

Specifying Performance Over Equipment Quickly Reduces THMs in the Colorado Springs' Distribution System

Colorado Springs, Colorado, enjoys some of the highest quality drinking water in the country, with most of its water coming from high country snowmelt. Despite its pristine origin in the mountains, the water at the far end of the distribution system is prone to developing trihalomethanes (THMs) due to low turnover and high water age. Armed with water quality lab results, the staff at Colorado Springs Utilities graphed the data to pinpoint the precise location of the highest occurrence of THMs in the distribution system in an effort to be proactive in reducing THM levels. The utility staff had developed numerous disinfection by-product (DBP) mitigation strategies over the years, including an annual distribution system flushing program, treatment process modifications, reduced tank storage levels, and on-site chlorine boosting to allow for reduced chlorine dosing at the water treatment plant itself. None of these strategies reduced the THMs to an acceptable level.



The utility staff then turned to THM aeration – a technology that removes THMs from finished water by volatilization. They determined that the quickest way to achieve their reduction targets was to create a specification for a design-build project that was based on an exact performance range, as opposed to specific equipment. The specification was written to require a reduction in THMs of at least 25% as measured in two different sampling locations. Critically, the specification called for the tank, located at an elevation of approximately 7,500 feet, to remain in operation during installation, which had to be completed within a short window of less than two months during the winter.

PSI Water Technologies, Inc. (PSI) of Campbell, California, was awarded the bid in November of 2017. The 250,000 gallon tank, located at the end of a distribution line, experienced low turnover, which the PSI engineering team used to Colorado Springs Utilities' advantage. Based on their modeling, PSI's engineering staff recommended a patent-pending system comprised of a submersible PAX Mixer with a roof-mounted Powervent® active ventilation system to generate removal rates that would be sufficient to meet the specified THM removal rate without the need for an aerator which would have increased both capital and operating costs. The submersible PAX Mixer was powerful enough to keep the full volume of water in motion and to continuously bring higher concentrations of THMs from the lower and middle depths up to the top layer of the water.



Once the THMs in the water were exposed to the air-water-interface, the Powervent® reduced the build-up of THMs in the headspace of the tank to nearly zero by continually exchanging fresh air from the tank exterior with THM-laden air within the tank. By maintaining a very low THM concentration in the tank headspace, the driving force for mass transfer of THMs from liquid to gas phase was maximized allowing for highly efficient THM volatilization.

The design-build team at PSI was given the notice to proceed on December 13, 2017. The PWM500 PAX Mixer was lowered into the water-filled storage tank and then connected to a control center located in an adjacent building. The PPV-400 Powervent® was installed over the top of an existing air vent on the roof of the tank and then connected to a control center in the same adjacent building. The installation was challenging due to cold weather, the remote location and a tight schedule just before Christmas, yet it was completed by PSI personnel in just three days. The system validation was performed in January 2018.

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The results were immediate. Operators reported a 42% reduction in the Locational Running Annual Average (LRAA) Sample Site #1 and a 48% reduction in the LRAA Sample Site #2, exceeding the performance requirements of the specification. The quick and successful execution of the project allowed remain in compliance. The decision to go with a performance specification and a design-build project allowed Colorado Springs Utilities to fulfill its objectives within a very short period of time. With the THM removal technology in place, operators can spend less time on DBP mitigation strategies, knowing that the PAX TRS™ system is doing the work for them.

