

Simplifying TOC Analysis of High Inorganic Carbon (IC) Samples Using the Lotix TOC Analyzer

Technical Bulletin

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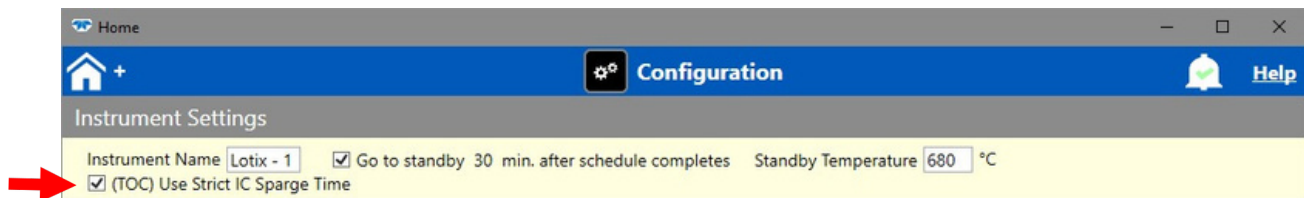
The Importance of IC Removal in TOC Analysis

Many total organic carbon (TOC) sample matrices including industrial brine, seawater and wastewater contain high amounts of inorganic carbon (IC) that can affect the accuracy of standardized environmental TOC analysis methodologies. Because both IC and TOC are converted to CO₂ during combustion oxidation, residual IC must be removed prior to combustion, to eliminate erroneously high TOC results.

Lotix TOC TekLink Enhanced IC Removal Feature (Version 3.1 or Higher)

The Lotix TOC TekLink software includes an enhanced IC removal setting, enabled by deselecting the “(TOC) Use Strict IC Sparge Time Check Box” on the Configuration Screen. When enabled, the IC sparge continues until the software recognizes the sample’s IC content has been removed (indicated by the release of CO₂), then automatically continues to the determination of TOC content. This setting eliminates any additional method development and the analytical uncertainty associated with high IC samples.

Figure 1 Configuration Screen – Deselect (TOC) Use Strict IC Sparge Time Setting



Standard and Sample Preparation

Calibration Standards

0.5, 1, 5, 10 and 20 ppmC Calibration standards were created using serial dilution of the 1000 ppmC stock standard.

1000 ppm IC Stock Sample Solution

Sodium Bicarbonate contains 14.29% IC and was used to make high IC content test samples using the following procedure:

1. A 1 L volumetric flask was filled halfway with DI water (<100 ppbC).
2. 7.069 g of 99% analytical grade sodium bicarbonate (NaHCO₃) was weighed to the nearest 0.001 g.
3. The NaHCO₃ was quantitatively transferred to the 1 L flask.
4. The 1 L flask was brought to volume with DI water (<100 ppbC).

Create Samples by Serial Dilution

A known amount of the 1000 ppm IC stock sample solution was diluted to achieve the concentrations shown in Table I.

Table I Sample Concentrations		
Sample Concentration	mL of Stock Sample	Final Volume (mL)
200 ppm IC	50	250
400 ppm IC	100	250
500 ppm IC	50	100

5 ppmC Quality Control (QC) Check Standard

The 5 ppmC calibration standard was used as a QC check standard and analyzed at the beginning and end of the sample schedule to ensure calibration integrity.

Proven IC Removal Results

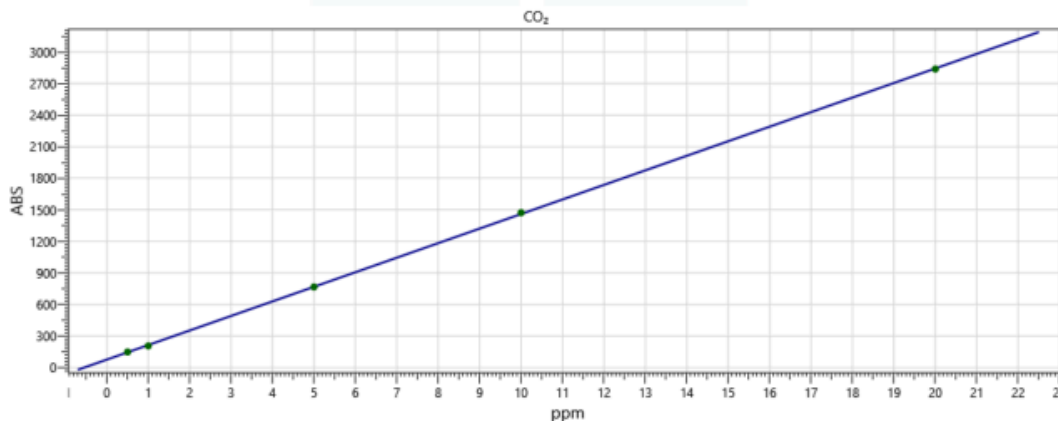
Calibration Results

A low-level calibration curve (0.5, 1, 5, 10 and 20 ppmC) was run to calculate residual carbon levels in the IC test samples.

Linear Curve: $y = 138.411x + 75.400$
Coefficient of Determination (r²): 0.99995

Standard Results

Actual ppmC	ABS	Measured ppmC	When
0.50	147.354	0.520	10/16/2019 1:39:04 PM
1.00	205.364	0.939	10/16/2019 1:54:49 PM
5.00	766.204	4.991	10/16/2019 2:10:34 PM
10.00	1472.073	10.091	10/16/2019 2:26:43 PM
20.00	2837.998	19.959	10/16/2019 2:42:54 PM



QC Check Standard Results

The 5 ppmC QC check standard was automatically calculated and within 10% accuracy.

Table II 5 ppm QC Check Standard Results		
Position	Calculated Concentration n=3	Accuracy
Start of Schedule	5.243 ppmC	95.14%
End of Schedule	5.368 ppmC	92.64%

IC Test Sample Results

Over 99.5% of the IC in the test samples (up to 500 ppm) was removed using the enhanced IC removal setting.

Table III IC Test Sample Results		
IC Test Sample Concentration	Average Residual IC n=3	Percent of IC Removed
200 ppm IC	0.564 ppm IC	99.72
400 ppm IC	0.569 ppm IC	99.86
500 ppm IC	2.024 ppm IC	99.60

Continuous Improvement Delivered to Meet Customer Needs

The Lotix TOC TekLink software's enhanced IC removal feature removed over 99.5% of the test sample IC content. This feature was designed for our customers who analyze samples with substantial IC content, and simplifies analysis by eliminating additional method development and removing analytical uncertainty.

At Teledyne Tekmar, we continue to strive to meet our customer's application needs and ease work flow. We offer free software upgrades to our customers. Refer to <http://www.teledynetekmar.com/Resource-Center/software-firmware-updates> for the latest software updates, features and tools.