GE Infrastructure
Water & Process Technologies
Analytical Instruments

CUSTOMER SAMPLE EVALUATION REPORT

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1. PURPOSE / BACKGROUND INFORMATION

The purpose for these tests was to evaluate the performance of the Sievers InnovOx Laboratory Total Organic Carbon (TOC) Analyzer. The principle of operation is based on the wet chemical oxidation technique. The InnovOx elevates the temperature of the sample and reagent mixture to ensure efficient oxidation. The temperature realized is enough to convert the liquid water sample into supercritical water. Once in this phase, a phenomena called supercritical water oxidation occurs. The resultant carbon dioxide is measured by a non-dispersive infrared spectrometer.

2. SAMPLE PREPARATION / EXPERIMENTAL TEST PLAN

Laboratory grade 30% Hydrogen Peroxide solution, H_2O_2, was used for evaluation. The InnovOx analyzed the samples in Non-Purgeable Organic Carbon (NPOC) mode. In the NPOC mode, a sample is mixed with acid and oxidizer. The inorganic carbon is converted to carbon dioxide by the acid and removed from the sample matrix and vented by purging with a carbon dioxide free air. The remaining carbon in the sample is presumed to be the remaining TOC. The data reported in section 5 was acquired in NPOC mode.

Analyses were performed on two identical samples vials with an InnovOx 900 Autosampler. A 10ppm KHP standard was analyzed at the end of the evaluation to demonstrate system performance. The acid used was 6M hydrochloric. Because of the oxidation properties of H_2O_2, no additional oxidizer was used in the process.

From a conversation with Steve Zhou, he mentioned that some samples may be as high as 70% H_2O_2. With that consideration, the samples were run in the 5:1 automatic dilution range on the InnovOx. This feature will allow an analyst to simply run samples as received allowing the InnovOx to automatically dilute the sample and report the full concentration strength.

3. METHOD PARAMETERS

Parameter	Value
Measurement Mode	NPOC
Range	0-1000ppm
Acid %	1.0
Oxidizer %	0.0
Sparge Time	0.83 Minutes
Flush	Off
Resuspend	Off
Blank Correction	Off
Calibration Applied	0 to 1000 pt pt April 11, 2008
Calibration Type	Point to Point
Manual Dilution	1.0

4. CALCULATIONS

The InnovOx was calibrated using a point-to-point curve utilizing potassium hydrogen phthalate (KHP) as a standard. The concentrations used were Reagent Water, 1ppm, 10ppm 25ppm, 100ppm, and 1000ppm.

5. RESULTS

The following table represents the raw data collected from the InnovOx.

Test Results Group 1

Sample ID	NPOC ppm	Average ppm	Standard Deviation ppm	% Releative Standard Deviation
Sample 1 H_2O_2	3.87			
	4.02			
	3.91			
	3.5			
	3.89			
	3.15			
	3.18			
	3.29			
	3.37			
	3.21			
		3.54	0.35	9.8%
Sample 2 H_2O_2	3.41			
	3.52			
	3.78			

	3.82			
	3.13			
	3.68			
	3.82			
	3.13			
	3.68			
	3.32			
	3.28			
	3.85			
	3.63			
		3.54	0.25	7.0%
10ppm KHP Standard	9.66			
	9.62			
	9.53			
	9.68			
	9.37			
		9.57	0.13	1.3%

6. RECOMMENDATIONS

The InnovOx is capable of routinely analyzing the 30% H_2O_2 solution with acceptable precision. The nature of the sample matrix showed no signs of calibration shifting, component deterioration, or system contamination.

7. TEST EQUIPMENT USED

68005-1	SN0024	Sievers InnovOx Laboratory TOC Analyzer
68500-01	SN4719A11997	InnovOx Autosampler