



Evaluating the Fast Mode of the QbD1200+ TOC Analyzer

Introduction

The QbD1200+ Laboratory TOC analyzer is designed for pharmaceutical water analysis and cleaning applications. It uses a proprietary technology that oxidizes the organic carbon into carbon dioxide, which is measured to determine the organic carbon concentration. The QbD1200+ analyzer strictly adheres to the requirements from global pharmacopeia standards.

The QbD1200+ analyzer's new Fast Mode provides high-throughput capability without sacrificing accuracy and repeatability. Compliance remains assured thanks to the dynamic endpoint detection that guarantees complete oxidation of organic matter and removal of inorganic carbon to discriminate between inorganic carbon and organic carbon from the oxidation of organic matter.

Objective

The goal is to evaluate the possibility of using the Fast Mode on an instrument calibrated with the standard measurement mode and to evaluate the impact of the Fast Mode on accuracy, repeatability, and sample-to-sample carryover. It will be achieved by performing multiple measurements of samples at various concentrations and of blanks. For consistency between measurements, tests have been performed using the AutoSampler. Evaluation of the gain in sample throughput will also be discussed.

Procedure

1. Place blank solutions and samples at 500, 1,000 and 10,000 ppb on the AutoSampler.
2. Set the measurement parameters as per Figure 1. The reactor temperature adjustment is automatically unchecked when selecting the Fast Mode.
3. Perform measurements of 3 blanks to assess the blank TOC concentration.
4. Analyze samples according to the following sequence:
 - Blank
 - 500 ppb
 - Blank
 - 1,000 ppb
 - Blank
 - 10,000 ppb
 - Blank

Note that since the Autorange mode is off, it is expected that the 10,000 ppb sample will not be accurate or may saturate the detector.

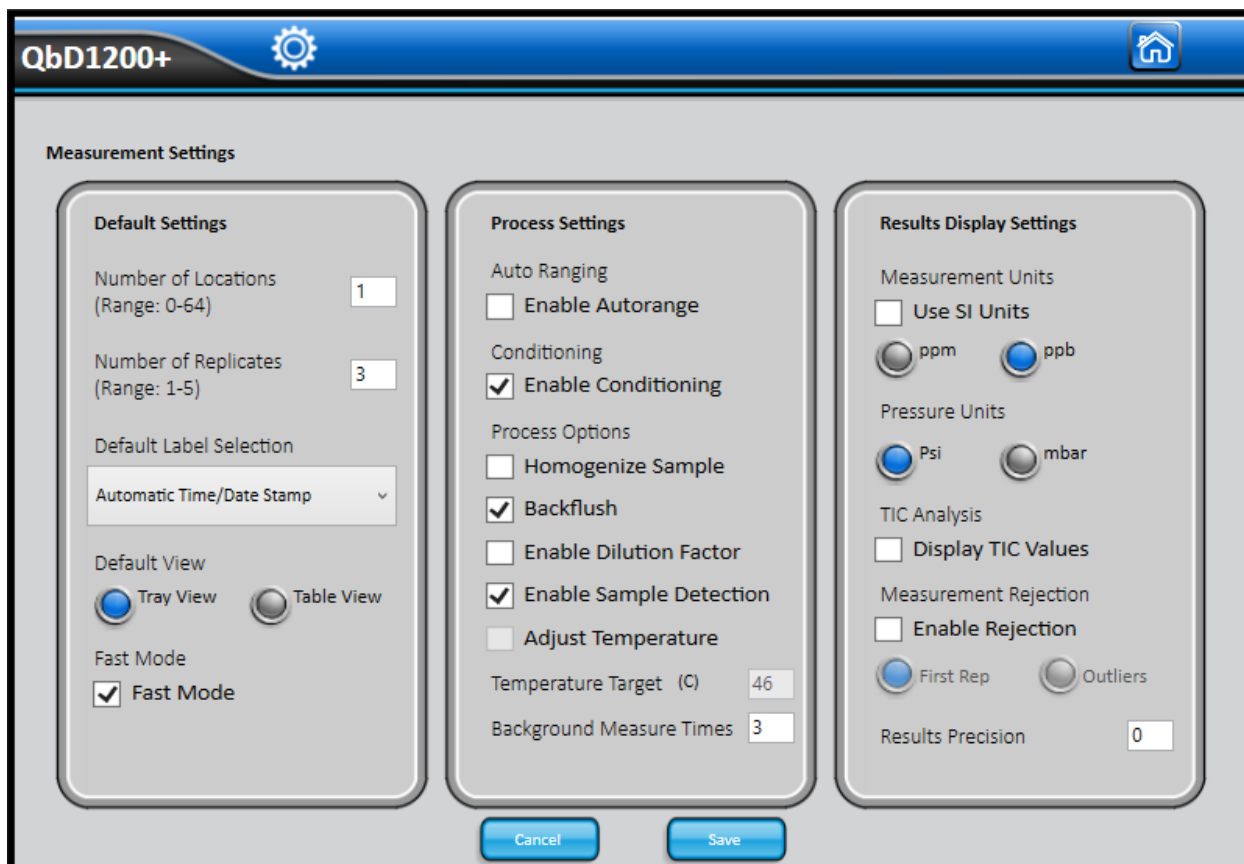


Figure 1: QbD1200+ TOC Analyzer measurement parameters to evaluate the Fast Mode.

Results are shown in Table 1. The average water blank value was calculated on 3 measurements. Average Water Blank Adjusted Concentration was calculated as the difference between the measured concentration of blank samples and the average water blank concentration.

Date	Sample Concentration (ppb)	Measured Concentration (ppb)	Adjusted for Average Water Blank (ppb)	Std. Dev.	RSD (%)
9/18/2024	Water Blank 1	4.2			
9/18/2024	Water Blank 2	2.2			
9/18/2024	Water Blank 3	2.3			
Average of Water Blank (ppb):		2.9			
9/18/2024	500	512		1.5	0.3
9/18/2024	Water Blank	2.8	-0.1		
9/18/2024	1,000	989.9		3.8	0.4
9/18/2024	Water Blank	3.5	0.6		
9/18/2024	10,000	8909.9		7.4	0.1
9/18/2024	Water Blank	9.4	6.5		

Table 1: Values correspond to the average of three replicates for each sample. The Average Water Blank is the average value of 3 consecutive measurements with three replicate runs of the Water Blank.

These results demonstrate that the QbD1200+ TOC analyzer is not sensitive to carryover and can provide accurate and repeatable results:

- The measured concentrations for samples at 500 ppb and 1,000 ppb show good accuracy of the QbD1200+ analyzer while using the Fast Mode. The low RSD (%) values obtained on the three replicates demonstrate good repeatability on the standard solutions.
- The instrument shows no significant carryover after analysis of 500 ppb and 1,000 ppb. After the measurement of 10,000 ppb, the system shows 0.07% of carryover that remains acceptable for most applications.

The total analysis time using Fast Mode is 2 hours and 30 minutes, which compares to 4 hours and 40 minutes using the standard mode. It is a gain in efficiency of 54% that enables the analysis of more samples within a day or helps reduce running costs. Note that the gain in efficiency can be different depending on the amount of TOC in the samples analyzed, as high TOC concentrations require more time for complete oxidation.

Conclusion

The results from this experiment demonstrate that the Fast Mode of the QbD1200+ analyzer can be used on an instrument calibrated using the normal mode without impacting accuracy of the results. The Fast Mode doesn't have a negative impact on the repeatability of the measurements and doesn't have a significant impact on the carryover, maintaining the possibility of getting accurate results for low concentrations of TOC, even with wide variations in concentrations between samples. The gain in efficiency helps reduce the cost per sample and enables the possibility to analyze more samples per day.

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