

## Online THM Monitoring System Supports Cutting Edge Innovation and Research at the Bilbao Bizkaia Advanced Water Treatment Centre



The Bilbao Bizkaia Advanced Water Treatment Centre (CATABB) in Etxebarri, Bizkaia, Spain, is an open platform for innovation and research in water treatment that was designed and built by the Bilbao Bizkaia Water Consortium (BBWC) in 2018. The CATABB plant, with a treatment capacity of 10 m<sup>3</sup>/h, is an advanced and versatile drinking water facility that is equipped with different technologies to evaluate suitable approaches for the purification of water of different characteristics and origins (the Nervión river, the Zadorra reservoirs or a mix from both).

The treatment train at the facility includes four different pre-oxidation processes (chlorine, chlorine dioxide, ozone and potassium permanganate), followed by coagulation/flocculation and sand filtration. Subsequently, water may be treated with ozone, a combination of ozone and hydrogen peroxide, a UV light process, or it may be directly filtered using a granulated activated carbon (GAC) filter. Two GAC filters are placed in parallel, each using a different type of GAC media so that their water filtration efficiency under the same or different operational conditions can be compared. Following filtration, water is disinfected with chlorine.

### Studying Desorption Processes of THMs

The CATABB plant aims to promote knowledge sharing of innovative technologies and cooperation across public and private partners. Several research studies have been carried out at the facility, one of which is "Adsorption and Desorption Processes of Trihalomethanes on Different Granulated Activated Carbon Filters."

This project gives real insight into the desorption processes of trihalomethanes (THMs) produced when characteristics of the feed water or the treatment process are modified at a drinking water plant using GAC.

The main highlight of this two-year study was to show full-scale, real-world data on the adsorption and desorption processes of different GAC compounds under various operational conditions. The demonstration project studied the saturation of GAC filters and any changes to their adsorption capacity because of varying the water source, altering any water characteristics, and changing the oxidation agent. Results from the study were presented at the IWA World Water Congress and Exhibition in September 2022.

The desorption process of harmful organic compounds such as THMs can be a cause of great concern to drinking water plants, especially if the desorption process is fast and high. To aid CATABB in their study to better understand the adsorption and desorption process of their GAC filters, an AMS online THM-100™ analyzer was installed at the facility to deliver fast, accurate and reliable data on THM levels. Despite fluctuations in THM values, treated water in the CATABB plant was always below the regulatory limit of 100 ppb (European Directive 2020/2184), even when the most depleted GAC was tested.

### High-frequency Data

While laboratories are prone to delays from sampling to analysis to the return of the data, making it difficult to proactively address fluctuations in THM levels, the THM-100 online THM analyzer provides a much higher frequency of data. In addition, results from the THM-100 instrument are available to CATABB in as little as 120 minutes and information is remotely accessible 24/7/365.

The real-time THM data allows CATABB to quickly see the impact of changes in treatment methods or water quality on overall plant performance and THM values. In addition, the online THM data supported CATABB in the timely development of strategic plans to minimize the THM concentration in drinking water.

According to BBWC, thanks to the online THM-100 analyzer, staff in the CATABB facility has been able to quickly detect variations in the THMs concentration, allowing it to act and respond rapidly and have a greater control of the water quality. The results obtained with the THM-100 have been validated in the laboratories of the Consorcio de Aguas Bilbao Bizkaia, demonstrating its accuracy.

Other benefits of the online analyzer include improvements in response time, reliability and cost reduction. Routine operations have also benefited from the THM analyzer. One of the parameters on which the CATABB facility is currently focusing when studying the quality of drinking water is the TTHM. According to BBWC, the THM-100 analyzer is proving to be a simple way to check the formation of these compounds throughout the drinking water purification process as well as in the distribution and storage of these waters.

"The online analyzers provide us with real-time data of the concentration of these disinfection by-products in the DWTP Venta Alta (Arrigorriaga), as well as the water supply network where analyzer data is received through SCADA. This serves as an early warning system in case of exceeding the required levels, making it possible for operations to act quickly in the optimization of the treatment processes to improve the quality of the water offered to the population," BBWC stated. "In addition, the online THM-100 analyzer has become a very useful tool for current and future research in the study of the generation of disinfection by-products, and it will enable the opening of new lines of research and collaboration at CATABB."