

Use of Online THM Analyzer Helps Maintain Water Quality at a Scottish Water Drinking Plant



More than 200 water treatment works (WTWs) sources managed by the Scottish Water Utility have been affected by a decline in water quality caused by environmental factors including climate change. The deterioration has primarily been observed through increased water color and a higher level of natural organic matter, which pose a significant treatment challenge because of the resulting formation of disinfection by-products (DBPs). To ensure deteriorating source quality does not affect customers' drinking water, Scottish Water has used operational enhancements and online water quality analyzers to meet the strict trihalomethane (THM) discharge requirements needed to guarantee DBP regulatory compliance.

In 2010, Scottish Water began continuous online monitoring of THM levels with the THM-100™, manufactured by AMS. In total, three THM-100 units have been purchased and used to optimize several Scottish Water systems since 2010; one unit was installed at the Bradan WTWs, another at the Tullich WTWs, and one was transported throughout the region as needed at other Scottish Water facilities.

Before the purchase of the online THM monitors, Scottish Water relied on standard laboratory analysis. Analytical results could take up to a week to be returned, making it very difficult for operations staff to fully optimize the treatment processes at any given facility since they were working off THM results that were a week old. By providing the operations staff with immediate and accurate daily reports on THM levels, the THM-100 monitor enabled Scottish Water to have visibility of process improvement changes and their impact on DBP formation.

The THM-100 proved especially valuable at the Tullich WTWs when the facility tested and implemented an aeration system to minimize THM formation further.

Online THM Monitor Validates THM Removal System Process

The Tullich Water Treatment Works in Oban, Scotland, services the needs of approximately 13,000 inhabitants through a 2.64 MGD (11 MLD) plant consisting of pre-filtration using microstrainers, pre-ozonation, granular activated carbon, and post-ozonation. Having already optimized their existing process scheme, Scottish Water introduced aeration at the Tullich WTWs in 2015 to aid THM removal. As volatile organic compounds, THMs can be removed from water through volatilization given

sufficient gas transfer opportunities. When water is exposed to and mixed with air inside a reservoir, the THMs are transferred into the air and can escape. There are four primary species of THMs; chloroform (CHCl_3), bromodichloromethane (CHCl_2Br), dibromochloromethane (CHClBr_2), and bromoform (CHBr_3). Chloroform is the most volatile of the primary THMs and is the most dominant THM speciation found in treated water at the Tullich WTWs, averaging approximately 70%.

A demonstration of a THM Removal System (TRS), developed by PAX Water, was undertaken from May to August 2015. The online THM-100 analyzer was used with the TRS to provide real-time measurements of influent and effluent THM levels. The continuous THM data Scottish Water obtained from the online analyzer enabled them to compare the TRS performance results against a known baseline from the control reservoir. Scottish Water observed a 47% reduction in THM levels following the installation of the TRS. Whereas THM levels ranged between 60-70 ppb prior to the installation of the TRS, THM levels ranged between 30-40 ppb following the addition of aeration on 21 September 2015 (Figure 1), data was provided by the online THM-100 monitor.

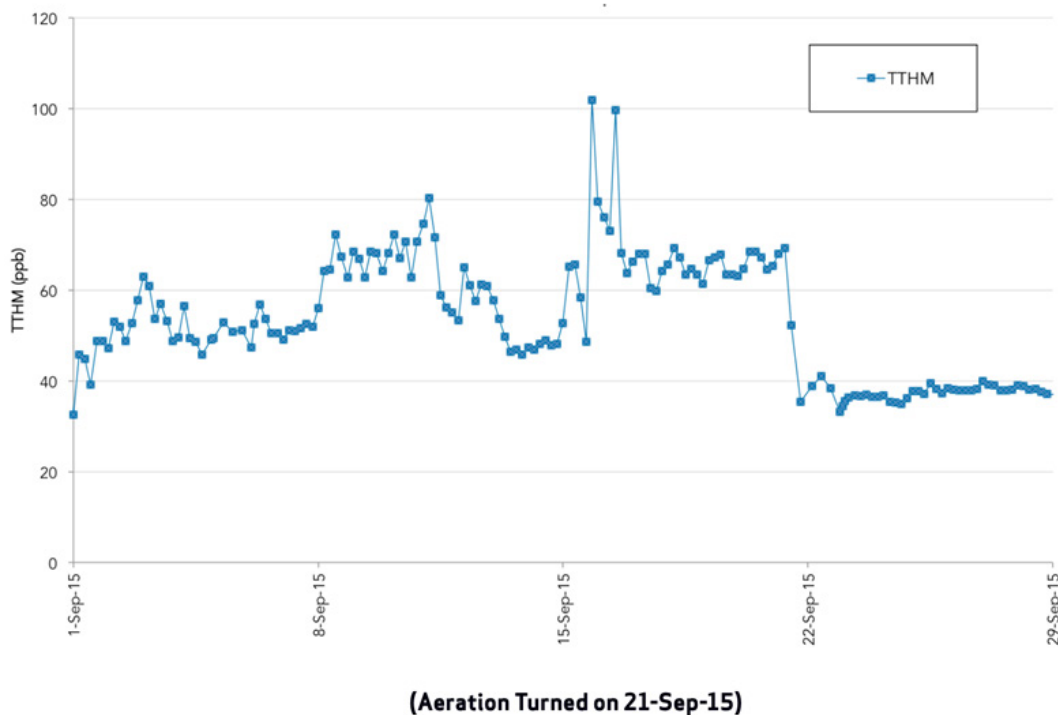


Figure 1: Tullich WTWs THM Levels Pre- and Post-Implementation of TRS

The high-frequency and reliable THM data also allowed Scottish Water to optimize performance and make additional process changes (e.g., ozone dose rate, pH levels) to ensure that water quality continuously met the highest standards and was safe for human consumption.

Conclusion

Scottish Water has relied on the reliability and accuracy of the online THM-100 monitor at several of its facilities. The online THM monitors have allowed Scottish Water to consistently monitor, maintain, optimize, and respond to any THM concerns promptly.