

Looking for Arsenic Relief at the Point of Use

By Dustin Hardwick, Circuit Rider

In my travels throughout Southern California I encounter many water systems struggling with the problem of arsenic contamination. Several of these small systems are under the gun to come up with a solution this year; by January 2006 they must meet a new tougher standard for arsenic levels imposed by the U.S. Environmental Protection Agency.

For many small systems, engineering, purchasing and operating a centralized arsenic treatment system is a major expense. Additional operator certificates are also needed. Presently, many of these small systems do little to no treatment. Between these issues and the higher operating costs (which includes increased rates), many small systems are unsure of the best way forward.

The community water system in Keeler, Calif., located in Inyo County, was faced with the challenges of evaluating arsenic treatment to meet the current maximum contaminant level of 50 parts per billion as well as the impending EPA regulation that would set a limit of 10 ppb. Keeler Community Services District has 49 active connections and one groundwater well with an arsenic level that ranges from 55 ppb to 65 ppb. The water quality profile is classified as poor, and includes total dissolved solids of 820 parts per million. Setting their sights on a central treatment design, the district evaluated several available arsenic treatment technologies for simplicity of operation, low cost and effective arsenic removal.

Keeler CSD found that the cost of installing a centralized treatment plant could range from \$200,000 to \$1.5 million, with monthly operational costs from \$5,000 to \$10,000. These costs proved unaffordable, especially given the limited numbers of residents served, so Keeler CSD looked to a "point of use" treatment alternative. The cost of installing a POU unit supplied by MEI of Flemington, N.J., was \$300 to \$400 per customer, with annual operational costs of \$100 to \$150 per customer. For its pilot arsenic treatment operation, the district chose MEI's Isolux™ Technologies arsenic absorption system.

In cooperation with the Southern California Field Operations Branch of the California Department of Health Services (DHS) Drinking Water Program, the district defined the scope of its POU pilot project to include installation, routine operation, system performance, inspection and testing of the POU units, as well as spent cartridge management. After several months of operation, Keeler CSD found the absorption technology was the most effective for removing arsenic. Analytical data showed that more than 1,000 gallons

of water could be treated while maintaining arsenic reduction of less than 10 ppb.

Paul Rice, director of Keeler CSD and past member of an ad hoc committee for the project, summarized for me the elements of the district's successful effort. In particular, he credits efforts to thoroughly inform and educate the entire community. Below is Rice's list of the factors that contributed to the project's success.

District size

The community has fewer than 200 residents, all of whom know each other. Communicating with every member of the community was a straightforward process.

Leadership

Because of the community's size, the pool of potential leaders is very small. Community leaders are easily recognizable and play a visible role in efforts such as this one. The five-member Keeler CSD board reached consensus on the issues involved

and then proceeded to unite the community. A volunteer project director was appointed to supervise, coordinate and respond to all aspects of the program.

Education

To educate community residents, Keeler CSD conducted several public meetings and workshops that involved MEI, Mono County officials and a hydrologist. Discussions covered the impending compliance issues related to the maximum contaminant level as well as the scope of the pilot project, including its benefits, limits and liabilities. Residents learned about their responsibilities and each was asked to sign an agreement to participate; only one resident declined. Early on, politics and personalities occasionally stalled the process, but those obstacles were overcome readily once everyone could agree on the goal of providing clean, potable, affordable drinking water. From that point forward, progress was steady. County health officials, MEI consultants and a hydrologist remained available



to answer questions and provide information, and everyone involved understood that all questions were valid and would be answered. The result was near-total community acceptance of the project.

Service

For the initial installation, a team of five residents representing a cross-section of the community was trained and paid to install and test the units and place them in service. A Keeler CSD board member serving as maintenance coordinator supervised the installers. The maintenance coordinator also taught customers how to use and care for their treatment units. Having multiple installers allowed the district to respond immediately to any problems related to property access. Being able to resolve potential conflicts at the earliest opportunity is essential where consensus is the goal, especially in a small-town environment.

Future considerations

Keeler CSD will be unable to enact any policy changes until DHS and Mono County approve the use of point of use treatment technology. Timing will remain critical if the district is to comply with the January 2006 EPA arsenic rule.

Economics

If approved for long-term use, installation of the POU system will become a conditional and integral part of all new Keeler CSD domestic water accounts. This will add approximately \$400 to \$550 to the cost of each new account or connection, with an annual operational cost per connection of approximately \$100. The district will decide how to administer this cost once DHS decides whether it will allow the district to continue using the POU system.

According to Paul Rice, the POU system's overall performance exceeded expectations by reducing arsenic to levels below detectable limits. Rice comes to this conclu-

sion from having participated extensively in every step of the project, including:

- Investigating the treatment unit, vendor and proposal.
- Training treatment unit installers, as well as directly installing several units himself.
- Studying the performance of the unit installed in his own home, where more than 1,000 gallons of potable water with an undetectable arsenic level passed at a projected cost of \$0.02 per gallon.
- Monitoring equipment, test results and performance. The unit in Rice's home required only the regularly scheduled replacement of the filter and inspection for maintenance.

Rice is convinced that the point of use system is the answer for addressing the state and federal mandates for arsenic removal faced by Keeler CSD and thousands of other small water systems across the country. It is available and affordable, and, most important, it's a solution that works. If the state of California declines to certify and approve the POU system used by Keeler CSD, the district will ask the state to fund the approved (and most costly) alternative.

The demonstration project performed by the Keeler CSD shows that point of use can be a successful alternative to more costly centralized treatment. With more than 400 water systems in California exceeding the EPA's impending 10 ppb arsenic rule and the possibility of an even lower state level, it's critically important to explore all the options for meeting these requirements. Small water systems may have the most at stake: many currently do not treat their water, and thus have a greater learning curve and operator certification needs.

Resources

To contact Dustin Hardwick or the CRWA field specialist in your area, call (800) 833-0322.

To learn more about the federal arsenic standard, visit the EPA Safewater website at www.epa.gov/safewater or call the Safe Drinking Water Hotline at (800) 426-4791.

To learn more about POU treatment units from Isolux™ Technologies, visit www.zrppure.com.

QUICK FACTS

Arsenic

Sources: Arsenic occurs naturally in soil and minerals. Wind-blown dust containing arsenic may get into water from runoff and leaching. Arsenic combines with oxygen, chlorine and sulfur to form inorganic arsenic. Inorganic arsenic compounds are used for manufacturing paints, drugs, dyes, soaps, metals and semi-conductors, and for preserving wood.

Health effects: Ingesting very high levels of arsenic can be fatal. Lower-level exposure can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet. Ingesting or breathing low levels of inorganic arsenic over long periods can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles and torso.

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the lungs, bladder, liver, kidney and prostate. There is some evidence that suggests that long-term exposure to arsenic in children may result in lower IQ scores and that inhaled or ingested arsenic may injure pregnant women or their unborn babies.

Regulation: The U.S. Environmental Protection Agency ruled in June 2001 that all community water systems and non-transient, non-community water systems must lower their maximum contaminant levels of arsenic from 50 parts per billion to 10 ppb on or before June 22, 2006. In California there are hundreds of systems where arsenic has been found in water samples, but at levels generally not considered unsafe.

Sources: www.epa.gov/safewater and www.atsdr.cdc.gov