

The Sievers InnovOx TOC Analyzer: Redefining Uptime for Brine Sample Analysis

Objective

Many industries need to know the amount of Total Organic Carbon (TOC) in a saline or brine solution to ensure accurate and reliable data generation. This is of particular concern to the seawater, petrochemical, and chlor-alkali markets.

A typical brine solution is a water-based aqueous sample that is free flowing, has minimum particulates, and contains dissolved sodium chloride or other salts. Seawater is generally a 3.5% brine solution, whereas a chlor-alkali sample may be as high as 28% brine. The importance of TOC testing is to determine product characterization, product quality, and release verification.

The salt matrix has always been a problem for analytical instrumentation when determining TOC. Specifically, in a UV-NDIR type system, the aggressive sample matrix attacks the lamp and dramatically reduces its effective life. Combustion-type techniques also exhibit great limitations, including catalyst poisoning and combustion tube divitrification. Once a unit has been attacked by a brine solution, it can take several hours of maintenance and hundreds of dollars to bring the unit back into operation.

To overcome marketplace concerns about excessive maintenance associated with available combustion TOC analyzers, GE Analytical Instruments developed the robust Sievers* InnovOx Laboratory TOC Analyzer that can handle the most difficult matrices. By utilizing an innovative and ultra-efficient Supercritical Water Oxidation technique, the Sievers InnovOx is



able to run hundreds of brine samples continuously with no recalibration, no system maintenance, and no replacement parts.

InnovOx Methodology

The Sievers InnovOx's principle of operation is based on the wet chemical oxidation technique, which adds an acid and oxidizer to the sample of interest. The inorganic carbon is removed by purging, and the sample is then oxidized with persulfate at elevated temperatures. The resultant carbon dioxide is measured by a nondispersive infrared spectrometer.

The Sievers InnovOx elevates the temperature of the sample and reagent mixture to ensure efficient oxidation and to convert the liquid water sample into supercritical water. Once in this phase, a phenomena called Supercritical Water Oxidation (SCWO) occurs. This innovation achieves greater than 99% efficient oxidation, resulting in superior accuracy and precision.



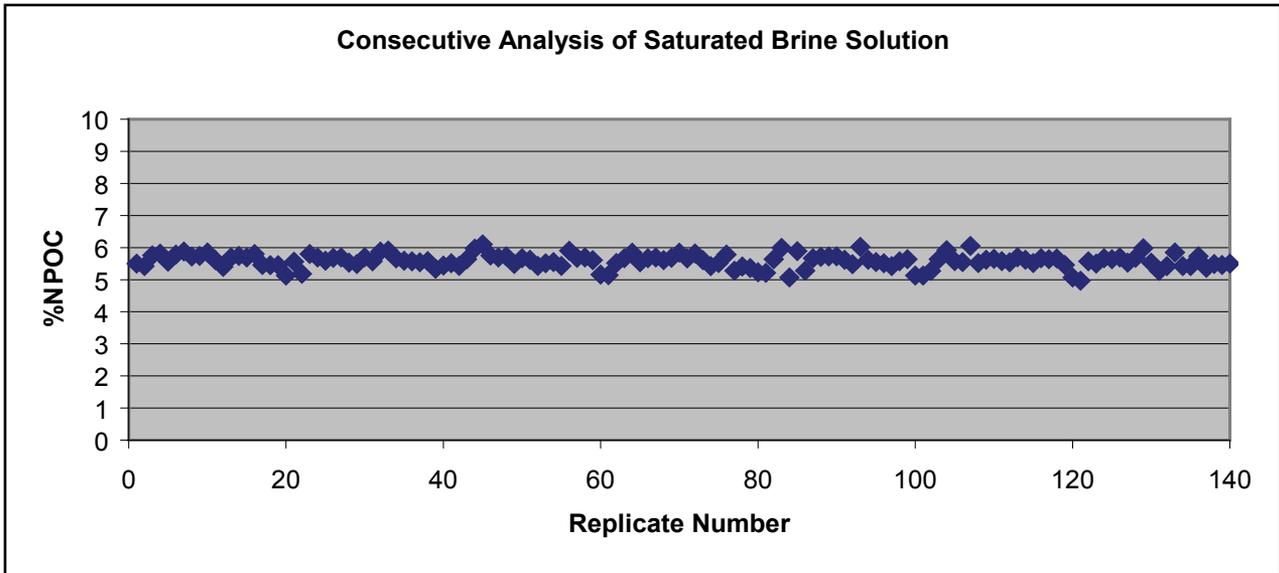


Figure 1. Saturated Brine Solution Sample Results

The InnovOx also removes problematic sample matrix contamination at the end of every analysis. As a result, there is no salt or oxidation by-product buildup in the reactor, tubing, or valves.

Long-term Analysis

For this study, the InnovOx was calibrated with potassium hydrogen phthalate (KHP). The samples were run in non-purgeable organic carbon (NPOC) mode. The sample analyzed was a saturated brine solution with no visible particulates. A total of 140 analyses were run over approximately 12 hours of unattended operation. The results are shown in **Figure 1** summarized in **Table 1**.

Conclusion

The Sievers InnovOx Laboratory TOC Analyzer has been proven capable of analyzing hundreds of consecutive, high-brine TOC samples without maintenance. The InnovOx TOC Analyzer's SCWO technique now allows difficult matrixes such as brine to be analyzed with confidence, ease, and minimal maintenance interaction.

Table 1. Data Results

Mean	5.58 ppm
Standard Deviation	0.21 ppm
Relative Standard Deviation	3.80%

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