ARSENIC REMOVAL



Integrated treatment system resolves community's arsenic dilemma

By Richard J. Cavagnaro

fter discovering that its three wells contained excessive levels of arsenic, Spring Creek Utilities Co. hired Sunrise Eng. to help develop a solution. The engineering firm contracted with AdEdge Water Technologies in June 2011 after a competitive bidding process to design, manufacture and start up an arsenic treatment solution as quickly and economically as possible.

Spring Creek Utilities Co. provides water service to 1,500 residents in Spring Creek, Nev., located near the city of Elko in the sparsely populated northeast portion of the state. Its water system consists of three wells that feed into a centralized distribution system: Well No. 1 receives water at a maximum flow of 435 gal per minute (gpm), well No. 3 at a maximum flow of 725 gpm and well No. 11 at a maximum flow of 720 gpm, for a combined maximum capacity of 1,950 gpm, or 2.8 million gal per day.

The water in these wells was found to have average arsenic

Spring Creek's five containerized treatment units arrived by truck, ready to use. levels ranging from 19 to 35 ppb, well in excess of the Nevada Div. of Environmental Protection's (NDEP) maximum contaminant level of 10 ppb. The U.S. Environmental Protection Agency and NDEP ordered Spring Creek to address this problem within six months.

"There was no time to design and construct a conventional facility," said Greg Gilles, vice president and principal of AdEdge. "One of the things that helped [Spring Creek Utilities Co.] to select us was our experience with arsenic treatment, and that we could deliver the system in the time frame they needed."

Solution

AdEdge provided five 40-ft-long WaterPOD containerized units: one custom-designed unit for well No. 1, and two each for wells No. 3 and No. 11. Each unit includes HVAC, pedestrian doors, vents, windows and lighting—and, most importantly, an AdEdge GS+ coagulation/ filtration package

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sized for each well's maximum flow. These units sit on concrete slab bases and are pre-designed and pre-piped, ready for "plug and play" use.

"Being able to have something that just rolls off a truck, you plug and play and it's ready to roll—[it] saved a lot of time for us," said Kevin Brown, civil engineering manager on the project for Sunrise Eng.

The treatment process begins in the well house, where a chlorine module injects liquid sodium hypochlorite into the water. This oxidizes arsenic (III) to arsenic (V) to aid in its removal. The water then is injected with ferric chloride to supplement the raw water iron concentration in order to further assist in arsenic removal. From there, the water is treated with CO_2 to reduce its pH level to approximately 7, as adsorbent media and coagulation/filtration processes are typically more effective in water with a pH level of 6.8 to 7.3.

After the pH level is reduced, the water is introduced to the WaterPOD and treated

using 26 cu ft of the GS+ coagulation/filtration media housed in carbon steel vessels (seven at well No. 1's system, and six each at the other two wells) in a parallel configuration. The media is an NSF/ANSI Standard 61-certified black filter media used for arsenic, iron and manganese removal. Its surface is coated with manganese dioxide, which acts as a catalyst in the oxidation-reduction reaction of iron, arsenic and manganese. The treated water is stored in an atmospheric tank.

Each system features automated control valves and harnesses, a central control panel with a programmable logic controller, and a color user interface screen. They also include differential pressure systems; control panels with local gauges, flow sensors and totalizers; and central hydraulic panels with sample ports.

The facility backwashes these systems every two to three days in order to remove any suspended solids that accumulate in the bed and to hydraulically fluff the bed to prevent







Top: Each unit contains a coagulation/filtration package sized for well's maximum flow. Bottom: Arsenic levels are now in control thanks to the NSF/ANSI 61-certified media.

channeling. AdEdge also provided an H2Zero backwash reclamation system that reclaims 99.8% of the settled backwash water. The settled suspended solids form a low-percent-solids sludge that can be dewatered and removed to a solid waste landfill.

Results

The systems started up in December 2011, with all three wells feeding into an overall integrated treatment system that manages the maximum capacity of 1,950 gpm. "It was easy to get the site ready and get the technology up and running. From an engineer's standpoint, it couldn't have been any better," Brown said.

Since this treatment process was initiated, the arsenic levels in water from all three wells have been reduced to fewer than 2 ppb—far below NDEP's maximum contaminant level. **WQP**

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