SAC_{254} Sensor for Reagent-free, Sampling-free Monitoring of Organic Materials in Drinking Water Treatment

Introduction

All surface water and ground water contains dissolved organic substances as the result of incomplete decomposition of vegetation, the metabolism of microorganisms and plankton, and man-made contaminants such as pesticides and herbicides.

Removing organic substances from drinking water is necessary because –

- they provide nutrients for microorganisms, bacteria, and viruses and encourage re-growth
- they are the precursors of disinfection by-products such as trihalogen methane (THM), shown to be carcinogenic in laboratory studies
- many, such as PAHs and pesticides, can be directly harmful to human health

Activated carbon absorption

Water treatment plants apply activated carbon filtration to remove undesirable organic materials from surface water and river filtrate and ground water exposed to industrial contaminants or agricultural organics. Typical organic contaminants include humic acid, fulvic acids, colorants, and synthetic halogenated hydrocarbons such as pesticides and solvents.

The role of SAC monitoring

The Spectral Absorption Coefficient (SAC 254 nm) is a total parameter measuring the dissolved organic material that absorbs UV light at a wavelength of 254 nm.

SAC can be used to measure the organic load of the raw water source. Assessment of changes in dissolved natural organic matter (humic and fulvic acids, algal bloom toxins, etc.) in the influent helps operators control downstream processing such as coagulation dose adjustment.

Continuous SAC measurement complements routine water quality analysis and can also signal effectiveness of activated carbon filtration (*Figure 1*). At this particular water treatment plant, an online SAC sensor monitoring dissolved organic material content shows a value of approximately 0.3 m^{-1} with correctly functioning filtration or activated carbon filtration (*Figure 2*).

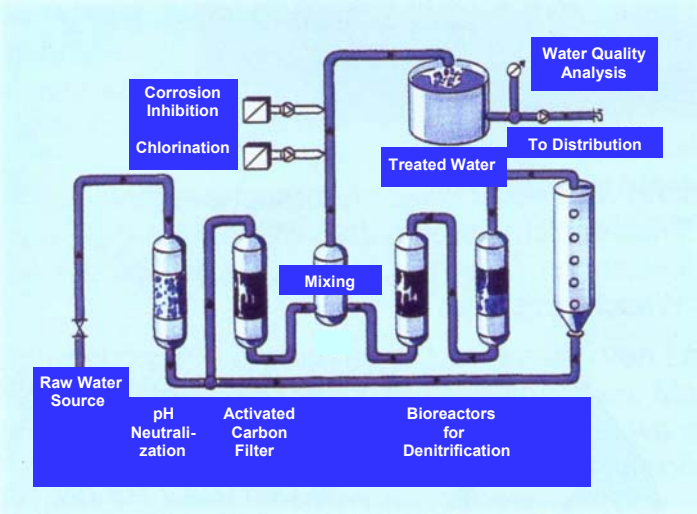

Figure 1 – Treatment scheme of ground water-source water plant

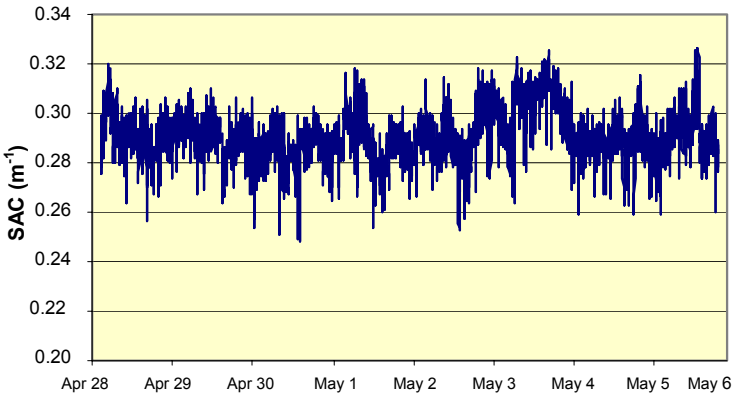

Figure 2 – Continuous measurement of SAC at treatment plant shown in Figure 1 schematic

The online measurement of the SAC before and after activated carbon filtration provides real-time information on the saturation of the activated carbon. The gradual reduction in the difference between the two readings is the first indication of imminent need for activated carbon regeneration.

Product Application

The Hach UVAS sc Sensor monitors online SAC_{254} as a determination of dissolved organic materials in raw water sources and subsequent treatment steps.
It yields reagent-free and sampling-free measurement directly in the medium or in a bypass.

In drinking water, a 50-mm pathlength achieves sensitivity to 0.01 m^{-1} SAC and a range up to 60 m^{-1} SAC. The measuring cycle can be set anywhere from one to 30 minutes.

This application solution note is one of several Hach documents describing wastewater process control based on continuous SAC measurement. For more detail, refer to:

"Continuous SAC_{254} Determination of Organic Pollutants Supports Management of Municipal Collection Systems," Hach Application Solution AS-SAC1

"Continuous SAC_{254} Determination of Organic Pollutants is Key in Real-time Wastewater Treatment Control," Hach Application Solution AS-SAC2

"Continuous SAC_{254} and TOC Measurement of Airport Runoff Streamlines Separation of Polluted and Unpolluted Water," Hach Application Solution AS-SAC3

"Online SAC_{254} Measurement Yields Operational Savings in the Paper Production Ozone System," Hach Application Solution AS-SAC4

"SAC_{254} as an Oxygen Demand Predictor: the Relationship and Correlation of Oxygen Demand Parameters and SAC," Hach Application Solution AS-SAC6

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