrosion control for the distribution system can have a significant impact on the distribution system. It can affect corrosion rates, customer complaints, and even water quality. Most corrosion programs were setup in the early 1990s. Since then, most water systems have not made any changes to their corrosion control program even though the distribution system has changed (e.g. location of population, new tanks, and new water mains). Even the way the distribution system is operated has changed.

These changes have an effect on how a proper (optimized) corrosion control program should be implemented. The ADEM Area-Wide Optimization Program has been encouraging Alabama water systems to embrace continuous improvement of operations to ensure that the highest quality of water is delivered to the public. Corrosion control treatment is no different, and the tendency to "set it and forget it" needs to be reconsidered when pursuing the goal of high quality, stable water being delivered to customer taps. The ADEM AWOP Team is looking for water systems to partner with to investigate how to properly implement a corrosion control program. If interested please contact William McClimans at wdm@adem.alabama.gov or (334) 271-7985.

Carl Hanke Attends 2017 National AWOP Meeting

The Mobile Area Water and Sewer System (MAWSS) received national attention at the 2017 National AWOP Meeting held in Cincinnati, Ohio in August. At the meeting, attendees (mainly EPA staff and state regulators from approximately 25 states) heard from Carl Hanke, Chief Treatment Plants Operator with MAWSS.

Carl's presentation centered on how MAWSS was able to utilize EPA's water storage tank spreadsheet to estimate turnover time and mixing for each storage tank and then use this data to alter the operation of the distribution system to improve water quality. MAWSS has taken a proactive approach to water quality which is not only benefiting MAWSS but also is helping the water systems that purchase water from MAWSS. For more information about MAWSS's efforts you can read Carl's article, " Using EPA's Tank Assessment Spreadsheet", which was published in the Fall 2016 issue of this newsletter.

For more information about this newsletter or the Area Wide Optimization Program, please contact:

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Alabama Optimization Program

The goal of the Optimization Program is to provide the best quality water to the citizens of Alabama by "Optimizing" the existing infrastructure to the fullest extent possible with minimal cost to the utility.

To protect public health and define "Optimized Performance", the program has adopted the following goals for water systems:

Microbial (Pathogen Removal)

- Clarified Water (Settled)
  When the raw water turbidity (NTU) average is greater than 10 NTU the settled water should be less than or equal to 2.0 NTU 95% of the time for each clarification unit.
  When the raw water turbidity (NTU) average is less than or equal to 10 NTU the settled water should be less than or equal to 1.0 NTU 95% of the time for each clarification unit.
- Filtration
  Individual filtered water turbidity should be below 0.10 NTU 95% of the time, regardless of raw water quality.
  Maximum single filtered water turbidity not to exceed 0.30 NTU.
  Rewash filter until the turbidity is below 0.10 NTU before returning to service.
- Chlorine residual
  Maintain sufficient chlorine residual in the finished water to ensure proper disinfection.
  Microbial goals are based upon the highest daily reading as reported on the monthly operational report.

Disinfection Byproducts

- Short Term Goal
  Each individual site's LRAA is ≤ 70 ppb for TTHM and ≤ 50 ppb for HAA5.
- Long Term Goal
  Average of max LRAA based upon 11 quarters of data should be below 60 ppb for TTHM and 40 ppb for HAA5.
- Plant Effluent Goal
  TTHM RAA 20 ppb or less
  HAA5 RAA 15 ppb or less
  TOC RAA 1.7 mg/L or less

For more information, contact ADEM's Drinking Water Branch at (334) 271-7773.

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