thermo scientific

Solution for routine and comprehensive water analysis

Thermo Scientific Disc-IC Systems— a fully-automated high throughput solution

ThermoFisher SCIENTIFIC

Industrial process water analysis

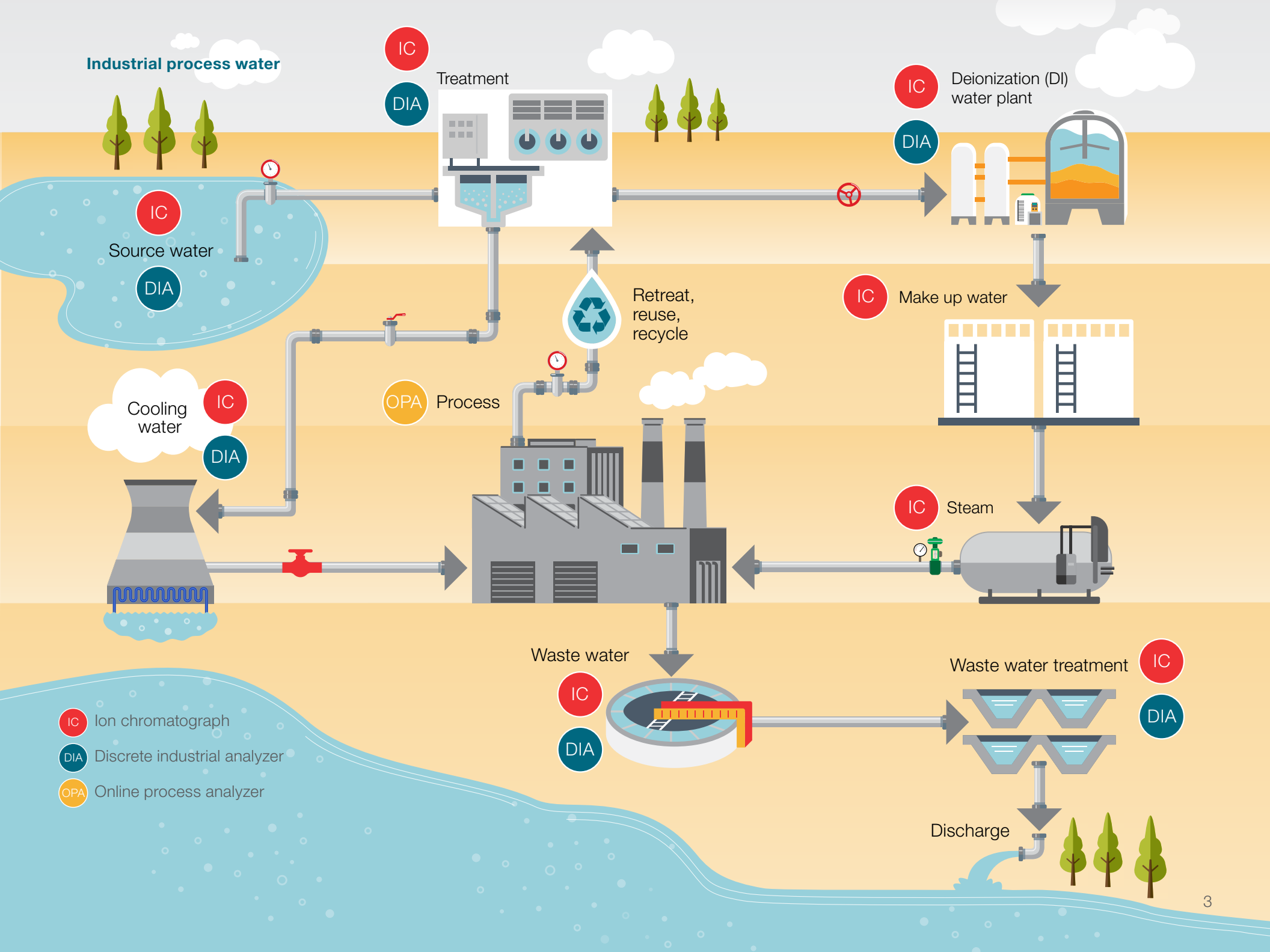
The majority of industrial manufacturing processes, such as distilling crude oil to refined petroleum products, paper production from wood chips, cracking larger naphtha molecules to ethylene, making polymers from ethylene oxide, power generation, and making high speed microprocessors, all need large quantities of high purity water. Clean water in adequate amounts is an ongoing global challenge. Water resources are experiencing increasing pressure in many parts of the world, requiring countries to improve the management and protection of water ecosystems. For these reasons, major water-consuming industries have a sustainable process water "reuse-recycle" program that minimizes the need for fresh water intake.

Water purity is a constant concern, monitoring the quality of intake raw water, and deionization plant efficiency is an everyday task for industries needing high purity steam. High purity deionized water production involves consumption of large quantities of treatment chemicals and energy in addition to the use of expensive ionic resin and membranes. Corrosion and scaling contribute significant cost to the operation and maintenance of boilers, heat exchangers, cooling water lines and turbines. The build-up of sub-µg/L concentrations of impurities in water used to drive steam generators propagates stress corrosion, cracking and other corrosion mechanisms. The ionic purity of boiler feedwater and steam is important to maintain component functionality and reliability in manufacturing plants. Failure mechanisms in the boiler, turbine, heaters, and condensers of power plants can be directly related to water and steam ionic purity. To prevent corrosion or scaling, these waters must be monitored continuously to detect upsets, leaks, carryover, and to ensure plant safety.

Monitoring, testing and maintaining sustainable water programs is essential for safe and profitable operation of all major water-consuming industries.

Routine process water analysis is critical for:

- Protecting process equipment from corrosion and scaling
- Optimizing water chemistry to gain energy efficiency
- Controlling cost by treating and reusing waste water
- Saving on chemical cost


Industrial process water
IC
DIA
Treatment
IC
Deionization (DI) water plant
DIA
IC
Source water
DIA
Retreat, reuse, recycle
IC
Make up water
Cooling water
IC
DIA
OPA
Process
IC
Steam
Waste water
IC
DIA
Waste water treatment
IC
DIA
Discharge
IC Ion chromatograph
DIA Discrete industrial analyzer
OPA Online process analyzer

Industrial water analysis—from point of entry to waste water

Process water quality is an integral part of the industrial manufacturing process. Water quality can change as it passes through a delivery or re-circulation system, so it is important to check for various parameters at point of use—i.e., where it enters the boiler or pretreatment system. Each water sample needs to be tested for multiple parameters, usually by multiple techniques to make sure the produced and reused process water is free of contamination. Source water and process water need to be tested for corrosive ions such as fluoride, chloride, sulfide, sulfate, and analytes that cause deposition in boilers such as silica, calcium, and magnesium. Additionally, testing is needed for analytes in chemicals that are added to the process water to prevent corrosion such as ammonia, zinc, molybdenum, amines, and nitrite. Before discharging, waste water needs to be tested to fulfill local regulatory requirements on discharge limits such as those enforced by the United States Environmental Protection Agency (U.S. EPA). Continual process water testing for iron and chromium is important for early detection of corrosion.

pH and conductivity measurements are often a critical early step in the water testing workflow. pH and conductivity are the most common parameters tested for all water samples, from the point-of-entry water to the waste water, to indicate overall utility performance. Water with a pH of less than 6.5 is typically corrosive at high temperature and can damage metal pipes and fixtures. Depending on the industry need, either a single or a combination of corrosion inhibitors such as ammonia, alkyl amines, alkanol amines or azoles are added to maintain an alkaline condition. Conductivity measurement estimates the total amount of dissolved solids (TDS) in the sample. Conductivity and pH along with the alkalinity and total hardness are critical parameters for deionization (DI) plant design and maintenance.

By understanding the level of contamination, facility operators can take actions to reduce the damage from corrosion, deposition, and scaling. Industrial water testing is, therefore, essential for quality control and process optimization.

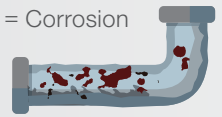
Multi-component analysis of corrosive ions, scaling ions, corrosion inhibitors, and corrosion indicators, provides detailed information for successful and predictable utility operation that bulk property analyses like conductivity do not.

Process water analytics

Parameters	Why	Where
pH Conductivity Alkalinity Total hardness	● ● ●	Source water DI water Make up water Cooling water Waste water
Silica Calcium Magnesium	●	DI water Make up water Cooling water
Fluoride Chloride Sulfate Sulfide	● ●	Source water DI water Make up water Cooling water Waste water
Nitrite Ammonia Alkyl amines Azole derivatives Poly acrylic acid (PAA) Alkanol amines Zinc Molybdenum Hydrazine Morpholine	●	Cooling water Make up water Steam condensate
Iron Copper Hexavalent chromium Zinc	●	Steam condensate Make up water Cooling water
Acetic acid Formic acid Glycolic acid	●	DI water Make up water Steam condensate
Total Kjeldahl Nitrogen (TKN) Total phosphate Total phenol Total Oxidizable Nitrogen (TON) Hexavalent chromium Cyanide Total cyanide Boron Total iron, etc.	●	Waste water

● = Scaling

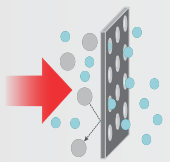
● = Corrosion



● = Regulatory compliance

● = Corrosion inhibitors

● = Resin/Reverse Osmosis (RO) membrane break through indicators



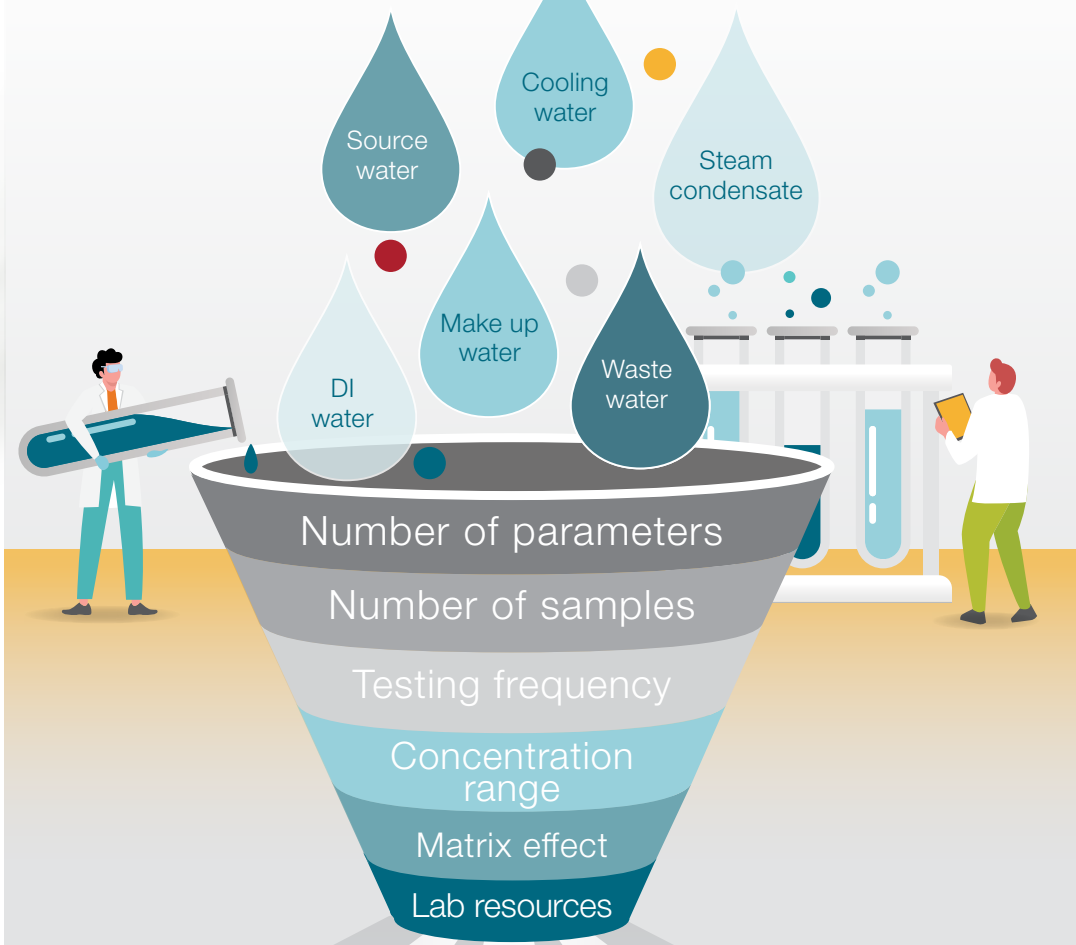
How does routine water testing impact the laboratory?

Daily testing many types of water samples for multiple analytes of varying concentrations increases the overall sample testing demand on utilities and central laboratories. For industrial process water quality monitoring, Thermo Scientific™ discrete analyzers and ion chromatography (IC) systems, offer rapid multiparameter testing, unattended high throughput analysis of large sample numbers, and cover a wide concentration range for sample types of varying ionic strengths. Together, discrete analysis and IC solve a majority of the water analysis needs for improved productivity and reliability.

List of analytics

Corrosive anions	Corrosion inhibitors	Corrosion indicators	Basic water analysis parameters
Fluoride Chloride Sulfide Sulfate Sulfite Thiosulfate	Ammonia Nitrite Phosphate Zinc Molybdenum	Total Iron Hexavalent chromium Zinc Copper	pH Conductivity Alkalinity Total hardness

Environmental parameters	Scaling parameters	Organic acids	Nutrients
Total Kjeldahl Nitrogen (TKN) Total phosphorus Total phenol Total Oxidizable Nitrogen (TON) Free and total cyanide Sulfide Aluminium Manganese Boron	Silica Calcium Magnesium	Formic acid Acetic acid Oxalic acid Glycolic acid	Ammonia Total phosphorous TKN TON



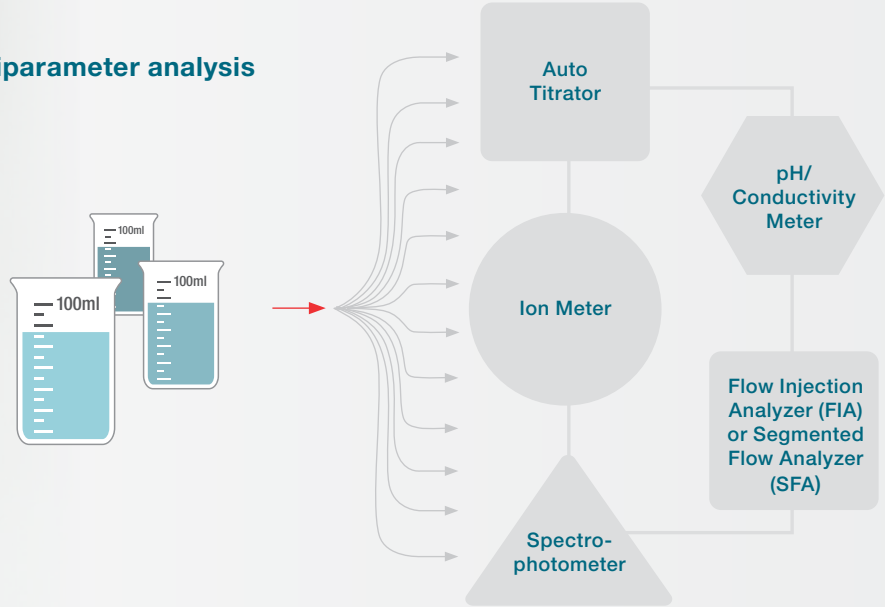
Thermo Scientific™ Disc-IC™ System

Thermo Scientific™ discrete analyzer + Thermo Scientific™ Dionex™ ion chromatograph

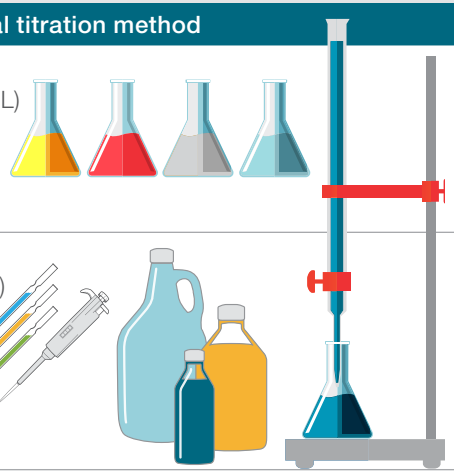
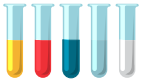
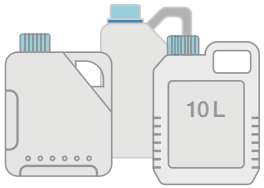
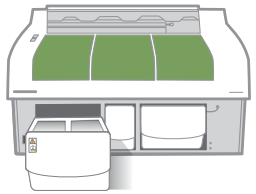
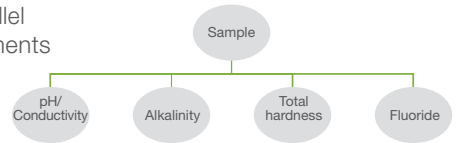
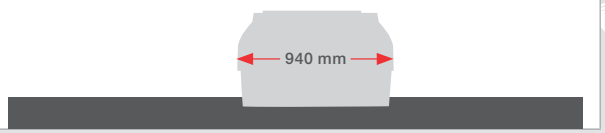
Routine high throughput process water and waste water analysis

Recycling and reusing process water increases the sample load of analytical testing labs. Utilizing the proper instruments to help ease your most critical daily applications is the key—regardless of whether you're in the industrial or in commercial testing lab. Typically, multiple automated traditional wet chemistry analytical methods such as titration, spectrophotometry, ion meter, pH/conductivity meter, and flow injection analyzers (FIA) are used to test several process water parameters.

Multiparameter analysis



Traditional automated techniques, such as titration and continuous flow analysis, are relatively inflexible: dedicated modules are used for specific chemistries, and dedicated skilled technicians are needed for instrument operation and maintenance. Analyses are time consuming and generate a large volume of reagent waste.

Feature	Traditional titration method	Fully integrated Gallery discrete analyzer platform
Size of sample volume	Large (50–100 mL) 	Small (20–120 µL) 
Reagent volume	Large (5–150 mL)	Very small (2–1240 µL) 
Waste disposal	High waste generation 	Low waste generation 
Productivity	Low: sequential measurements 	High: parallel measurements 
Speed/ throughput	20–30 sample per hour 	up to 350 tests per hour 
Cost per analysis	High 	Low 
Bench space	Large and open; exposed to harsh chemicals	Small; fully concealed for operator safety 

Thermo Scientific Gallery and Thermo Scientific Gallery Plus discrete analyzers

The Thermo Scientific™ Gallery discrete analyzer provides an integrated platform for two measurement techniques, photometric and electrochemical (ECM), which can be run in parallel. Discrete cell technology allows for simultaneous measurement of several different tests for the same sample, eliminating method changeover time. The Gallery system is able to achieve very low detection levels, and its sophisticated dilution features help to manage a wide concentration range without user intervention. The Gallery and Thermo Scientific™ Gallery™ Plus integrated discrete analyzers are fully automated and more flexible compared to traditional wet chemistry methods, performing many different tests within a single instrument while simultaneously determining multiple analytes and requiring only a single technician. The discrete cell technology allows laboratories to measure multiple analytes simultaneously while reducing total analysis and operator time. The unique low volume cuvette design accommodates small reagent volumes, minimizes reagent waste, and as a result, reduces reagent costs.

Gallery discrete analyzer workflow

Load cuvettes

Insert samples

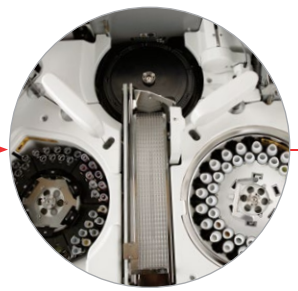
Insert reagents

Run analytes

Import sample table from LIMS

Create run table

Start analysis



Parallel pH/conductivity

Dispensing

Mixing

Incubation

Photometric measurement

Consolidated report

PDF

LIMS export

Spreadsheet

Walk away from Gallery discrete analyzer

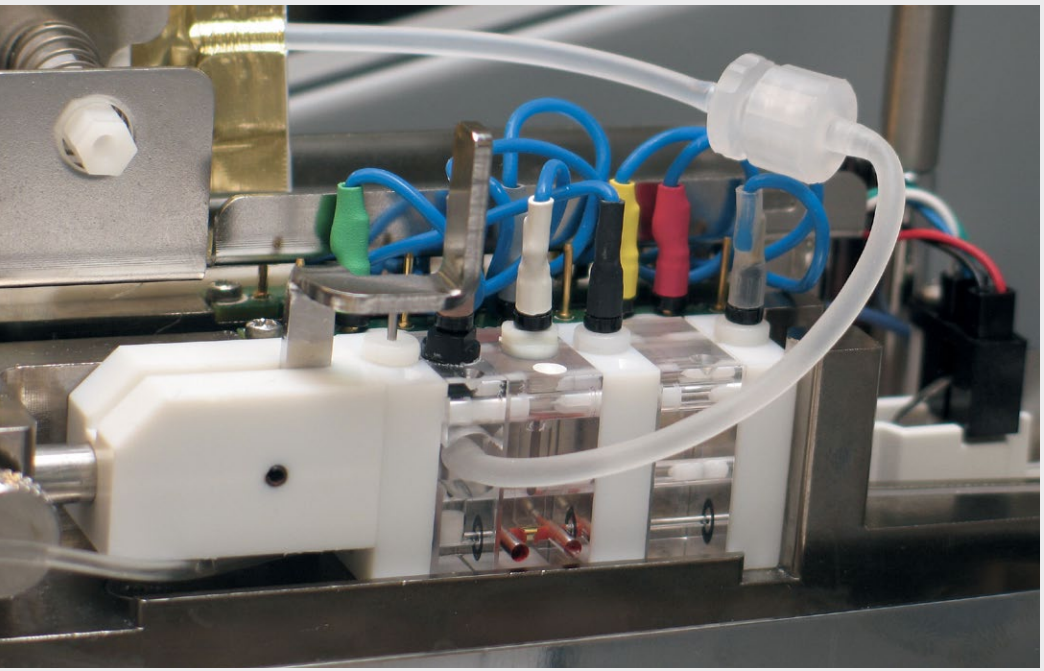
Automated pH and conductivity measurement

Electrochemical measurement (ECM) of pH and electrical conductivity from water samples is accurate using the automated Gallery and Gallery Plus discrete analyzer. Shown above, the ECM is an integrated unit into the benchtop discrete photometric analyzer. It has the capability to simultaneously measure both pH and conductivity alongside the photometric testing.

ECM is suitable for raw water, ground water, sea water, rain water, municipal water, drinking water and waste water. It is not suitable for measurement in pure water matrix like DI water or steam condensate.

Measuring ranges

pH	2–12
Conductivity	20 µS/cm–112 mS/cm



Gallery and Gallery Plus discrete analyzers are easy-to-use, automated systems that allow laboratories to simplify their testing with dual benefits: time and cost savings. All necessary analysis steps are automated, providing true walk-away time for the operator. Both Gallery and Gallery Plus instruments provide an integrated platform for two measurement techniques, photometric and electrochemical (pH and conductivity), which can be run simultaneously. Parallel determination of several analytes from a single sample as well as the presence of several automated features ensures analytical efficiency.

For laboratories that perform routine process water, drinking water and waste water analysis while experiencing increased demand for their routine analytical services, the Gallery and Gallery Plus discrete analyzers provide increased throughput while lowering the cost per analysis.

Single instrument—single operator—multiple parameters

Basic water testing: pH, conductivity, alkalinity, total hardness

Comprehensive waste water testing as per regulatory methods: Total Kjeldahl Nitrogen (TKN), total phosphate, total phenol, Total Oxidizable Nitrogen (TON), phosphate, nitrite, nitrate, boron, aluminium

Corrosive anions: Fluoride, chloride, sulfate, sulfide, nitrite, nitrate, phosphate, thiocyanate

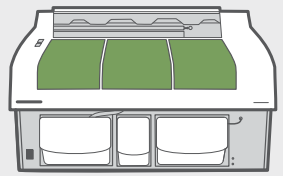
Scale formers: Silica, calcium, magnesium

Corrosion inhibitors: Ammonia, zinc, molybdenum, nitrite

Corrosion indicators: Total iron, hexavalent chromium, zinc

Free and total cyanide

Regulatory fulfillment: Waste water analysis as per U.S. EPA and other standard methods



The best thing to do when using Gallery discrete analyzers is to simply walk away.

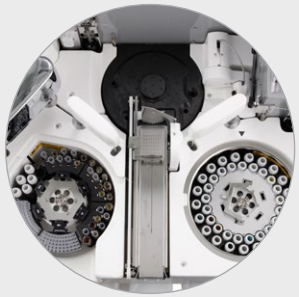
Gallery discrete analyzer features and benefits

Automate labor-intensive and time-consuming multiparameter wet chemical analysis with a single instrument.

Gallery discrete analyzer
The Gallery discrete analyzer includes a combined sample and reagent disk for a maximum capacity of 90 samples and 30 reagents, with the ability to run up to 200 tests/hour.

Unique disposable DECACELL

- The DECACELL cuvettes used are 10 independent reaction cells mounted together for truly discrete analysis
- No need for washing to prevent carryover
- Minimal or no carry over—improved result reliability



Fully-integrated multiparameter analyzer

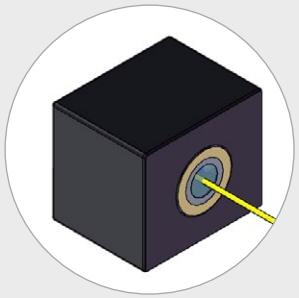
- Capable of performing simultaneous photometric, and electrochemistry (pH and conductivity) measurements

High throughput analyzer

- Capable of performing up to **350 tests per hour**
- Parallel pH and conductivity testing
- True walkaway solution

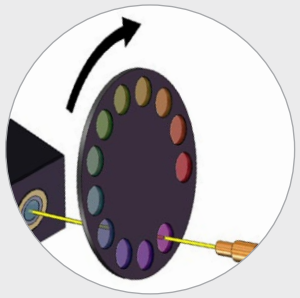
Low volume cuvette

- Reduced sample and reagent consumption: 2–240 µL
- Lowest waste generation and disposal cost
- Reduced cost per analysis



Xenon source lamp

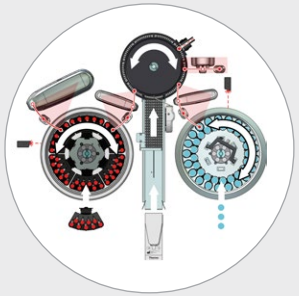
- Long-life
- No frequent replacement
- Savings over lifetime of the instrument
- Sensitivity to the ppb level



More filters—more chemistries

- 12 different filters
- Up to 20 different chemical parameters per sample
- Wide wavelength coverage: 340–880 nm

Gallery Plus discrete analyzer
The Gallery Plus discrete analyzer can accommodate 108 samples and 42 reagents in separate sample and reagent disks, with the capability to run up to 350 tests/hour.



Robust analyzer
- Minimal moving parts—less maintenance
- Effective mixing and reproducible results
- Calibration curve stability

Flexible system
- Versatile to modify an existing method
- Up to 4 different reagent additions
- Easy to transfer existing FIA or spectrophotometric methods
- Variable incubation temperature from 25 °C–60 °C

LIMS
- Bi-directional LIMS connection
- Easy sample table import and workflow optimization

Auto analysis
- Automated calibration from single stock standard
- Automatic dilution of over range samples
- Auto start up and shutdown

Ease of use
- Workflow based operation—suitable for all users' levels
- Built-in barcode readers for samples and reagents—no manual errors; full traceability

Ready-to-use reagent kits
- More than 40 different chemistries
- Only µL consumption per test
- Bar-coded reagent vials provide easy and reliable identification:
  - Lot, expiration date, and vial size
  - Real-time reagent monitoring

ECM unit
- Integrated pH and conductivity
- Parallel analysis:
  - pH range 2–12
  - Conductivity: 20 µS/cm–112 mS/cm

Ion chromatography features and benefits

For ion analysis, nothing compares to a Thermo Scientific™ Dionex™ Ion Chromatography (IC) system. Whether you have just a few samples or a heavy workload, whether your analytical task is simple or challenging, we have a solution to match your performance requirements. Recent innovations include high pressure ion chromatography (HPIC), 4 micron column packings, capillary systems, and consumables device monitoring. As the technology leader in IC for over 45 years, you can feel confident that you're getting the best in IC systems, consumables, service, and support.

Automated eluent generation with reagent-free ion chromatography (RFIC)

- Just-add-water ease of use, which avoids handling toxic chemicals
- Optimize runs for peak performance with on demand gradients
- Increase run-to-run consistency by removing user-to-user variability
- Lower maintenance requirements by exposing pumps only to water

Eluent suppressors

- Achieve low noise and high sensitivity
- Get robust tolerance for potentially problematic sample matrices with chemical suppression or get the convenience of electrolytic suppression
- Continuous regeneration assures high uptime and run to run component traceability

Ultra-trace analyte determinations

- Obtain reliable results at sub-ppb levels by preconcentrating samples with high capacity Thermo Scientific™ Dionex™ IonPac™ and Thermo Scientific™ Dionex™ IonSwift™ anion and cation concentrator columns

Thermo Scientific™ Dionex™ Aquion™ IC system

Brings a level of robustness to anion and cation analyses through engineered simplicity.

Thermo Scientific™ Dionex™ ICS-4000 HPIC system

A dedicated capillary system that is always on and ready, providing an easy workflow when you need the quickest time to result.

Thermo Scientific™ Dionex™ Integrion™ HPIC system

A compact system that requires almost no user interaction to operate and maintain, with just-add-water eluent generation, consumables tracking, and upgradeability that keeps the window open to adapt to future needs.

There are IC system solutions for every ion analysis need, from basic with just a few samples, to a challenging, heavy workload.

Extensive portfolio of Thermo Scientific™ Dionex™ analytical columns

- Choose the selectivity, capacity, and format to match your application needs
- Combine 4 µm particle columns with HPIC systems to accelerate chromatographic speed and enhance resolution

Thermo Scientific™ Dionex™ ICS-6000 HPIC system

A highly versatile system that can run any IC application, it is designed to perform analyses from routine QA/QC to cutting edge research, providing the freedom to develop, explore, and run different methods simultaneously.

Thermo Scientific™ Dionex™ Integral™ Process Analytical system

Online sample analysis lets you optimize process operations with hands-free, accurate analyte monitoring using customizable modules for configurations tailored to meet your specific application and environmental needs.

Sample preparation

- Remove particulates with high-pressure inline filters—labor saving, low maintenance, no sample loss
- Eliminate matrix interferences with Thermo Scientific™ Dionex™ OnGuard™ and Thermo Scientific™ Dionex InGuard™ cartridges, or Thermo Scientific™ Dionex™ Guardcap™ vial caps

Automate consumables device monitoring

- Save time and improve traceability by eliminating manual logging with automatic monitoring of use and performance
- Anticipate preventive maintenance needs

Establish starting conditions without wasting time or reagents

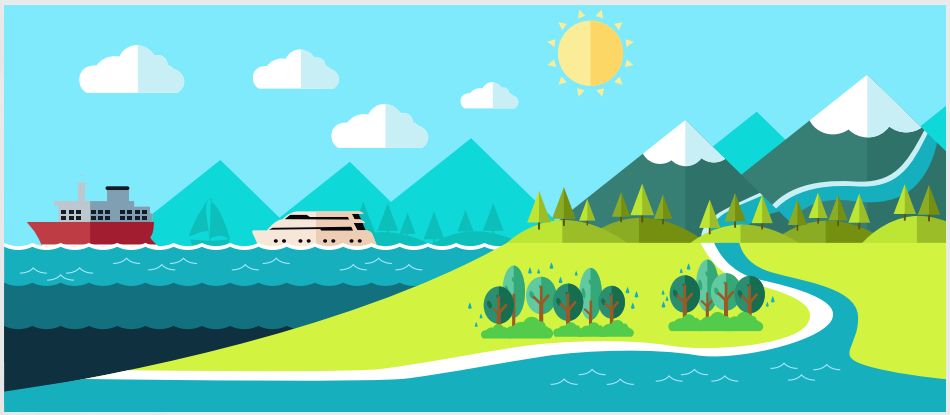
- Explore the impact of varying run parameters with the Thermo Scientific™ Virtual Column™ Separation Simulator
- Download pre-tested instrument methods from the Thermo Scientific™ AppsLab Library of Analytical Applications

Automated sample handling

- Reduce hands on time to optimize throughput
- Automatically modify the amount of sample injected with Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS) AutoDilution
- Use the sample dilution capabilities of the Thermo Scientific™ Dionex™ AS-AP autosampler or choose to inject variable sample loop volumes

Comprehensive ion analysis

Ion chromatography expands the breadth of water analyses available by offering comprehensive and distinct capabilities that include ultra-trace (ppt) analyte determinations, quantification of an extensive array of anions, cations, and amines, and the ability to handle challenging matrices.



Fast source water testing for anions and cations

Rapid determination of ions in source waters (ground, surface, recycled) provides the information needed to quickly adjust chemical or mechanical treatments, which can significantly reduce operating costs by minimizing reagent usage and protecting downstream equipment. Several innovations allow IC systems to rapidly determine both anions and cations:

- RFIC produces consistent, high-purity eluent simply by addition of DI water. The low background produced enhances the intensity of the analyte signal generated during each run and the use of gradients can further enhance peak resolution, facilitating chromatographic integration and shortening time to results.
- Small particle (4 µm) columns increase column efficiency, generating sharper peaks, enabling use of faster flow rates to reduce run times without compromising data quality
- Dual channel IC systems permit the parallel analysis of cations and anions

Ultra-trace analysis

Determination of ppb and below concentrations of corrosive anions and scaling species in DI water, make up water, and steam condensate is critical to eliminate or reduce damage caused by ionic contaminants, maintaining component reliability, safety, and overall economic viability.

- With IC, sub-ppb determinations can be achieved using the low backgrounds and high signal intensities of suppressed conductivity detection in combination with eluents produced by RFIC and the ability to load large sample volumes and trap analytes on concentrator columns

Reliable online measurement

The Dionex Integral Process Analytical system enables online monitoring of DI water, make up water, and steam condensate along with waste streams to:

- Rapidly identify transient upsets and trends in corrosive species, corrosion inhibitors, and corrosion indicators so that action can be taken to minimize potential damage and prevent costly shutdowns
- Reduce the risk of exceeding regulatory limits
- Eliminate the lag in information that can occur when waiting on lab results

Corrosion inhibitors determination in DI water, cooling water, and steam condensate

In addition to monitoring for the presence of corrosive species, corrosion inhibitors and oxygen scavengers are added to control pH and create a reducing environment in both liquid and vapor phases of cooling systems and are part of a comprehensive corrosion prevention plan. Examples of inhibitors include:

- Morpholine and ethanolamine, the most commonly used organic amines, which minimize corrosion by maintaining the water and vapor phase pH between 9.5 and 9.8
- Hydrazine, a strong reducing compound added as an oxygen scavenger to remove or displace oxygen and to passivate metal surfaces

IC with suppressed conductivity detection is a well-established method to determine µg/L to mg/L concentrations of common cations and amines and is the method of choice in the power industry for both cooling waters and the waste waters that result from periodic water system flushings.

Corrosion indicators in boiler water and steam condensate

Despite the presence of inhibitors and the monitoring of corrosive species, corrosion can still occur. Determination of corrosion indicators, such as iron, zinc, hexavalent chromium, and copper in waters by IC can alert operators to potential equipment failure and the need for system maintenance.

Complex sample matrices

Samples that contain disparate concentrations of analytes and those from waste water (such as sour water produced at refineries or power plant effluents) can be particularly challenging to analyze. IC is able to overcome these challenges with several strategies:

- Because it is based on chromatographic separation, IC is able to physically separate components within a sample, reducing the likelihood that interferences will inhibit measurement of analytes of interest
- A combination of IC column selectivity and capacity permits the loading of samples containing high concentrations of one analyte (e.g., sodium) while still retaining and resolving analytes that are present at much lower concentrations (e.g., ammonium)
- Incorporating a step such as matrix elimination into IC methods, can remove potentially interfering sample components prior to chromatographic separation and detection
- Solids and semi-solids that would normally be inaccessible to chromatographic techniques can be analyzed by combining IC with a combustion oven (CIC) for automated sample preparation

Broad spectrum of analytes

Beyond the standard set of anions and cations, IC enables determination of and/or identification of the presence of additional analytes that could impact downstream processes. With IC you can:

- Perform multi-component analysis for more information than single component or bulk property analyses
- Determine additional analytes with interchangeable detectors, such as electrochemical (Pulsed Amperometric Detection (PAD)) and mass spectrometry (IC-MS)

Waste water analysis—reuse and discharge

Manufacturing industries consuming large volumes of water produce both hazardous and non-hazardous waste water. Treating this waste water and reusing it is a key challenge for companies seeking to maintain a profitable operation while protecting the environment. Reclaimed or recycled water is produced by conversion of waste water into water that can be reused for other purposes. These waters are adequately treated to meet "fit-for-purpose specifications" for next use. Waste water testing serves two purposes:

1. To indicate that treatment in place is working for re-use purposes.
2. Industrial waste water is safe before it's discharged into surface waters in accordance with regulations.

The table below summarizes U.S. EPA and international reference methods for the Gallery discrete analyzer and IC systems.

Gallery discrete analyzer — U.S. EPA and international reference methods

Regulatory methods	Analytes
EPA 310.2 ISBN 0117516015 SMWW 2320 B	Alkalinity*
SM 3500-Al B	Aluminium*
EPA 350.1 ISO 7150 ISO 15923-1 DIN 38406 ISBN 0117516139	Ammonia
ISBN 0117515833	Boron*
EPA 410.4	COD*
EPA 325.2 EN ISO 15682 ISO 15923-1 ISBN 0117516260 SM 4500-Cl-E	Chloride
EPA 330.5 SM4500-Cl G	Chlorine*
EPA 120.1	Conductivity
SM 3500-Cu C	Copper
ASTM D2036-09(B)	Cyanide
EPA 335.4	Cyanide (Total)
EPA 340.3 SM 3500-F D	Fluoride
EPA 130.1	Hardness (Total)

Regulatory methods	Analytes
ISO 11083 DIN EN ISO 23913:2009 ASTM D1687-12(A) SM 3500 Cr-B SW 7196 A	Hexavalent chromium
ISO 6332-1988 SM 3500 F-B	Iron
SM 3500-Fe B	Iron (Ferrous), Iron (Total)
ASTM D7781-14 (NECi) Nitrate Reductase method for drinking water (USGS I-2547-11 (USGS I-2548-11 (NECi) Method N07-0003	Nitrate (TON ENz)
EPA 353.1 ISO 15923-1 ISBN 0117515930 SM 4500-NO3 H	Nitrate (TON Hyd)
NEMI (Nitrate via manual Vanadium (III) reduction)	Nitrate (TON Vanadium)
EPA 354.1 ISO 13395:1996 ISO 15923-1 DIN EN 26777 ISBN 0117515930 SM 4500 NO2-B	Nitrite
EPA 150.2	pH

Regulatory methods	Analytes
EPA 420.1 ISBN 0117516171	Phenols (Total)
EPA 365.1 EN ISO 6878 ISO 15923-1 ISBN 0117515825 SM 4500 P-E	Phosphate
EPA 365.4 ISBN 0117518883	Phosphorus (Total)
EPA 370.1 ISO 15923-1 SM 4500 SiO2-C USGS I-2700-85	Silica
EPA 375.4 ISO 15923-1 DIN 38405-D 5-2 ASTM D516-11 ISBN 0117533406 SM 4500 SO4-E	Sulfate
EPA 376.2 ISBN 011751718 SM 4500-S2 D HMSO SCA Blue Book	Sulfide*
SMWW 4500-CN-M	Thiocyanate*
EPA 351.2 ASTM D3590-11 (B) ISBN 0117521299 SMWW 4500-N(Org)	Total Kjeldahl Nitrogen (TKN)

*Third party reagents; # after digestion

Ion chromatograph — U.S. EPA and international reference methods

Regulatory methods	Analytes
EPA 302 EPA 317 EPA 321.8 EPA 326 ISO 11206	Bromate
ASTM D6581	Chlorite, bromate, bromide, chlorate
ASTM D7237	Cyanide
EPA 300.0 ASTM D4327	Fluoride, chloride, nitrite, bromide, nitrate, ortho-phosphate, sulfate
EPA 300.1	Fluoride, chloride, nitrite, bromide, nitrate, ortho-phosphate, sulfate, bromate, chlorite, chlorate
EPA 557	HAAs, BrO_3, dalapon
EPA 218.7 ASTM D5257	Hexavalent chromium
ISO 14911 ASTM D6919	Lithium, sodium, potassium, ammonium, magnesium, calcium
ASTM D6994	Metal cyanide
EPA 314.0 EPA 314.2 EPA 332 ISO 19340	Perchlorate
ASTM D8001	TKN, total phosphorus

The Disc-IC System—a comprehensive solution for consolidated water analysis

The Disc-IC system is a package of two independent techniques from Thermo Fisher Scientific—discrete analysis and ion chromatography for comprehensive water analysis. Unique and fully automated, the Disc-IC system combines the power of direct measurement, discrete analysis with ion chromatography to support a comprehensive water analysis workflow that offers the highest flexibility and sample throughput to reduce overall cost per analysis.

Gallery discrete analyzers are robust, easy-to-use, and provide parallel measurement of multiple analytes, including those used in photometric (colorimetric and enzymatic) and electrochemical (pH and conductivity) analysis. All necessary analysis steps are automated and low detection levels can be achieved.

Dionex IC systems can be tailored to meet specific anion and cation analysis needs, providing direct determination of multiple analytes in a single run, the highest sensitivity, and the ability to handle even the most challenging of water samples.

Disc-IC provides a true walkaway solution for comprehensive source water, process water and waste water analysis and performs unattended large sample series analysis.

Consolidated water analysis by the Disc-IC System

Thermo Scientific discrete analyzer

Routine high throughput analysis

- Single instrument—many parameters
- Up to 350 tests/Hr
- Parallel pH and conductivity measurements together with photometric parameters

Thermo Scientific Dionex ion chromatograph

Comprehensive ion analysis

- Fast anion and cation analysis
- Ultra trace (ng/L) determinations
- Complex sample matrices
- Wide range of corrosion inhibitors

Basic water testing: pH, conductivity, alkalinity, total hardness

Comprehensive waste water testing as per regulatory methods: Total Kjeldahl Nitrogen (TKN), total phosphate, total phenol, Total Oxidizable Nitrogen (TON), phosphate, nitrite, nitrate, boron, aluminium

Corrosive anions: Fluoride, chloride, sulfate, sulfide, nitrite, nitrate, phosphate, thiocyanate

Scale formers: Silica, calcium, magnesium

Corrosion inhibitors: Ammonia, zinc, molybdenum, nitrite

Corrosion indicators: Total iron, hexavalent chromium, zinc

Free and total cyanide

Regulatory fulfillment: Waste water analysis as per U.S. EPA and other standard methods

Corrosive anions: Fluoride, chloride, sulfate, sulfide, nitrite, nitrate, phosphate, thiocyanate and oxyhalides chlorite, chlorate, perchlorate, bromate

Cations: Lithium, sodium, potassium, calcium and magnesium, ammonia

Scale formers: Silica, calcium, magnesium

Corrosion inhibitors: Ammonia, zinc, molybdenum, nitrite, azoles, alkyl amines, alkanol amines, poly acrylic acid (PAA)

Corrosion indicators: Ferrous and ferric iron, hexavalent chromium, zinc, copper, manganese at sub-ppb level

Free and total cyanide

Ultra trace (ng/L) determinations: in DI water, steam condensate

Lab and online analysis

Complex sample matrices: Sour water, waste water

Regulatory fulfillment: Waste water analysis as per approved methods

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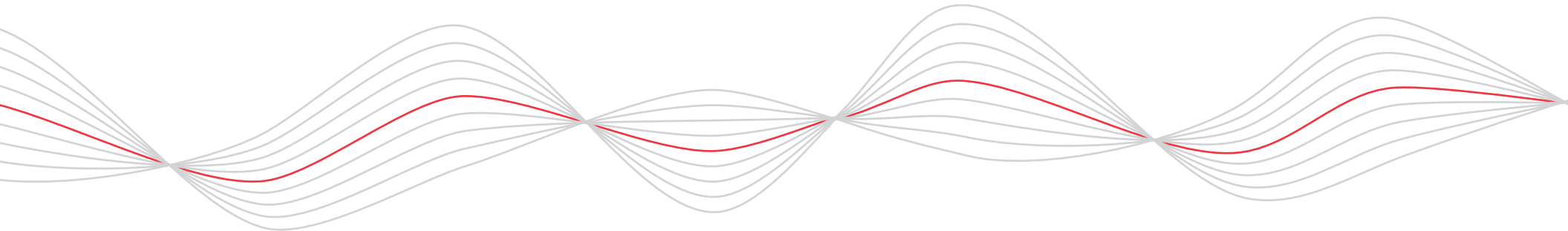

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