

POU Options for Arsenic

How to Select from Available Treatment Options

The topic of arsenic has received a lot of press coverage this year, ever since the Bush administration halted the EPA's newly issued maximum contaminant level (MCL) of 10 parts per billion (ppb). Since then, the MCL was reinstated back to 50 ppb and further discussions and studies have continued. This article will discuss some of these updates.

A Little Arsenic MCL History

The EPA had set the current MCL of arsenic in drinking water at 50 ppb in 1975, based on the Public Health Service standard originally established in 1942. A report by the National Academy of Sciences in March 1999 concluded that the standard of 50 ppb does not achieve the EPA's goal of protecting public health and should be lowered as soon as possible.

It has been determined that 0 ppb is the only level of arsenic in water that is completely safe for human consumption. However, the cost required to implement a compliance standard of 0 ppb is too high. Prior to the end of President Clinton's last term in office in January 2001, the EPA issued a new standard of 10 ppb for arsenic in public drinking water supplies.

In March 2001, the EPA announced that it would withdraw the 10 ppb standard until further studies related to costs associated with lowering the standard and impact on public health could be conducted. Although the EPA agrees the current standard of 50 ppb should be lowered, the agency is undecided as to where the standard should lie and has requested time to gather data in order to make an appropriate decision.

Currently, the World Health Organization and European Union set the world standard of arsenic in drinking water at 10 ppb, well below the current MCL of the United States.

Revised MCL Impact

The EPA estimates that approximately 13 million people in the United States routinely drink water with more than 10 ppb of arsenic. The proposed MCL would require that all drinking water and industry wastewater be treated to this limit by the year 2006, which has been estimated to cost consumers somewhere between \$5 to \$20 per month in areas affected. Small water systems—those serving fewer than 1,000 people—will feel a greater financial impact from the new arsenic rule. The EPA estimates approximately 2,526 of 2,912, or 86 percent, of small community water (groundwater) systems serving fewer than 3,300 people will be impacted at a 10 ppb MCL.

Recent studies indicate that treatment costs can be minimized for the small communities by implementing a point-of-use (POU) approach rather than through a centralized treatment system. A POU system is a filtration device that is attached under a household's sink to treat the water that comes from that particular faucet. The short turn-around time for installing a POU system is one key advantage of this approach given that the majority of homeowners, parents in particular, are not willing to wait until the 2006 deadline imposed by EPA.

Since 1996, the EPA's Drinking Water

State Revolving Fund (DWSRF) has made \$3.6 billion available to assist water systems in financial need with projects to improve their infrastructure. The EPA has funded more than 1,000 loans for water systems in the United States. There also are federal funds available through such groups as the Housing and Urban Development's Community Development Block Grant Program and the U.S. Department of Agriculture. In 2000, the DWSRF and Rural Utilities Service together provided \$1.7 billion to states and public water systems for improvements and infrastructure needs.

Treatment Options

EPA has indicated that the original compliance date of June 22, 2006, will be maintained, giving utilities up to five years to meet the final standard.

Consumers unwilling to drink arsenic contaminated water are demanding a more rapid implementation. Publicly owned utilities, however, will be held hostage from implementing a more rapid solution due to government approval cycles, annual budgets, required bidding processes and slow implementation schedules. As a result, in-home treatment systems, which can be installed immediately, are a very popular treatment option for individual homeowners. Other advantages such as low implementation/operating costs and improved flexibility make the POU/POE approach option appealing.

For small communities with centrally treated water, the POU approach also is growing in appeal. EPA's most recent



POU installation for household kitchen sink using adsorptive media. Device located in the basement of a household in Maine.

task force on implementation costs now estimates that for small communities with fewer than 5,000 homes, the POU option may be the most affordable approach. For communities larger than this, centrally treated water remains the most economical approach.

The top two POU/POE treatment technologies recognized by the industry are adsorption and reverse osmosis.

Adsorption uses filtration media to chemically bind the arsenic to the adsorbent. Advantages include no wasted water, removes AsIII and AsV, low cost, no chemicals or regeneration required, safe handling and removal of other heavy metals such as copper. It does, however, requires certain contact time, competing ions can reduce capacity and performance decreases with pH.

RO also has its advantages and disadvantages. RO effectively reduces AsV, but AsIII must be oxidized prior to treatment. RO removes other dissolved contaminants as well as taste and odor. Other challenges for RO include a high cost is arsenic is primary target contaminant; it is not suitable for POE systems due to corrosion and affordability; wastes three to five gallons of water for every treated gallon; and requires routine maintenance.

Why Use POU?

- **Immediate protection from contaminated water.** An abundance of water treatment professionals are available to assist in selecting an appropriate system to meet specific treatment and maintenance needs.

Legislation Activities

The federal legislative history for revising the existing drinking water standard on arsenic has been a roller coaster ride. In 1942, the U.S. Public Health Service set the drinking water standard at 50 parts per billion (ppb), which was adopted by the EPA in 1975 as a result of the passage of the Safe Drinking Water Act. While this treatment standard still is in place today, it has been the subject of debate and controversy in the federal government for more than 20 years.

Many deadlines and opportunities for revision have come and gone. Most recently, in the final days of President

Clinton's administration, the EPA posted a final rule in the Federal Register on January 22, 2001, lowering the standard from 50 to 10 ppb. (Ten ppb is the accepted standard adopted by both the World Health Organization and the European Union.) However, on March 22, 2001, the EPA, under the new leadership of the Bush administration, withdrew the rule, citing the need for additional research on cost and health effects. Although the EPA under the Bush administration has refused to implement the final rule of 10 ppb, it has publicly recognized the need to lower the standard somewhere to a level between 3 and 20 ppb. The EPA now is accepting

comment on these levels. A final rule is anticipated on February 22, 2002.

As a result of the continued delays by the EPA on this issue, several states have initiated their own legislation to implement a more stringent standard than the current 50 ppb. State government agencies in New Hampshire and New Jersey have drafted new laws that will bring the MCL from 50 to 10 ppb. These proposals currently are under review by the state's respective legislative committees.

You can visit WaterInfoCenter.com to find more detailed and up-to-date information on federal and state legislation activities.

- **Simple maintenance**, usually performed by the homeowner through cartridge replacement. Waste products of adsorption technologies are nonhazardous and can be disposed with household waste
- **Lower cost**. At \$0.10 to \$0.20/gal., POU treated water is more than 50 percent less costly than bottled water, which ranges from \$0.75 to \$2/gal. Initial capital costs range between \$250 and \$500. Annual operating and maintenance costs will average \$30 to \$50. Annual costs are minimized because only the water needed for ingestion is treated.
- **Customized flexibility**. POU systems can be custom designed, allowing the consumer the opportunity to address a range of concerns based on budget and preferences. It also creates flexibility to cost-effectively upgrade the system should new cartridge-based improvements be commercialized. The customer has the choice to decide which aspects of his water are most important to him and focus a solution towards improving the quality of his drinking water based on his needs and budget.

Considerations for POU/POE

- **What is the level of arsenic in the water?** This factor will help determine

the effectiveness of the system as well as the level of required maintenance.

- **Which form of arsenic is in the water?** Arsenic comes in both a pentavalent (AsV) and a trivalent (AsIII) state. Arsenic III is the harder to remove and more hazardous of the two. Not all treatment systems can remove both forms of arsenic, making it necessary to convert it to AsV through oxidation with chemicals such as chlorine, potassium permanganate or ferric chloride, which can be dangerous to humans.
- **What is the water profile?** Several characteristics of the water such as pH silicate level and temperature can affect the performance of a treatment system being considered, which also may make a pretreatment system necessary. This question is important for a small community system interested in using a POU solution for compliance.
- **How much water will be treated?** Do I want to treat all of the water in my household or just my drinking water? This decision will greatly impact the cost of the treatment system. EPA data indicates that arsenic is dangerous only when ingested.
- **Which type of waste is generated by the treatment system?** Is there water waste? Is a hazardous material gener-

ated? Is disposal of the waste a problem?

- **How do I test for arsenic?** There are several field test kit systems that can be used to determine the level of total arsenic present in the water. The use of these tests kits can help determine the level of treatment needed and ensure proper function of the treatment system once installed. **WQP**

For further arsenic information you can frequently visit WaterInfoCenter.com's new topic forum, which offers arsenic's history, treatment options, legislation movement, available experts, case studies, research and continuing up-to-date information.

About the Author

Apyron develops, markets and licenses materials that enable customers to achieve breakthroughs in product innovation, create new market opportunities and improve the quality of life worldwide. The company currently is focused on advanced solutions for water quality and the energy industry. Apyron, based in Atlanta, has been recognized with multiple awards for its arsenic treatment solutions.

For more information on this subject, write in 1015 on the reader service card.



A disposable cartridge based system which removes both arsenic III and V other heavy metal contaminants, and improves taste and odor is a cost-effective water treatment option for many homeowners.