Water Testing for Lead at Cincinnati Schools

Customer: Greater Cincinnati Water Works (GCWW)

Application: Testing of Municipal Drinking Water for Lead Concentrations at Cincinnati School Fixtures

Project supported by:
IMAGINE H$_2$O

City of Cincinnati, OH, USA

GCWW supplies more than 48 billion gallons of water a year through 3,000 miles of water mains to more than 1.1 million people. It's service area has grown to include the entire City of Cincinnati, parts of Hamilton, Butler, Warren and Clermont Counties in Ohio and in 2003, started selling water to Boone County and Florence, Kentucky via a pipeline installed under the Ohio River.

Water supplies come from two sources: the Ohio River and the Great Miami Buried Valley Aquifer. The Bolton Treatment Plant treats ground water from 13 wells in the Great Miami Aquifer. Surface water from the Ohio River is treated at the Miller Treatment Plant, which supplies about 88% of drinking water to GCWW's customers, and uses state-of-the-art water treatment processes that include Sand Filtration, Granular Activated Carbon (GAC), Powdered Activated Carbon (PAC), and ultraviolet (UV) light. It is one of the first in the nation to use a combination of all four treatment methods.

GCWW also treats the drinking water specifically to minimize the amount of lead that may leach into the drinking water. This corrosion control process ensures there is no lead in the water as it leaves GCWW treatment plants and minimizes the chance that lead can be picked up from home plumbing. Despite this, according to the 2016 water quality report, 15 out of 267 samples tested during the most recent compliance period were above the 15ppb Action Level.

in April 2016, GCWW began working with schools to ensure the health and safety of students, teachers, and staff members in schools; but first formed a partnership with the Cincinnati Health Department and Hamilton County Public Health to help 'get the lead out' in the Cincinnati area. Together they are working with special groups such as schools and daycares and plan to include restaurants, hospitals, nursing homes, churches, libraries, parks and entertainment venues to understand the water quality of facilities where children spend ample time.

Problem/Concern: Heath concerns over lead levels in water have recently become a widespread focus in the US particularly when it concerns young children, infants, and fetuses who are particularly vulnerable to lead. However, there is no federal law requiring testing in drinking water in schools, except for schools that have their own water supply and are regulated under the Safe Drinking Water Act (SDWA). As shared by USEPA in the 3Ts for Reducing Lead in Drinking Water in School: Revised Technical Guidance, lead most frequently gets into drinking water by leaching from plumbing materials and fixtures as water moves through the school's distribution system. Although the drinking water received from the water supplier meets federal and state standards for lead, the facility may have elevated lead levels due to plumbing materials and water-use patterns. While GCWW does offer lead testing to residents for free, due to high request volume, it may take up to a week for customers to receive a kit and an additional 2-4 weeks for analysis and results.


AND1100 Fluorometer

ANDalyze Solution:

To help quickly, easily and inexpensively identify lead issues in water on-site, allowing immediate action to shut off fixtures with results above limits, ANDalyze has developed an innovative instrument for on-site water testing using a patented DNA-based technology. The US EPA ETV validated technology is a universal platform that offers simple, fast, inexpensive and reliable measurement of trace metals, such as lead and copper, and other targets including bacteria, viruses and chemicals such as pesticides. It is capable of accurately measuring well below regulatory levels in a variety of water types.

Samples of drinking water from Cincinnati schools and daycare facilities were measured at the GCWW testing laboratory using the ANDalyze instrument and lead (Pb) sensors. The samples tested were selected based on the likelihood that they contained measurable amounts of lead. The remaining volume was then separated into two aliquots, one which was filtered using a 0.45um filter. This was done to produce one sample that would still contain insoluble lead if any (UNfiltered) and another that should contain only soluble lead (filtered), the latter which should match the ANDalyze results. These solutions were then tested with ICP-MS in the laboratory.

Results/Discussion:

Using a 12ppb pass/fail point (15ppb EPA limit minus 15% error), the ANDalyze unit was able to successfully identify over 90% of the samples that were above the EPA limit and that all of those below were below. In addition, results showed that practically all samples in this set contained some level of insoluble lead, some as high as 12.4ppm (1000x EPA limit) having 99% insoluble. There was one sample which was determined to contain over 300ppb of total lead while less than 4ppb was measured as soluble by both ICP-MS and ANDalyze. It is well known that most lead salts are soluble in water that is slightly acidic, allowing lead to exist in the ionic form. However, undissolved lead does remain a challenge to quantify even in the most capable laboratories.

Conclusion:

On-site testing methods may not be a “total” measurement of metals, but if un-dissolved metals exist, the ANDalyze technology does appear to accurately fulfill its role as a screening tool by positively identifying samples containing insoluble lead particles. If the ANDalyze measurement indicates the sample is over 12ppb lead (15ppb +/- 15%), for example, the user should immediately shut down the fixture and take remediation actions.

It is excellent that GCWW is taking additional, proactive, and precautionary measures to understand water quality in schools and investigating potential options to improve the time to action for issues such as these. While the accuracy and consistency of laboratory testing are certainly valuable in some applications, we cannot ignore the importance of on-site testing and the speed, simplicity, and low cost that it provides, allowing users to test EVERY potential water source, locate and rectify the issue, and verify the issue has been addressed, all within minutes and at a fraction of the cost of laboratory testing with 90% accuracy.

Technology:

ANDalyze develops and offers innovative instruments for on-site water testing using a patented DNA-based technology that was originally developed at the university of Illinois. The US EPA ETV validated technology is a universal platform that offers simple, fast, inexpensive and reliable measurement of trace metals, such as lead and copper, and other targets including bacteria, viruses and chemicals such as pesticides. It is capable of accurately measuring well below regulatory levels in a variety of water types including public drinking water supplies, industrial water operations, mining water management, and environmental waters including sea water.

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