



Clean & Green

By Richard J. Cavagnaro

Elevated levels of arsenic, iron and manganese prompted the Resort Village of Kannata Valley in Saskatchewan, Canada—a community of 149 households situated on the north shore of Last Mountain Lake, approximately 50 km northwest of Regina—to seek a treatment solution for its drinking water. The community water system is served by an artesian well that provides drinking water for approximately 250 residents. In November 2009, AdEdge Water Technologies LLC was selected by the community to supply an arsenic, iron, manganese and turbidity treatment system.

Working the System

The selected system was an AdEdge AD26 oxidation/filtration system rated for 150 gal per minute (gpm). The raw water levels of arsenic, manganese, iron and turbidity exceeded the Saskatchewan Drinking Water Quality Standards and Objectives (SDWQSO) that went into effect at the end of 2010, as well as the federal drinking water quality guidelines in Canada. The incoming concentrations were 31 ppb arsenic, 1.7 mg/L iron, 0.09 mg/L manganese and 10 ntu turbidity, all above the standards set by the SDWQSO of 10 ppb for arsenic, 0.3 mg/L for iron, 0.05 mg/L for manganese and 1 ntu for turbidity.

The treatment train consists of one skid-mounted triplex packaged treatment system with three vessels. A design filtration rate of 3.98 gpm per sq ft was chosen to allow for filtration of the high level of contaminants.

Prior to the treatment system, a continuous feed of sodium hypochlorite and polymer is injected into the raw water using the ADIN chemical feed system to aid in achieving the

designed treatment goals. Sodium hypochlorite is fed prior to the polymer to oxidize iron, manganese and any arsenic (III) to arsenic (V) for optimal removal. Polymer is injected into the raw water to assist in the flocculation of turbidity and color.

Dosing of the chemical feed pumps is pulse controlled by the InGenius programmable logic controller (PLC). The feed rate of the chemicals is manually set; however, the pulsing frequency is adjusted based on system flow rates due to multiple variable frequency drive supply pumps. The PLC performs automated functions needed for operation of the control valves, including system pressure- and differential pressure-activated backwashing, flow rate, backwash recycle, air wash and filter drain down, and total gallons processed.

Each 48-in. carbon steel vessel contains 25 cu ft of AD26 oxidation/filtration media and 12 cu ft of anthracite #1.5. AD26 is a highly catalytic manganese dioxide media used for the removal of arsenic, iron, manganese and hydrogen sulfide. The system also is equipped with sample ports, flowmeters and totalizers, differential pressure gauges and flow control valves.

The system also includes an H2Zero backwash/recycle system that conserves water by storing and treating contaminated backwash water from the treatment system. A result of the filtration process is liquid or solid residuals, which require regular backwashing to remove suspended solids and iron particulates that accumulate in the bed. The Resort Village of Kannata Valley's treatment system is designed to backwash once or twice weekly to prevent excessive pressure loss from the system. Air-wash occurs prior to the backwash

cycle being initiated. Water exiting the treatment system feeds two 25,000-gal hydro-pneumatic storage tanks and is distributed to the end users.

The Aftermath

Installation was completed and the system was commissioned in August 2010. Since operations began, the system has consistently met all the SDWQSO maximum contaminant levels for arsenic, iron and manganese. It is treating approximately 100,000 gal per day.

Arsenic in the treated water has been recorded consistently below detection (less than 2 ppb) and turbidity has been recorded at 0.014 ntu. Monitoring and periodic sampling of the system is performed by the site's certified operator in accordance with the operating permit.

"The technology was very cost-effective compared with other approaches considered, including membrane and biofiltration methods," said Arnold Flegel, administrator for the Resort Village of Kannata Valley. "The community was seeking a treatment approach that would be 'green' in three ways: no chemicals would be added to the process (other than a disinfectant); a minimal amount of filter backwash water would go to waste; and the system would be cost effective to install and operate." *wqp*

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Canadian community implements efficient contaminant removal