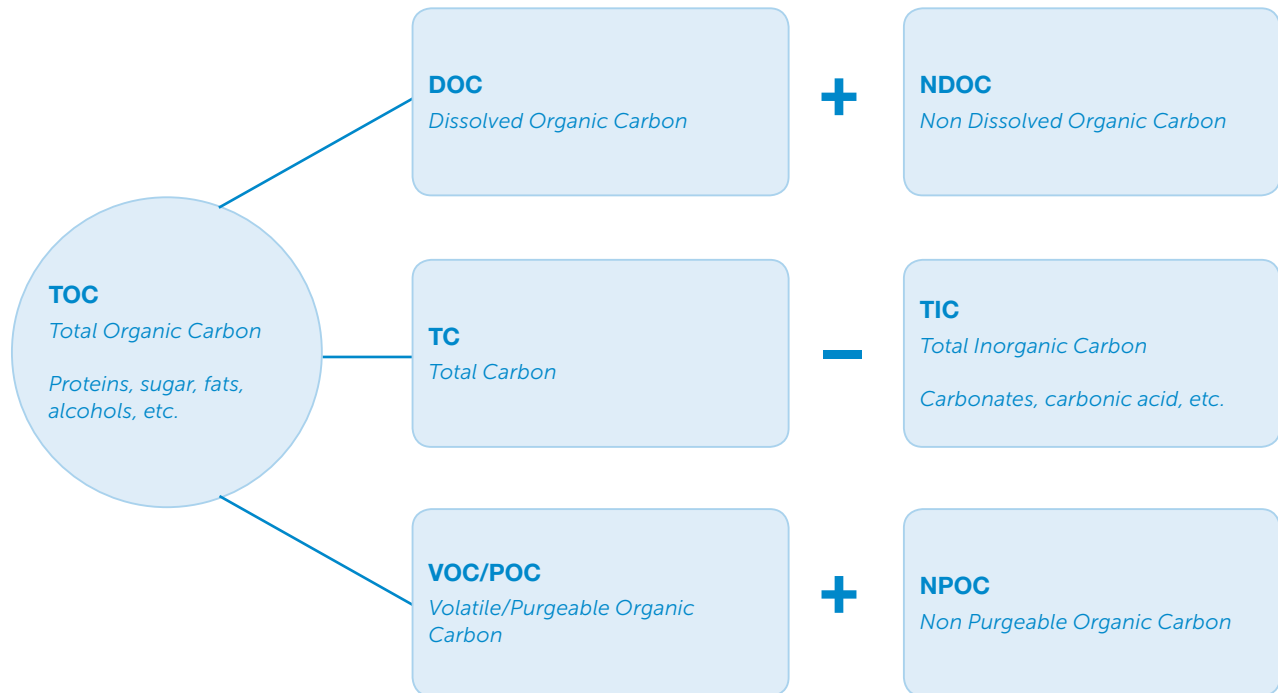


TOC – an insightful sum parameter



Introduction

In recent years, TOC has steadily gained in importance in both wastewater and drinking water analysis. In relationship to COD TOC provides specific information about the type and origin of organic loads in wastewater.

In drinking water production TOC is an important measurement for monitoring precursors to disinfection by-products (DBP). TOC monitoring and removal are regulated by the US EPA. Hach TOC Method 10267 is approved for measuring TOC in drinking water.

Advances have also been made in TOC analysis – no longer is a major investment required, either financially or in terms of equipment. Reliable and cost effective TOC measurements are possible with the Hach TNTplus® Vial Test System.

What does TOC tell us?

Alongside or in association with COD and BOD₅, TOC is an important sum parameter for assessing the organic load of water. As all organic carbon compounds are determined and specified in terms of carbon mass, TOC is an exactly definable absolute quantity and is directly measurable (unit: mg/L C).

Wastewater applications frequently measure organic loading via COD. Neither COD nor TOC on their own shed light on the oxidizability of the measured carbon or the amount of oxygen needed for its biodegradation. However, the ratio COD:TOC provides important information about the presence of certain organic compounds (e.g. alcohols, proteins, etc.). If this ratio changes, e.g. in the inflow of a sewage treatment plant, conclusions can be drawn immediately about the causes, and the possible effects on biological processes in the sewage treatment plant.

Drinking water producers monitor TOC as an indicator of potential DBP formation. The majority of organic material in source waters is from natural organic matter (NOM). NOM reacts with common disinfectants such as chlorine and chloramines to form DBP. Removal of TOC may be mandated as a means of minimizing DBPs.



TNTplus Vial Tests for TOC measurement by the purging method

The TOC is determined directly with just one measurement after the inorganic carbon (TIC) has been completely expelled from the sample (acidification + purging). Especially suitable for samples with:

- a TIC content that is much higher than their TOC content,
- a very low TIC content,
- a low TOC content.

Indicator vial



The indicator solution changes color depending on the amount of carbon dioxide which transfers across the membrane.

Double cap with CO₂-permeable membrane

Sample + Reagent, 2 h at 100 °C

Digestion vial

Functional principle of the TNTplus TOC Vial Test

TOC TNTplus Vial Tests

Vial tests are the simplest and most cost-effective TOC measurement option. The chemicals and photometer are factory-calibrated and are therefore ready for immediate use.

A wet chemical oxidative digestion is carried out, followed by photometric determination of the liberated carbon dioxide. The CO₂ passes from a digestion vial through a gas-permeable membrane and into an indicator vial. The resulting color change in the indicator is evaluated photometrically.

A significant advantage of this method is that even turbid, particle containing and colored samples can be analysed without difficulty, as only the color change in the indicator vial is measured.

The purging method requires the inorganic carbon (TIC) to be removed from the sample before the digestion is carried out. This is accomplished via the TOC-X5 shaker. The sample is simply pipetted into the digestion vial, and the open vial is positioned in the shaker. The combination of shaker and fan drives all the TIC out of up to eight samples simultaneously within just five minutes. The cap is then screwed onto the indicator vial, and the TOC digestion in the reactor can begin.



The shaker procedure saves time and is very easy and reliable from the point of view of handling.

- The correct amounts of all reagents are already present in the digestion vial.
- Analysis accessories do not need to be rinsed with TOC-free water.
- The two practical measuring ranges cover carbon concentrations from 1.5–300 mg/L. Homogenized samples can usually be analyzed immediately without any need for time-consuming dilution, which is also a potential source of error.



Using TNTplus Vial Tests and the TOC-X5 shaker, the TIC is purged in just 5 minutes – from up to 8 samples simultaneously.

Table 1: Overview of Hach TOC TNTplus Vial Tests

Order no.	Measuring Range	Sample preparation	Hach accessories	Hazard Codes
TNT810	1.5-30 mg/L C	Homogenization, purging, digestion	TOC-X5 shaker, reactor, photometer	GHS07 GHS08
TNT811	30-300 mg/L C			 

Analytcs solutions for the determination of organic load



Online UV Probe

for continuous reagent-free determination of organic load via the spectral absorption coefficient (SAC)



UV-VIS Spectrophotometer

for evaluation of the TOC and all other TNTplus Vial Tests, plus for reagent-free determination of organic load via SAC



Online TOC Analyzer

for continuous determination of TOC/TN/TP in challenging applications, e. g. containing fats, greases and oils as well as particulate loads



Laboratory TOC Analyzer

for determination of TOC in drinking water, semiconductor and power applications



Online TOC Analyzers

for continuous determination of TOC in condensate return, cooling and demineralized water, drinking water and effluent



For more information please visit www.hach.com

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