POU Devices for Risk Mitigation

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There are several water quality issues that are uniquely suited to a POU or POE solution. The Water Quality Association (WQA) discusses these issues at the WQA Annual Convention and over the past decades, the Water Quality Research Foundation (WQRF) has been funding research to further advance our understanding of these issues. This article focuses on one of those issues, namely the ongoing efforts to get lead out of our drinking water.

Municipal POU treatment strategies

Lead leaches into our drinking water through contact with lead service lines (LSL), lead goosenecks, lead solder and pipes or fixtures with high lead content. Municipalities do an excellent job of removing lead before the water leaves the drinking-water treatment plant, but then the water must travel through miles of pipe and fittings to reach the consumer's tap. Since water is a very good solvent, there is a good chance that it will pick up lead if it encounters lead-containing pipes or fittings along the way. This problem is not unique to municipalities. Even consumers on private wells may have pipes and fixtures with high lead content.

Several municipalities have decided to go above and beyond federal requirements in order to protect their consumers and they have incorporated POU technology into a successful strategy to mitigate the risk of lead in drinking water for their customers.

POU treatment as a final barrier in homes or buildings is an effective strategy to prevent lead contaminants from impacting public health. Recognition of the importance of proactive and preventative approaches to reduce exposure to waterborne hazards is driven by historical events and new research. Investment in POU water treatment devices for communities is shown to be cost effective when conditions of increased exposure potential is forecast.

Several municipalities have decided to go above and beyond federal requirements in order to protect their consumers and they have incorporated POU technology into a successful strategy to mitigate the risk of lead in drinking water for their customers. These municipalities should be commended, for this is not a simple message to deliver to consumers and taxpayers, who can be unforgiving even when the municipality is meeting all federal requirements.

DC Water gives residents free water filters during LSL replacements and has had this program in place for the last 15 years. According to Maureen Schmelling, Director of Water Quality and Technology: "DC Water takes proactive measures to protect public health after any lead service-line replacement, or project that could increase the risk of lead release in water. We distribute a six-month supply of filters after any lead service-line replacement and instructions for flushing the newly installed pipe. The filter and flushing method are both effective and easily understandable for customers to minimize risk of lead exposure after these types of projects. DC Water recently handed out filters for a planned water-pressure increase last August, as well.

"For all building construction projects that could vibrate or physically disturb plumbing, we recommend the responsible parties inform residents of the risks associated with pipe disturbance. Flushing of pipes and filter use should be encouraged to mitigate the potential for lead release in water," Schmelling added.[1]

Milwaukee Water Works also distributes POU water filters to residents directly or indirectly affected by LSL replacements. That agency will either drop off a door-hanger with a voucher for a free filter or, in some cases, bring the filter right to the resident's door, recommending filters certified to *NSF/ANSI 53*.[2] They do not perform partial LSL replacements, only full replacements, to reduce the risk of releasing lead into the pipeline. In Ohio, distribution of POU filters during a partial LSL replacement is now mandated by law. A new administrative code effective in October now requires filters certified to *NSF/ANSI 53* be provided to homeowners up to three months after a partial LSL replacement.[3]

Lead service-line inventory for planning

Fourteen states have moved forward with mandatory or voluntary initiatives to re-evaluate how many LSL exist in their distribution systems. Each municipality is required to maintain such inventories as part of compliance to the *Lead & Copper Rule*. These inventories are conducted through surveys and are important tools for planning LSL replacements and evaluating which homes should be samples as high-risk under the *Lead & Copper Rule*. Illinois, Michigan, Ohio and California all mandate a new inventory be conducted by utilities by 2020 or sooner.[4]

In Michigan, there is a requirement to begin replacing LSL at a rate of five percent per year starting in 2021. The new requirement also prohibits partial LSL replacements due to the risk for elevated lead exposure. Additionally in Michigan, the homeowner will receive a written notice if they are on a lead service line or if the pipe's material cannot be determined.[5]

Illinois reported on their LSL inventory earlier this year. Eighty-seven percent of utilities reported inventory so far: 378,374 lead service lines, 305,060 copper with potential lead solder and almost 1.5 million pipes where the material could not be identified.[6] Research suggests that there may still be over six million LSL in use nationwide.[14] The cost to replace the LSL portion on the homeowner's property will continue to be a challenge. DC Water rates for LSL replacement are $100 per foot of pipe plus $500 to connect to the home.[10] This problem was not created overnight and there is no practical way that we can expect municipalities to remove all LSL overnight either. Even if they could, disturbing those lines can cause the lead levels to spike. This is why many municipalities are seizing upon POU treatment as an effective solution to protect consumers while they work to 'Get the Lead Out.'

Illinois requires a notification to the homeowner for any potential disturbances to LSL, such as water-main repair or

construction. This is in line with AWWA's guidance, which is to notify customers not only of LSL replacements but also of repairs or maintenance work done on any water mains that might disturb LSL.[7] Research has shown that disturbances to LSL can cause spikes in the level of lead, which consumers are exposed to at the tap.[12, 13] Illinois EPA includes POU devices as a strategy for homeowners concerned with their water, along with testing, flushing and purchasing lead-free faucets and plumbing materials. That agency also includes having awareness of water-main construction as one of their strategies for homeowners.[8]

Other guidelines offered by the AWWA include that the utility provide information to homeowners about POU devices for lead reduction before LSL replacement occurs. The AWWA guidelines also suggest the municipality provide the POU device itself to the homeowner after LSL replacement.

Continued challenges and opportunities

The *Boil Water Notices in the U.S. (*2012-2014) study funded by the WQRF found over half the *BWNs* issued in the three-year period were precautionary due to water-main breaks or leaks. During the three-year study period, there were 11,131 *BWNs* issued due to main breaks or leaks.[9] These occurrences involved repair work that could disturb sediment in the distribution system, which increased the risk for lead release in areas with LSL. But this repair work also provided opportunities for LSL replacement at the same time.

Justifying the cost of LSL replacements to the public is the task at hand. This is where education on the cost to society from lead exposure is important. The cost benefit of implementing a POU strategy in terms of avoiding healthcare costs was shown in the case of Flint, MI. With an assumption of exposure to 25 ppb lead in drinking water and 20-percent accumulation of lead in the body, this corresponds to a blood lead level of 0.5 μg/dL and loss of 0.257 IQ points. Using the blood-lead-level-to-lifetime-economic-impact model, the anticipated lifetime loss is $5,381 per person. Whereas, using a POU activated carbon device for five years is estimated at a total cost of $546 (or a POU RO estimated five-year cost is $680).[11]

Conclusion

A proactive approach to the use of POU devices is prudent given the continuous effort toward infrastructure repair and replacement. The large number of *BWNs* occurring each year in the US further indicates the need for a focused mitigation strategy. Not all risk scenarios, however, can be predicted in advance. Improved strategies for risk mitigation include a consistent use of POU final-barrier devices. Municipalities which have decided to go above and beyond the federal requirements and to incorporate such a strategy should be commended for their efforts.

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