Application Note:

EN-03002

Total Organic Carbon (TOC) in Wastewater

Key Words

- TOC
- Wastewater
- High Temperature method

Introduction

TOC in wastewater streams is required in an increasing number of territories, enforced by environmental ruling or compliance. In other cases, it's important to know if such a stream threatens the functioning of a treatment plant. By measuring TOC, the number of carbon-containing compounds in a source can be determined. This is important because knowing the amount of carbon in a freshwater stream is an indicator of the organic character of the stream. The larger the carbon or organic content, the more oxygen is consumed. A high organic content means an increase in the growth of microorganisms, which contribute to the depletion of oxygen supplies. Both the plant effluent and the stream must be monitored for organic levels. Industrial waste effluent may contain carbon-based compounds with various toxicity levels. Both of these situations can create unfavorable conditions for aquatic life, such as the depletion of oxygen and the presence of toxic substances.

Referenced Documents

The HiPer-TOC analyzer complies with the following standard methods:

EN 1484:	Water analysis: Guidelines for the determination of Total Organic Carbon (TOC) and Dissolved Organic Carbon. (DOC)
ASTM D4839:	Total Carbon and Organic Carbon in Water by UV-Persulfate Oxidation, and/or Infrared Detection TC,IC,TOC in water, wastewater and sea water.
EPA 415.1:	Combustion or Oxidation

Principle of operation

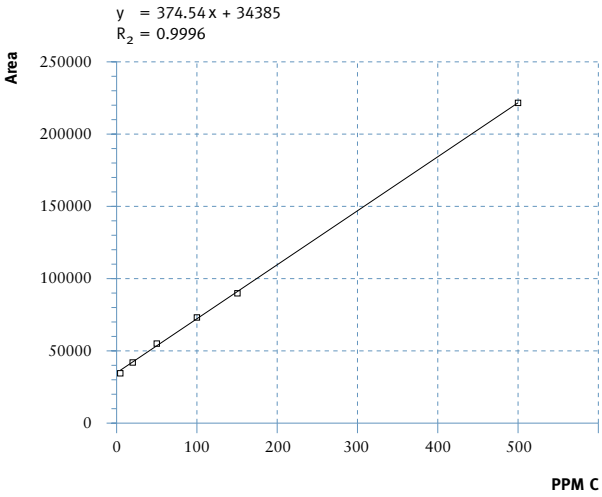
Preferred method for Wastewater applications, using the HiPer-TOC, is the High Temperature method. High temperature oxidation can take place at 680°C, combined with a platinum catalyst, or at 1000°C without catalyst. (depends on application)
The sample is automatically taken by the standard XYZ autosampler, and injected into the vertical positioned furnace tube. Both temperature configurations, ensure a complete oxidation of the water sample, including the allowed particle load. The produced CO_2 gas is passed through a gas-liquid separator, and "air dried" by a peltier cooler. The CO_2, together with the carrier gas, is led through two IR detectors, one being 10 times more sensitive than the other one. To better fit the analytical range, both can be calibrated simultaneously, resulting in less need for dilution and always-accurate results, without over-ranging. ThEuS software allows storage of several multiple point calibration lines. Working ranges used are standard or customer defined. Generated data and peaks can be recalculated afterwards, or during analysis. Preferred method is NPOC. (Non-Purgable Organic Carbon).
NPOC method:
TIC sparged off: The sample is automatically acidified in the autosampler, and TIC is sparged off. The sample is taken, injected into the furnace tube and oxidized. The peak appearing on the measuring screen represents the direct TOC value.

System settings

Furnace:	680°C with catalyst
Carrier gas:	Oxygen, 100 ml/min
Sample volume:	1000 µl
Injection speed:	3 µl/s
System configuration:	HiPer_TOC_HT
ThEuS method:	NPOC_HT_680

Thermo
ELECTRON CORPORATION

Standard Curve NPOC HT 680 iC

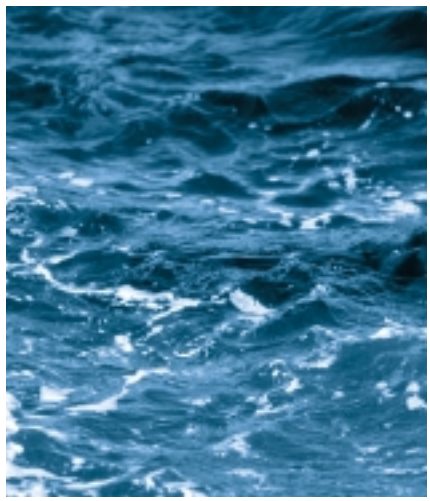


Concentration C PPM	Area
5	34351
20	41782
50	54978
100	73036
150	89625
500	221536

Typical NPOC results in waste water

Injection volume	1 ml	
Waste water containing Aminotriazole	1.36	ppm
Waste water containing Naphtyl Acetic acid	5.36	ppm
Waste water containing 2-Phenylphenole	2.57	ppm

Rsd ‹ 2%



Note: A complete Application Report with detailed test results is available on special request.

Thermo ELECTRON CORPORATION
www.thermo.com

Thermo Electron Corporation
Voltaweg 22
2627 BC Delft
The Netherlands

T +31 (0) 15 257 1314
F +31 (0) 15 257 2297
E info@thermoeuroglas.com

Thermo Electron Corporation has direct subsidiary offices in North America, Europe and Japan. To complement these direct subsidiaries, we maintain a network of representative organizations throughout the world. Use this reference list or visit our Web site to locate the representative nearest you.

Austria
Tel: +43 (0)1 333 50 34 0

France
Tel: +33 (0)1 39 30 53 00

Germany
Tel: +49 (0)6102 3671 0

Italy
Tel: +39 02 6601 6351

Netherlands
Tel: +31 76 5724840

EN-03002