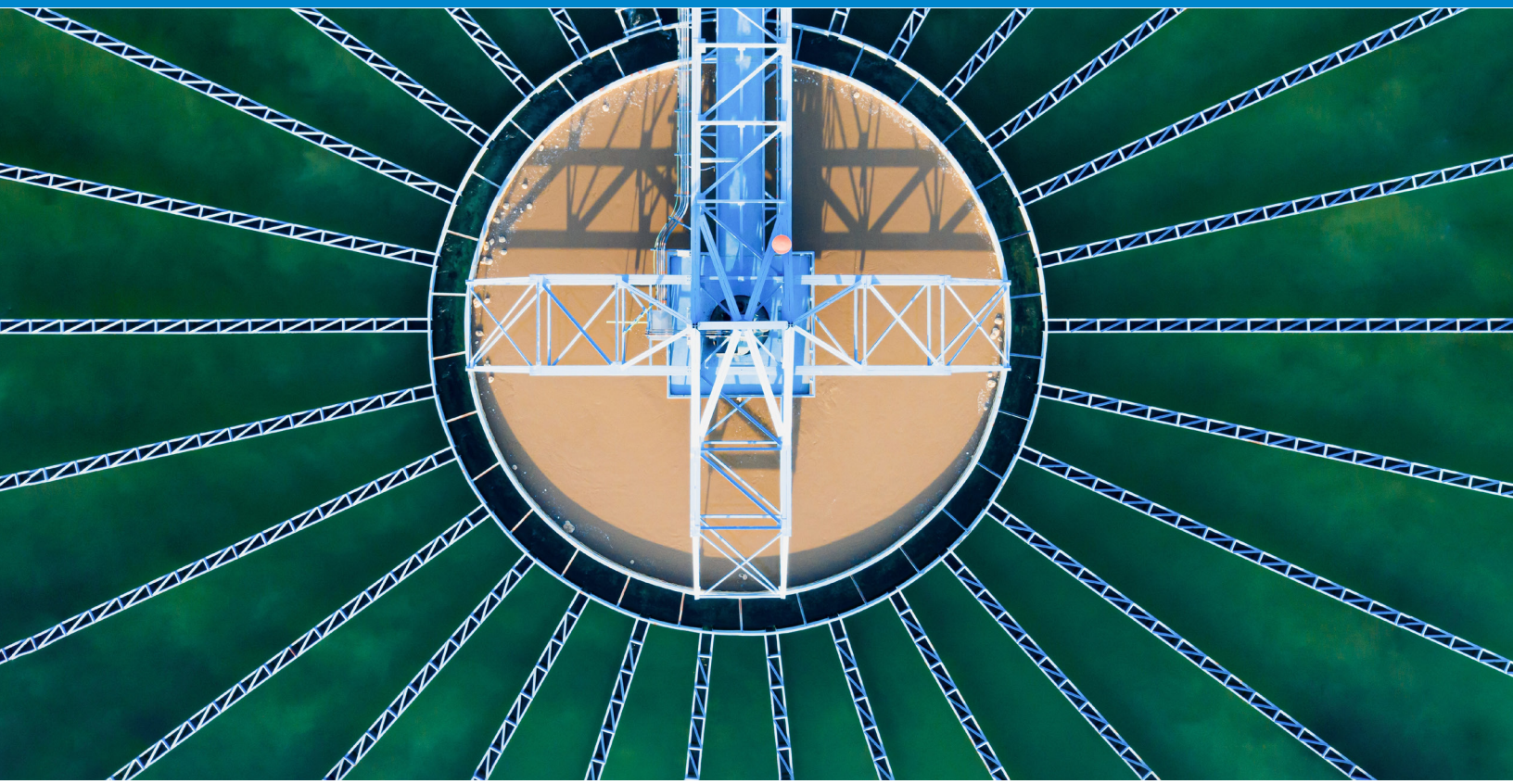


Control DBP Formation in Wastewater Effluent with Online THM Analyzer

Controlling trihalomethanes (THMs) discharged as final effluent from wastewater treatment plants (WWTPs) has become an important issue in the United States. WWTPs are sources of numerous disinfection by-products (DBPs) and DBP precursors. WWTP effluents also contain inorganic substances such as ammonia, bromide, nitrate, and nitrite that influence DBP formation in rivers, lakes and groundwater sources supplying water to water treatment plants downstream of WWTPs.

DBPs are a health and regulatory concern given their link to increased risk of certain cancers and adverse reproductive effects. THMs and haloacetic acids (HAAs) are the two most abundant groups of known DBPs. State and local environmental protection agencies set regulatory limits for THMs in treated wastewater effluents discharged to surface waters to protect their quality. The four regulated THMs are chloroform ($CHCl_3$), bromodichloromethane ($CHCl_2Br$), dibromochloromethane ($CHClBr_2$), and bromoform ($CHBr_3$). Wastewater treatment plants across the United States face stringent effluent permit limits for THMs.

THM Formation in Wastewater Treatment Plants

Chlorination is the most widely used method for disinfecting treated wastewater. The reaction of free chlorine with certain organic compounds in wastewater leads to DBP formation, including THMs. THM formation can be affected by numerous water quality and treatment factors. Source water characteristics, including the type and abundance of organic precursors, as well as bromide concentrations, influence the formation and speciation of THMs in WWTPs. Disinfection variables affecting THM formation at a WWTP include contact time, pH, chlorine dose, and water temperature.

The presence of ammonia in treated wastewater effluents reacts with the chlorine disinfectant to form chloramines. In general, chloramines form fewer THMs and HAAs than free chlorine. While adding ammonia to form chloramines is a practical method of controlling THM formation in drinking water, in wastewater the process will increase the total nitrogen effluent concentrations. WWTPs face stringent federal, state and local effluent discharge requirements on nitrogen species, such as ammonia, nitrate, and nitrite. As a result, finding a balance between THM mitigation strategies and nitrogen- and nutrient-removal process systems is imperative to ensure complete regulatory compliance.

The Importance of Measuring THM Levels in Wastewater Effluent

To reduce the formation of DBPs while minimizing nitrogen and ammonia levels, measurement of THM levels in the effluent before and following the chlorine injection point is necessary. Fluctuations in THM levels are difficult to characterize through external laboratory analysis.

Results from external analysis are typically returned up to 10 business days later, at which point the underlying water quality parameters have changed. Additionally, some THMs are regulated at levels below the detection limits of most laboratory methods.

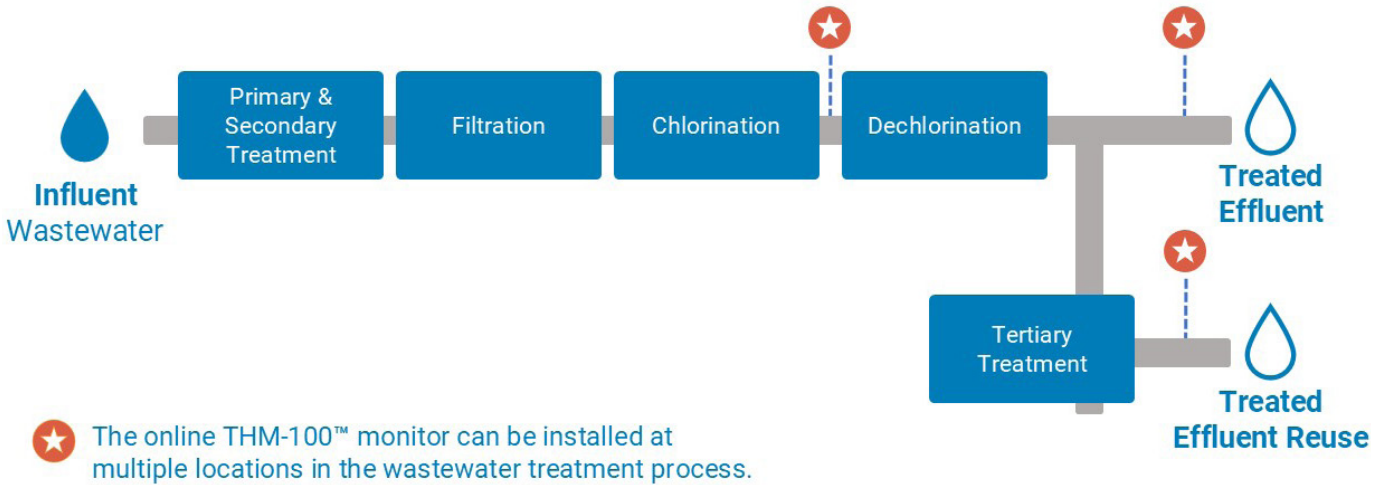
The automation of sampling, analysis and reporting available through online THM analyzers characterize and monitor THM levels while providing operational staff with immediate, real-time and accurate daily reports on THM levels. The precision of online THM analyzers can be equivalent to or better than those of onsite or offsite laboratories. Online THM analyzers allow operators to ensure THM levels comply with required target values and check for deviations from stable values. The high-frequency data provided through online THM analyzers allow operators to effectively monitor their wastewater treatment systems and mitigate the impact of a potential regulatory breach through timely adjustment of contaminant remediation processes for DBPs and nitrogen species.

The online THM-100™ water quality analyzer from AMS provides real-time, accurate and reliable data on THM and THM Formation-Potential levels throughout the wastewater treatment process (Figure 1). The THM-100 is programmed with a default standard sampling schedule of every 4 hours; average sampling time of 90–110 minutes. A more or less frequent sampling schedule can be programmed to meet application-specific needs. Some configurations of the THM-100 yield speciated THM results at sub ppb levels.

The Benefit of Online THM Data

Online THM analyzers allow WWTPs to optimize disinfection and process controls while reducing DBP formation in wastewater effluent to meet strict THM effluent permit regulations. The real-time THM data provided by the online THM-100 analyzer helps users make informed decisions at all phases of their THM mitigation strategy: treatment design, commissioning, operations, and optimization.

Figure 1: Wastewater Treatment Process



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