Reducing Arsenic Levels with Iron-Based Media

A Pennsylvania town meets EPA arsenic standards

Since the U.S. Environmental Protection Agency (EPA) reduced the federal arsenic standard to a maximum contamination level of 10 parts per billion (ppb) in drinking water in January 2006, there has been much attention focused on areas of the country with the highest arsenic levels. Western states such as Arizona, New Mexico and Nevada, and Midwestern states such as Michigan and Indiana have become hotbeds of arsenic treatment activity.

By Nadia Abbott

While groundwater arsenic levels in Pennsylvania are not as high as levels in these states, communities in a picturesque and historic area north of Philadelphia have spent millions of dollars in recent years to meet the new EPA standard.

Founded in 1682 by William Penn, Bucks County is known for its historic Revolutionary War-era sites (it is where George Washington crossed the Delaware River to fight the Battle of Trenton in 1776), rolling farmland and fast-growing population. In recent years, towns such as Hilltown, Quakertown, Sellersville, Solebury and Perkasie have been installing arsenic removal equipment for their water systems.

Problem in Perkasie

Perkasie, Pa., is located about 40 miles north of Philadelphia. The Perkasie Borough Authority operates a water and wastewater system that meets the needs of about 4,500 housing units and 200 commercial and industrial customers in three different municipalities. With a total system demand of 0.75 million gal per day (mgd) and the ability to expand to 1.34 mgd, the authority's water is supplied by six wells that operate at distribution capacities of 120 to 500 gal per minute (gpm).

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"Based on everything we'd seen before selecting our system, we were believers in the effectiveness of iron-based adsorptive media," Winton said. "It's the premier arsenic removal technology, and our SORB system has done everything we expected.

Chlorine is used as the system's disinfectant, polyphosphate is used for corrosion control, and in well No. 10, a stripping tower is used to remove trichloroethylene caused by industrial contamination in the 1950s and 1960s. Three of the wells have elevated levels of arsenic, including well No. 11, with an arsenic level measured at 12 ppb.

With a looming EPA deadline of January 2006, and the knowledge that the Pennsylvania Department of Environmental Protection (PADEP) did not provide extensions to facilities that did not meet the new EPA standard, the borough shut down well No. 11 in November 2005 and demolished the building in preparation for the installation of a new arsenic system in 2006. With adequate capacity in the three wells not contaminated by arsenic, the authority also closed the other two contaminated wells prior to the EPA deadline.

Gary J. Winton, general manager of Perkasie Borough Authority, and his staff investigated a variety of arsenic removal methods and were aware of the success of the adsorption process using iron-based media in many parts of the country. In fact, nearby Hilltown Township had installed a 300-gpm SORB 33 arsenic removal system from Severn Trent Services early in 2006. After a bidding process for an iron-based media adsorption system, the authority also selected the SORB 33 system utilizing Bayoxide E33 arsenic removal media.

Long-Lasting Solution

Construction on the new treatment building began in May 2006, and the system was installed during October and November 2006. It went online in March 2007. Using three 6-ft-diameter

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adsorbers operating in parallel, the system has a capacity of 500 gpm. Winton and his staff decided to purchase adsorbers that were a little larger than standard size in case the arsenic limit lowers further, as it has in some states.

To extend the life of the media, only two of the adsorbers are used each day (i.e., on day one, water flows from adsorber No. 1 to No. 2; on day two, water flows from adsorber No. 2 to No. 3; on day three, water flows from adsorber No. 3 to No. 1; and so on).

"We expect that alternating the use of the three adsorbers will improve the useful life of the Bayoxide media," Winton said. "We believe we will get 45 months of use out of the media before we will need to change it out—maybe longer."

The system treats a portion of the well's flow—160 gpm—and then blends it with the remaining 340 gpm, providing water with an arsenic level of 8 to 9 ppb. This blending procedure, which also extends the life of the Bayoxide media, has been recognized by PADEP, which awarded a $250,000 Growing Greener grant to assist with the arsenic removal system's purchase. The purpose of the Growing Greener program is to restore watersheds and streams, reclaim mined lands and remediate abandoned mine drainage.

"Based on everything we'd seen before selecting our system, we were believers in the effectiveness of iron-based adsorptive media," Winton said. "It's the premier arsenic removal technology, and our SORB system has done everything we expected. We've been very satisfied with it, and we're also considering the feasibility of using the system for well No. 12, where arsenic levels have measured 37 ppb." WWD

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