

CUSTOMER ANALYTICAL SERVICES

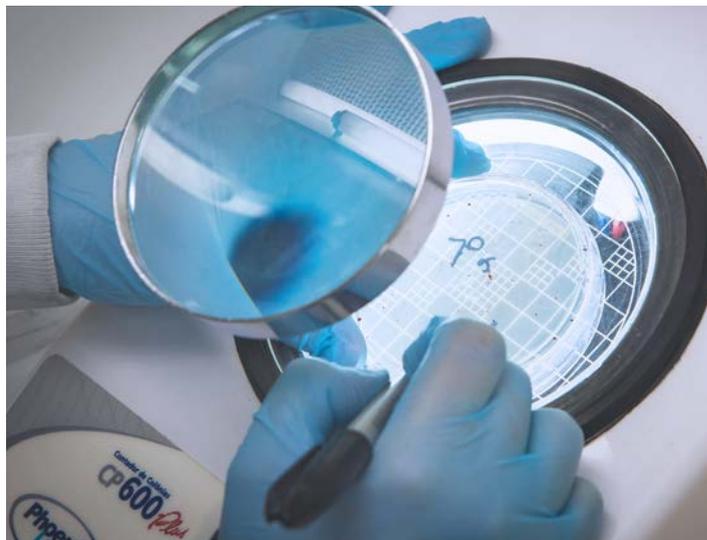
Analytical Capabilities for Industrial Water Customers



Water is the lifeblood of most industrial operations. It's also the focus and passion of Solenis. For nearly 100 years, our experts and research scientists have helped facility managers and engineers in water intensive industries optimize their water treatment processes with an array of innovative specialty chemicals and equipment. The Customer Application Laboratories, which include Customer Analytical Services, serve as hubs of our application expertise, ensuring that Solenis is prepared to meet the needs of our customers today and into the future.

Comprehensive analytical services. Global reach.

As a key element of Solenis' Customer Applications Laboratories, the Customer Analytical Services (CAS) group works closely with our sales, application, and research teams to understand industrial water systems and problems, as well as assist in the development of new treatment technologies. With laboratories located in Wilmington, Delaware; Paulínia, Brazil; Krefeld, Germany; Barendrecht, the Netherlands; Drammen, Norway; Terrassa, Spain; and Shanghai, China, we are dedicated to meeting the needs of customers in every region of the world. Solenis CAS laboratories are staffed with experienced scientists and technicians, who use an extensive array of analytical instrumentation to deliver the most accurate, relevant, and timely results. Solenis' laboratories can provide comprehensive analysis of inorganic, metallurgical, microbiological, and organic samples.



Anions/Cations and Functional Analysis in Water

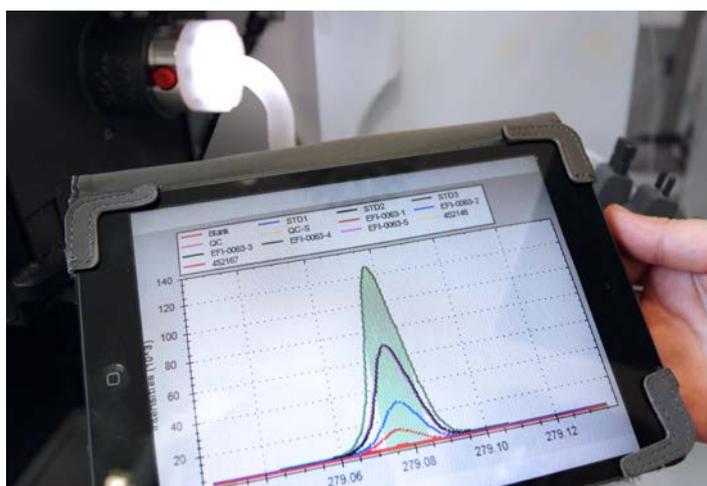
A thorough knowledge of water chemistry allows for anticipation and prevention of potential scaling, deposition, corrosion and other problems. Solenis scientists use a number of techniques to understand these phenomena, including:

- Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) for metals analyses
- Capillary Electrophoresis (CE), Ion Chromatography (IC), and Ion-selective Electrode (ISE) for anion analyses
- Automated spectrometry for phosphate detection
- Automated titrators to measure conductivity, alkalinity, and pH
- UV-Vis Spectroscopy to estimate Chemical Oxygen Demand (COD)

Organic Analysis in Water

Organic analysis is another important aspect of water analysis for the purpose of monitoring chemical treatment levels and contaminations. Key Solenis CAS lab capabilities include:

- Evaluation of metal passivators, such as amines, and corrosion inhibitors, such as azoles, using Gas Chromatography-Flame Ionization Detector (GC-FID) and High Performance Liquid Chromatography (HPLC) techniques
- Detection of residual biocides with HPLC
- Detection of volatile components with headspace Gas Chromatography/Mass Spectrometry (GC/MS)
- Detection of glycols with Fourier Transform Infrared (FTIR) Spectroscopy
- Detection of oil content
- Measurement of Total Organic Carbon (TOC) and nitrogen with elemental analyzers
- Assessment of Adsorbable Organohalogen (AOX) contaminants



Microbiological Analysis

The Solenis CAS laboratory performs problem-solving analysis to identify sources of microbial contamination in the industrial water systems. Analysis methods include:

- Cultivations to determine Total Plate Count (TPC) of microorganisms, including *Escherichia coli*, *Legionella* and *Pseudomonas aeruginosa*
- Identification of various bacteria including sulfate-reducing, iron-reducing, and nitrifying bacteria
- Rapid Legionella analysis with real-time Polymerase Chain Reaction (PCR) testing
- Biocide screening and chlorine dioxide demand testing
- Microscopic techniques, such as identification and live/dead staining
- Toxicity tests including luminescence

Metallurgy

Our experts conduct failure analyses and general assessments of various metal components found in steam generation, heat exchangers, and cooling water systems. Some techniques used to analyze corrosion failure mechanisms include:

- Corrosion coupon analysis
- Deposit weight density measurements
- Photographic documentation
- Dimensional analysis
- Positive material identification
- Microstructural evaluation
- Metal hardness testing
- Electrochemical analysis methods

Deposit Analysis

Our scientists use advanced organic, inorganic, and microbiological analysis techniques to identify components of complex process and functional problems. Some techniques used include:

- Organic characterization with FTIR and pyrolysis GC/MS
- Detection of inorganic components with Scanning Electron Microscopy Energy Dispersive X-ray Spectroscopy (SEM-EDS), X-Ray Fluorescence (XRF), and ICP-OES
- Identification of biological material with microscopic techniques
- Loss on ignition test by standard ashing or thermal gravimetric analyzer
- Oil and grease analysis

Ion Exchange Resin Analysis

The water treatment industry is currently placing increased emphasis on ion exchange techniques as a means of reducing fuel, water, and chemical treatment costs. Solenis CAS laboratory provides a series of analysis for cation, anion and mixed bed resin samples to help our customers troubleshoot their systems, including:

- Total exchange capacity
- Moisture retention capacity
- Microscopic bead integrity examination
- Metal fouling analysis by ICP-OES



Real-world science. Rapid response.

The quality of communication between Solenis' CAS team and our customers is just as important as the quality of the science in supporting the efficiency of industrial operations. This is especially true when analytical testing reveals out-of-specification results. Seamless coordination between lab and field, supported by state-of-the-art systems and software, ensures timely transmission of analytical results to sales representatives for fast interpretation and problem-solving recommendations.



Solenis

Strong Bonds. Trusted Solutions.

Solenis supplies specialty chemicals for water-intensive industries, including the pulp and paper, oil and gas, chemical processing, mining, biorefining and power markets. Whether you want to increase production, develop new products, reduce costs or simply do more with less, we can help. With our innovative technologies, passionate people and unrivaled experience, Solenis is ready to deliver the solutions you need.

To learn more, contact your technical sales representative or visit us online.

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