

Isleton Water System Demonstrates In-situ Ferrous Generation Technology for Arsenic Remediation



A well-known carcinogen, arsenic in drinking water poses a serious threat to human health. In 2018, the World Health Organization stated that “Every effort should be made to keep arsenic concentrations as low as reasonably possible and below the guideline value of 10 ppb when resources are available.” Currently, the EPA is reviewing its MCL recommendations for arsenic. This has led utilities across the U.S. to evaluate the efficacy of their existing arsenic removal treatment systems.

In Isleton, California, California American Water has been using a range of drinking water treatment technologies to remove naturally occurring arsenic, iron and manganese, and chlorination for disinfection to maintain water quality in the distribution network of the Isleton Water System.

Since 2008, the Isleton Water System has been using a coagulation/filtration treatment scheme that, under optimized conditions, can reduce an influent arsenic level of 20 ppb to an effluent level between 5-8 ppb. While effective at arsenic removal, the existing coagulation/filtration process relies on the use of bulk chemicals that are toxic and hazardous in nature. These chemicals require special transportation, handling and use to ensure safety. In addition, a large storage area is required to house the bulk chemicals on site at the facility.

The Isleton Water System underwent an evaluation of SafeGuard™ H2O, an innovative arsenic treatment approach developed by Aqua Metrology Systems (AMS) that generates a ferrous ion reagent in-situ via an electrolytic process to address arsenic contamination effectively and economically. The electrolytic ferrous ion generation process does not require special complex infrastructure or safety protocols as compared to bulk chemicals.

The SafeGuard™ H2O system also features an online analyzer for real-time monitoring of arsenic and iron contaminant levels to help control and optimize the treatment process.

Autonomous and Scalable Solution

Unlike some traditional treatment systems, which cannot operate unattended, the fully autonomous SafeGuard™ H2O system can be controlled, monitored and optimized remotely. The need of personnel on site for supervision is minimal, further reducing operating costs. Depending on treatment size needs and site requirements, a system can be designed to operate unattended for up to several weeks.

The ferrous reagent generator within the SafeGuard™ H2O system has a modular and flexible design that can be scaled to any size. The system features low capital and operating costs, making it an economical and reliable arsenic remediation system.

A full-scale SafeGuard™ H2O demonstration unit with a treatment capacity of 3 gallons-per-minute (gpm) was installed at the Isleton Water System Well #3A (Isleton Well #3A) for an evaluation in September 2021 and February 2022. The objective was to demonstrate the ability of the electrogenerated ferrous reagent produced on demand by the SafeGuard™ H2O system to remove arsenic from unchlorinated well water reliably and effectively. The demonstration system was configured to replicate Isleton's current coagulation/filtration treatment process; with the only difference being the reagent dosing method where the electrolytic ferrous reagent generator replaced the liquid ferric reagent dosing system.

The characteristics of the source water for Isleton Well #3A are challenging. The groundwater contains relatively elevated levels of dissolved silica at 33 ppm. Silica, sulfates, phosphates, fluorides and many other substances can pose significant interferences for conventional treatment approaches; yet they have minor to no effect on arsenic removal with the SafeGuard™ H2O in-situ ferrous ion reagent generation technology.

Results

The demonstration of the SafeGuard™ H2O technology at Isleton Well #3A confirmed the performance of the in-situ ferrous ion reagent generation technology to treat arsenic to under 10 ppb in unchlorinated well water, achieving a removal efficiency matching the existing coagulation/filtration system that uses liquid ferric chloride. In addition, the system's versatile automated treatment design, in combination with frequent online arsenic monitoring via the online and onboard MetalGuard™ trace metal analyzer, also manufactured by AMS, enabled the operation of an unattended and low maintenance arsenic treatment system under field conditions.

The full-scale demonstration of SafeGuard™ H2O at California American Water's Isleton Water System proved the effectiveness of the technology to mitigate total arsenic contamination in drinking water below 10 ppb, and its ability to deliver an affordable and reliable fully automated treatment process that does not require the use of bulk chemicals like conventional treatment approaches.



SafeGuard™ H2O trailer-mounted arsenic removal demonstration system installed at Isleton Well #3A.