

Water Technologies & Solutions

# Sievers\* InnovOx On-Line TOC Analyzers

for organics monitoring includes BOD and COD reporting



ready for the resource revolution



## overview

Sievers InnovOx Total Organic Carbon (TOC) Analyzers are designed to continuously measure organic carbon in a broad range of water streams ranging from steam condensate to wastewater influent and effluent to concentrated brine in chemical applications. All InnovOx Analyzers include robust sample handling capability and industry leading supercritical water oxidation (SCWO) technology, all designed to enhance performance and uptime in challenging applications.

## industries served

- Pharmaceutical
- Hydrocarbon Processing
- Pulp and Paper
- Food and Beverage
- Chemical Production
- Wastewater Treatment

## InnovOx measurements for brine, cellulose, and humic acid samples

| Replicate   | 28% Brine Solution<br>(Process Sample) | 90 m Cellulose Solution<br>(100 ppm C) | Humic Acid Solution<br>(10 ppm C) |
|-------------|--|--|-----------------------------------|
| 1           | 5.80                                   | 95.1                                   | 10.2                              |
| 2           | 5.69                                   | 98.0                                   | 10.1                              |
| 3           | 5.59                                   | 90.9                                   | 10.4                              |
| 4           | 5.68                                   | 104                                    | 10.4                              |
| 5           | 5.69                                   | 93.2                                   | 10.2                              |
| 6           | 5.53                                   | 98.0                                   | 10.2                              |
| 7           | 5.49                                   | 93.3                                   | 10.4                              |
| 8           | 5.70                                   | 101                                    | 9.91                              |
| 9           | 5.57                                   | 103                                    | 9.86                              |
| Mean        | 5.66                                   | 97.3                                   | 10.19                             |
| Stand. Dev. | 0.12                                   | 4.50                                   | 0.20                              |
| RSD         | 2.13%                                  | 4.63%                                  | 2.0%                              |

*InnovOx Robust SCWO Oxidation*

† BOD or COD values are calculated based on the TOC measurement.

## real-time monitoring applications

**Biological wastewater plant optimization.** Monitoring organics before and after treatment can allow operators to optimize the F/M (food to microorganism) ratio, thereby enhancing organics removal and reducing sludge, minimizing chemical usage as well as avoiding system upsets.

**Wastewater effluent monitoring and COD/BOD correlation.†** As a fully automated surrogate for time consuming and difficult COD and BOD tests, the InnovOx TOC instrument can continuously track the performance of a wastewater system. Optimizing the process provides confidence that regulatory testing results will be within permit limits.

**Steam condensate leak detection.** The InnovOx is uniquely capable of monitoring hot condensate water up to 85 °C (185 °F) and quickly identifying glycol, hydrocarbons, or other product leaks before expensive boiler/steam components or final products are damaged or contaminated.

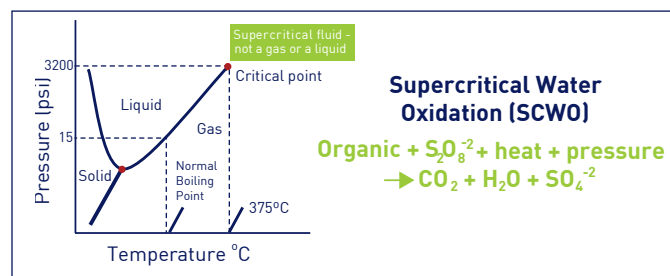
**Cooling water contamination.** The InnovOx continuously monitors both raw water and discharged cooling water to protect cooling systems from contamination and quickly identify leakage of any organic before discharge to the environment.

**High-salt seawater and brine monitoring.** The patented SCWO oxidation technology was designed to measure organics reliably in high-salt or brine samples commonly encountered in refineries. Unlike combustion TOC technologies that can easily be plugged or damaged by salt, the InnovOx oxidation reactor is self-cleaning and is not affected by salts coming out of solution.

## supercritical water oxidation (SCWO)

Supercritical Water Oxidation (SCWO) was originally developed to treat large volumes of aqueous waste, sludges, and contaminated soils. SCWO destroys organic wastes using an oxidant in water and temperatures and pressures above the critical point of water: 375 °C (770 °F) and 22.1 MPa (3,200 psi). These conditions enable rapid and complete oxidation of organic carbon to CO<sub>2</sub>.

Today, SCWO research and development is focused on treating a variety of toxic and hazardous organic wastes. Sievers Instruments is the first company to use this technique in a commercial online TOC instrument.



## compliance

**US EPA Method 415.1** – Organic carbon in drinking, surface, seawater, and waste water

**US EPA Method 415.3** – Organic carbon in surface and drinking water

**US EPA Method 9060A** – Organic carbon in ground, surface, saline, and waste water

**CEN Method DIN EN 1484** – Organic carbon in drinking, ground, surface, sea, and waste water

**ISO 8245** – Organic carbon in drinking, ground, surface, sea, and waste water

**ASTM D5173** - Standard Guide for On-Line Monitoring of Total Organic Carbon in Water by Oxidation and Detection of Resulting Carbon Dioxide

**Pattern Approval Certificate** for Measuring Instruments of the People's Republic of China, issued by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China

## product capabilities

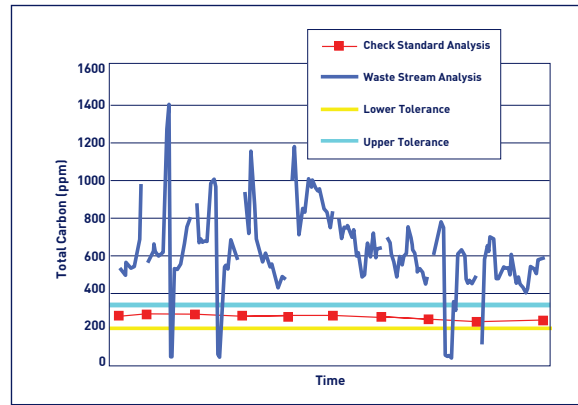
- Wide dynamic range of 50 ppb to 50,000 ppm TOC
- Robust sample handling options for reliable operation even with high suspended solids
- Patented supercritical water oxidation (SCWO) for superior TOC recovery and high reliability
- Reliable NDIR detection technology with no moving parts
- Straightforward operation
- High temperature option allows measurement of samples up to 85°C
- Versatile measurement modes include TOC (TC-IC) or NPOC
- Handles tough TOC samples, like cellulose and brine

## options & accessories

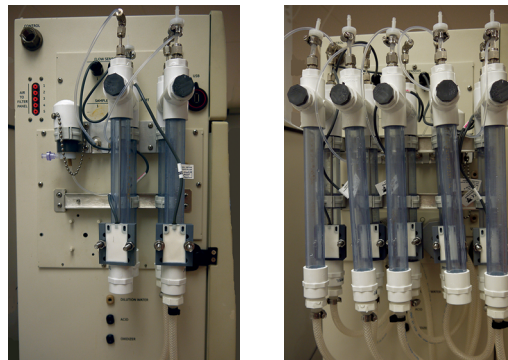
**Multi-stream capability.** Either 2-stream (standard) or 5-stream (optional) configurations. Allows monitoring of multiple sample streams where processes are not so dynamic that they require continuous monitoring.

**High-temperature sampler.** Stainless steel components allow for monitoring of samples up to 85°C. Ideal for use in steam condensate and cooling tower applications (available in 2-stream version only).

**Wastewater sampler.** For wastewater applications, a sampler is available in either 2-stream or 5-stream configurations. Configurable for either low to moderate or high levels of particle content without the maintenance of filtering systems. Ideal for wastewater applications in a wide range of industrial applications.



*InnovOx On-Line Analyzer Data*



*Wastewater 2-Stream and 5-Stream Option*

### **NEMA 4X/Class 1 Division 2/ATEX enclosures.**

Enclosure options for varying levels of harsh environments or hazardous locations. For use in elevated ambient temperatures, environments with corrosive gasses, refinery, or high dust applications.

**Fail safe.** Monitors for the presence of sample flow and adequate supply of reagents/check standards to increase reliability. Recommended for most applications.

**Exterior sample pumps.** Auxiliary sample pumps for applications where a pressurized sample is not available. Pulls sample from a reservoir or tank.

# system specifications

## operating specifications<sup>1</sup>

|                           |   |
|---------------------------|---|
| Analysis Modes            | NPOC, TOC (TC-IC), TC, IC   |
| Range                     | 50 ppb to 50,000 ppm TOC  |
| Precision                 | RSD ≤3% of reading at >5 ppm NPOC or TOC  |
| Accuracy                  | Greater of ± 3% of reading or ± 0.25 ppm, 1 to 100 ppm, NPOC or TOC                           |
| Linearity                 | R <sup>2</sup> ≥ 0.995, measured as NPOC  |
| LOD                       | ≤50 ppb NPOC mode <sup>2</sup>  |
| TOC Calibration Stability | Up to 6 months  |
| Analysis Time             | 2.6 to 8.3 minutes  |
| Particle size             | ≤200 µm without filtration or >200 µm with optional wastewater sampler                        |
| Sample Temperature        | 5-60° C (41-140° F), or 5-85° C (41-185° F) with high-temperature options                     |
| Ambient Temperature       | 10-40° C (50-104° F)  |
| Source Sample Pressure    | 125 psig maximum with provided control valve<br>0.5 psig minimum without optional sample pump |
| Minimum Sample Flow Rate  | 50 mL/min without optional sample pump  |
| Drain                     | Gravity Drain   |

## analyzer specifications

|                                   |   |
|-----------------------------------|---|
| Outputs                           | External USB Port (1); Internal USB Ports (2); Ethernet (1); Binary End-of-Analysis Output (1); Isolated 4-20 mA Analog Outputs (5 analytical; 1 for stream ID) |
| Inputs                            | Binary Input (1) for Remote Analysis Start/Stop   |
| Display                           | Color LCD w/touch-screen  |
| Power                             | 100 – 240 ± 10% VAC, 50 – 60 Hz, 400 VA   |
| Alarm Relays                      | System Fault Alarm (1); User-Configurable Alarms, High and Low Limit (4)  |
| Communications Protocols          | Modbus®; TCP/IP over Ethernet   |
| Installation/Overvoltage Category | II  |
| Sample Streams                    | 2 Streams (standard), 5 Streams (optional)  |
| Dimensions                        | H: 92.7 cm (36.5 in.); W: 64.6 cm (25.4 in.); D: 38.7 cm (15.3 in)  |
| Weight                            | 36.3 kg (80 lb)   |
| Safety Certifications             | CE, ETL listed. Conforms to UL Std. 61010-1. Certified to CSA C22.2 NO. 61010-1   |

## environment

|                           |                                      |
|---------------------------|--------------------------------------|
| Maximum Relative Humidity | IP56/NEMA 4X/Class 1 Division 2/ATEX |
| Normal Operating          | Up to 95%, non-condensing            |
| Maximum Altitude          | 3,000 m (9,800 ft)                   |
| Pollution Degree          | 2                                    |

1. Stated analytical performance is achievable under controlled laboratory conditions that minimize operator and standards errors.
2. NPOC mode, bottled N<sub>2</sub> as carrier gas. This performance is achieved under controlled conditions where variables that influence low-level performance have been minimized or eliminated. This performance may not be achievable on instruments delivered before August 2016.

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6060 Spine Road  
Boulder, CO 80301-3687 USA  
T +1 800 255 6964  
T +1 303 444 2009  
F +1 303 527 1797  
[www.sieversinstruments.com](http://www.sieversinstruments.com)

