

Central Texas Water Supply Corporation Incorporates Online THM Monitor to Better Manage Disinfection By-Product Formation

The Central Texas Water Supply Corporation (CTWSC) in Bell County, Texas is a water wholesaler servicing the needs of more than 20 municipal customers across 7 counties in Central Texas.

Despite the relatively good source water quality, the CTWSC Water Treatment Plant (WTP) experiences high organic loading that leads to trihalomethane (THM) formation in their distribution network. The utility uses chloramines, combined chlorine and ammonia treatment, as their primary disinfection method to help minimize THM formation.



The CTWSC produces 21.8 mgd of water to service customer demand using three treatment plants; two conventional and one ultrafiltration. The Stillhouse Hollow Lake, the primary water source for the CTWSC WTP, is of relative good water quality with a total organic carbon (TOC) of 4 mg/L. However, Stillhouse Hollow Lake is part of an agricultural-based watershed where tannins and lignins routinely wash into the lake and cause elevated levels of manganese and iron levels.

Prior to the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR), the CTWSC WTP would maintain an effluent total THM (TTHM) value of less than 40 ppb to help ensure that TTHM values 60 miles out in their distribution would be below 80 ppb. With the advent of Stage 2 DBPR, locational running annual average (LRAA) requirements at specific monitoring locations throughout the distribution system were determined with quarterly sampling for TTHMs. The change to LRAA requirements highlighted the need for the CTWSC to review operational performance and optimize DBP mitigation strategies to ensure consistent production of treated water containing less than 80 ppb TTHM.

The CTWSC worked to adjust ammonia and chlorine concentrations, keeping them as consistent as possible to ensure the proper ratio of monochloramines. Effluent TTHM was maintained at 15 ppb to ensure compliance at remote locations in the network and at handover points. A mixer was installed at the clearwell of the ultrafiltration plant to reduce THM formation. The mixer successfully reduced levels of chloroform, yet other specie of THM persisted in the treated water.

The Value of Real-time THM Data

Up until 2014, the CTWSC was solely relying on external laboratory analyses of water samples to validate the efficacy of process improvements and changes. However, it often took two to three weeks for results to be returned. At which point, the treated water had already exited the plant and entered into the distribution system. In an effort to obtain more timely results on TTHM levels in the WTP effluent, within the distribution network and at handover points, the CTWSC began a yearlong full-scale study of the THM-100™ online THM monitor manufactured by Aqua Metrology Systems.

The THM-100 monitor has been independently validated and found to be consistent and highly reproducible with a standard error of deviation of five percent. The automated and online THM-100 uses an approved 'purge-and-trap' sampling method, followed by desorption into a chemical mixture that generates a colored product and time-resolved spectrophotometric analysis for determination of THM levels. Manually collected 'grab' samples from other locations can be analyzed alongside samples taken automatically by the monitor in its online mode, allowing for multi-location analyses.



Online THM-100™ THM Monitor

The THM-100 monitor was installed at the CTWSC WTP and analyzed six daily samples. The instrument provided plant operators with immediate, real-time, results for TTHM at the CTWSC WTP. As a result of the real-time data provided by the online monitor, THM formation within the CTWSC WTP and distribution system became easy to identify. Operators were able to better manage the ratio of monochloramines, adjusting it accordingly as TTHM levels fluctuated. This process optimization led to a reduction in chemical costs since the ammonia-to-chlorine ratio was being managed based on real-time TTHM levels instead of dated results from external laboratory analyses. Fluctuations in TTHM levels above 15 ppb were easily identified and process changes were made immediately.

The baseline and predictive data available through the THM-100 allowed operators to easily see the effect of process changes. For example, during the clean-in-place (CIP) treatment of the ultrafiltration membrane elements the online THM monitor showed that in-plant TTHM levels reached 90 - 100 ppb following the return of wastewater into the process stream. Without the real-time data provided through the online THM monitor, operational staff would not have easily identified the negative effect of returning the CIP wastewater back into the treatment plant. However, using the online THM monitor enabled operators to easily see the effect, within hours, and as a result CIP wastewater is now discharged.

With the conclusion of the yearlong study and successful operation of the online THM monitor, the CTWSC WTP has permanently installed the THM-100 monitor at the facility. Providing safe drinking water is of the utmost importance for the CTWSC operational staff. The THM-100 is a viable tool, among others, that enable plant operators to have a firm and immediate understanding of water quality leaving their plant and throughout their distribution network.