

## SAC<sub>254</sub> as an Oxygen Demand Predictor: the Relationship and Correlation of Oxygen Demand Parameters and SAC

### Introduction

Oxygen demand is a vital parameter for determining the amount of organic pollution in water. Oxygen demand measurement is widely applied in monitoring waste loadings of treatment plants and in evaluating treatment effectiveness.

### Total parameters

The parameters Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Total Organic Carbon (TOC) and Spectral Absorption Coefficient (SAC) are all 'total parameters' that measure very specific attributes of water pollution (*Table 1*).

BOD measures organic substances that are accessible to microbial oxidation. The COD measurement indicates organic substances that are accessible to chemical oxidation. In contrast, TOC measures the total or complete organic content of the water.

Organic compounds dissolved in water, in general absorb UV light. For this reason, the measurement of UV absorption – the Spectral Absorption Coefficient (SAC) measurement – represents an independent total parameter for dissolved organic substances in water.

Parameter	Measured variable	Measuring method	Substance groups measured
<b>BOD</b> Biochemical Oxygen Demand	O <sub>2</sub> consumption	Microbial oxidation	
<b>COD</b> Chemical Oxygen Demand	O <sub>2</sub> consumption	Wet chemical oxidation	
<b>TOC</b> Total Organic Carbon	C concentration	Thermal, wet chemical digestion	
<b>SAC</b> Spectral Absorption Coefficient	UV absorption at $\lambda = 254$ nm	UV absorption measurement	

*Table 1 – Monitoring all total parameters provides a true picture of the organic load in wastewater.*

### Comparison between SAC and TOC/COD

Numerous investigations have demonstrated the comparability between SAC and COD or TOC. Baumann and Krauth<sup>1</sup> observed a correlation factor of 0.94 between COD and TOC in measurements in the primary settling tank. Matsché and Sturmwöhrer<sup>2</sup> concluded that “UV absorption has an excellent correlation to COD in wastewater treatment plants.”

Figures 1 and 2 show the comparability of COD and TOC, respectively, with SAC in municipal wastewater.

These data show SAC can be used as a correlative method to predict other oxygen demand parameters, but SAC is not an exact measurement of the total parameters. It is important to note that any SAC correlation depends on the water source and can change with changing water quality conditions.

The Hach UVAS® sc Sensor yields delay-free measurement of the dissolved organic substances in waste water. With self-cleaning design for low maintenance and reagentless operation, it provides operators a high-utility tool for complete analysis of oxygen demand in wastewater.

#### References

1. Baumann, P., Krauth, K.: Vergleichende Untersuchung zur Bestimmung der organischen Belastung im Abwasser (Comparative study to determine the organic pollution of wastewater); Report by the Institute for Residential Waterworks, Water Quality and the Waste Industry, Stuttgart University (1994).
2. Matsché, N., Sturmwöhrer, K.: CSB-Bestimmung durch UV-Absorption (Determination of COD by UV Absorption) *Special I* 137 (1996), pages 25-31.

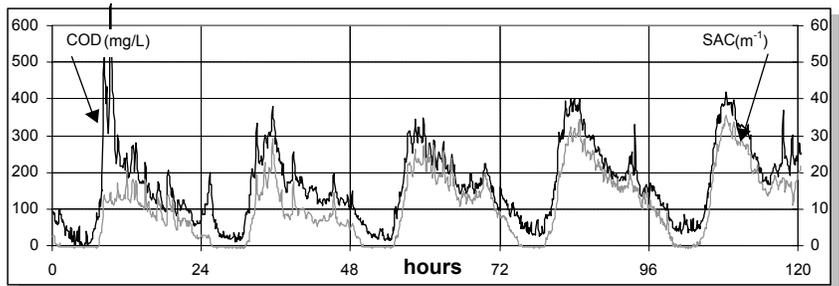


Figure 1 – Comparison of SAC and COD in the influent of a municipal wastewater treatment plant

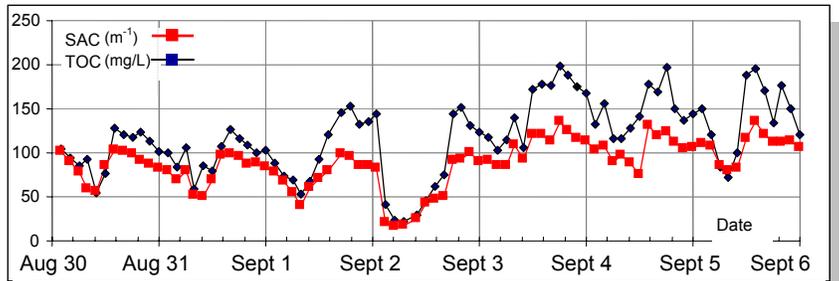


Figure 2 – Comparison of SAC and TOC in the main sewer of a municipality with a high concentration of industrial effluent

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

“Continuous SAC<sub>254</sub> Determination of Organic Pollutants Supports Management of Municipal Collection Systems,” Hach Application Solution AS-SAC1

“Continuous SAC<sub>254</sub> Determination of Organic Pollutants is Key in Real-time Wastewater Treatment Control,” Hach Application Solution AS-SAC2

“Continuous SAC<sub>254</sub> and TOC Measurement of Airport Runoff Streamlines Separation of Polluted and Unpolluted Water,” Hach Application Solution AS-SAC3

“Online SAC<sub>254</sub> Measurement Yields Operational Savings in the Paper Production Ozone System,” Hach Application Solution AS-SAC4

“SAC<sub>254</sub> Sensor for Reagent-free, Sampling-free Monitoring of Organic Materials in Drinking Water Treatment,” Hach Application Solution AS-SAC5



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