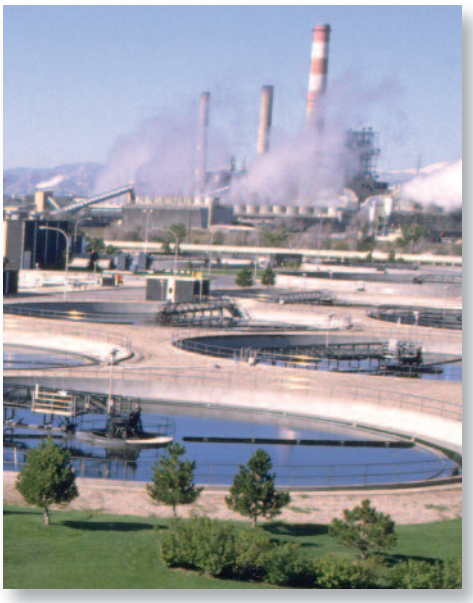
Complete Water Analysis for the

CHEMICAL & REFINING INDUSTRY

HACH®

Be Right™



YOUR PARTNER FOR WATER ANALYSIS IN THE CHEMICAL & REFINING INDUSTRY

At Hach, we understand your needs when it comes to maximizing the efficiency and effectiveness of your boiler/cooling and wastewater processes. Since 1947, Hach Company has designed, manufactured, and distributed world-class instrumentation, test kits, and reagents for testing water quality in the chemical and refining industry. We invite you to take a look at our comprehensive line of product solutions and services. They're the most accurate and dependable products you can buy.

Hach offers:

- On-line process instrumentation and reagents
- Laboratory equipment, reagents, and supplies
- The most EPA-approved water analysis methods
- Portable test kits and field instruments
- Automatic samplers and flow meters
- Prepared media for microbiological testing
- Local sales and service teams
- Service partnership programs and customized training

The following water quality parameters are a sample of those most critical to maintaining your boiler/cooling and wastewater processes efficiently and effectively. The remainder of this guide provides detailed information on the specific products Hach offers.

KEY PARAMETERS FOR BOILER/COOLING PROCESSES

pH

The pH of cooling and steam processes should be tightly monitored and controlled to optimize the use of critical inputs like chemical addition for corrosion and scale protection, as well as microbial protection in cooling towers. The pH of pre-treatment water should also be monitored and controlled to prevent corrosion of feedwater piping and optimize efficiency of pre-treatment equipment.

Dissolved Oxygen

At the elevated temperatures of the steam cycle, minute quantities (ppb) of oxygen can cause severe corrosion problems in boiler and feedwater piping. Monitoring at the ppb level is critical to maintaining the equipment since several variables can cause changes in DO. These include fluctuations in condensate return; fluctuating steam pressures; plugged, broken or missing nozzles or trays; varying feedwater flows; and air in-leakage from process.

Silica

Controlling volatile silica contaminants is critical to avoid fouling and other adverse effects in superheaters, turbines, heat exchangers, condensers and dryers, where heat transfer efficiency could ultimately impair production efficiency. Plus, monitoring silica detects demin breakthrough faster than resistivity, resulting in improved make-up water quality control.

Sodium

Sodium levels are an important index of water quality throughout the steam cycle. Monitoring sodium concentration is necessary for applications involving on-site power generation and/or high concentrations of caustic soda and other corrosive chemicals. Changes in sodium levels indicate leaks in heat exchangers and carry-over of sodium phosphate-based chemistries, both of which can have catastrophic effects on turbine blades or on the boiler's heat exchange surfaces.

KEY PARAMETERS FOR WASTEWATER

pH

The continuous monitoring of pH plays an important role in alerting a facility of necessary process adjustments well in advance of a violation. Additionally, pH monitoring at various stages within the wastewater treatment process is critical for maintaining bugs' health, optimizing chemical usage, and preventing corrosion to control costs.

Dissolved Oxygen

The activated sludge process for wastewater treatment requires a steady supply of oxygen to function effectively. Insufficient oxygen slows down organisms, makes facultative organisms less efficient, and favors production of foul-smelling intermediate products. Since this process constitutes roughly 70% of the wastewater plant's energy costs, precise monitoring and control of oxygen enables effective and efficient processes.

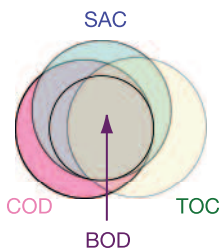
Turbidity/Total Suspended Solids

Total Suspended Solids measurements are commonly used for monitoring and controlling dissolved air flotation systems, dewatering equipment, clarifier influent, effluent, Return Activated Sludge (RAS) and Waste Activated Sludge (WAS). When applied to polymer feed systems, the resulting additional control often results in significant polymer savings.

Organics

In wastewater with high organic loads, a facility uses chemical treatment and physical processing to reduce load levels to those acceptable for either re-use or discharge into the environment. Efficient management of organics typically involves Biological Oxygen Demand (BOD) for reporting purposes. However, since the test takes 5 days, surrogates such as Chemical Oxygen Demand (COD), Total Organic Carbons (TOC), and Spectral Absorption Coefficient (SAC) may be used. These offer quicker test results and early detection of upsets or spills for reduced operational and maintenance costs. COD, a relatively simple lab procedure, reduces testing time to 2 hours. On-line TOC monitoring provides results every 7 minutes and on-line UV254 (SAC) monitors continuously for real-time control.

Comparison of Methods for Measuring Organics

Parameter	Measured Variable	Method	Substance Groups Measured
Biochemical Oxygen Demand (BOD)	Oxygen Consumption	Microbial Oxidation	
Chemical Oxygen Demand (COD)	Oxygen Consumption	Wet Chemical Oxidation	
Total Organic Carbon (TOC)	Carbon Concentration	Thermal, Wet Chemical Oxidation	
Spectral Absorption Coefficient (SAC)	UV Absorption at λ = 254 nm	UV Absorption Measurement	

HACH WATER ANALYSIS TOOLS FOR T

From Arsenic to Zinc, Hach offers portable, laboratory and process instruments, and reagents for more than 100 test parameters—the broadest range for water analysis in the chemical & refining industry.

		LAB & FIELD ANALYSIS																		
		Photometric and Colorimetric						Electro-chemical		Titrametric			Microbiology			Other Tools				
ANALYSIS PARAMETER	PROCESS INSTRUMENTS AND ANALYZERS	Hach Spectrophotometers	Hach Colorimeters	Hach Prepared Reagents	Hach Turbidimeters	Hach Test Kits & Portable Labs	Hach Test Strips	Hach HQd and SensION+ Meters & Probes	Radiometer Analytical MeterLab Meters & Probes	Titralab Automatic Titrators	Hach AutoCAT 9000 Titrator	Hach Digital Titrator	Hach Microbiology Media	MEL Portable Labs	LuminUltra	Hach Digesdahl Apparatus	Hach HSA-1000 Analyzer	Hach Sigma Samplers	Laboratory Supplies
Alkalinity	• APA 6000 Analyzer			■		■	■	■	■	■		■							■
Ammonia	• AMTAX sc Analyzer • APA 6000 Analyzer	■	■	■		■	■	■	■				■	■					
ATP				■											■				■
Biochemical Oxygen Demand (BOD)	• UVAS sc Sensor* • BioTector TOC Analyzer*			■				■											■
Chlorine	• CL17 Analyzer • CL10 sc Analyzer • 9184 sc Analyzer	■	■	■		■	■		■		■	■		■					
Chemical Oxygen Demand (COD)	• UVAS sc Sensor* • BioTector TOC Analyzer*	■	■	■															■
Chlorine Dioxide	• 9187 sc Analyzer	■	■	■		■					■								■
Conductivity	• Hach Contacting Conductivity Sensors • Hach Inductive Sensors (Electrodeless) Conductivity Sensors			■		■		■	■								■		■
Copper		■	■	■		■	■		■						■				■
Dissolved Oxygen	• LDO Model 2 Probe (ppm) • K1100 LDO Analyzer (ppb) • 3100 Portable	■	■			■		■		■		■		■			■		■
Flow	• Sigma Open Channel Flow Meters • Hach U53 Open Channel Analyzer • Hach Flow Monitors/ Totalizers and Sensors																■		
Hardness	• APA 6000 Analyzer • SP510 Analyzer	■	■	■		■	■			■	■								■
Hydrazine, Oxygen Scavengers, Reducing Agents	• 9186 Oxygen Scavenger/ Hydrazine Analyzer	■	■	■		■													
Iron		■	■	■		■	■						■	■					■
Lead		■	■	■		■									■	■			■
Microbiology				■									■	■					■

*By correlation.

HE CHEMICAL & REFINING INDUSTRY

For more information,
call 1-800-227-4224
or go to:
hach.com/chemicalguide

ANALYSIS PARAMETER	PROCESS INSTRUMENTS AND ANALYZERS	LAB & FIELD ANALYSIS																	
		Photometric and Colorimetric						Electro-chemical		Titrametric			Micro-biology		Other Tools			
		Hach Spectrophotometers	Hach Colorimeters	Hach Prepared Reagents	Hach Turbidimeters	Hach Test Kits & Portable Labs	Hach Test Strips	Hach HQd and SensION+ Meters & Probes	Radiometer Analytical MeterLab Meters & Probes	Titralab Automatic Titrators	Hach AutoCAT™ 9000 Titrator	Hach Digital Titrator	Hach Microbiology Media	MEL Portable Labs	Hach Digesdahl Apparatus	Hach HSA-1000 Analyzer	Hach Sigma Samplers	Laboratory Supplies
Moisture, KF										■								
Molybdate		■	■	■		■												■
Monochloramine	• APA 6000 Analyzer	■	■			■					■							
Nitrate	• NITRATAX plus sc Sensor	■	■	■		■	■	■	■					■				■
Oil & Grease	• FP360 sc Oil-in-Water Sensor			■														■
Organics	• BioTector TOC Analyzer • UVAS sc Sensor	■																
Ozone	• ORBISPHERE C1100 Ozone Sensor	■	■	■		■												■
pH/ORP	• Hach Differential pH Sensors • pHD Differential Sensors • 8362 sc High Purity pH or ORP Panel		■	■		■	■	■									■	■
Phosphate	• PHOSPHAX sc Analyzer • 5500sc Phosphate Analyzer	■	■	■		■	■							■				
Sample Conditioning	• Filtrax Sample Filtration System																	
Silica	• 5500sc Silica Analyzer	■	■	■		■												■
Sludge	• SONATAX sc Sludge Blanket Level Probe														■			
Sodium	• 9245 Sodium Analyzer							■	■									
Sulfate		■	■	■		■												■
Sulfite				■		■					■	■						
Total Organic Carbon (TOC)	• BioTector TOC Analyzer	■	■	■														■
Total Suspended Solids	• TSS sc																	
Turbidity	• FilterTrak 660 Nephelometer • 1720E Turbidimeter • TSS sc • Surface Scatter 7	■	■	■	■									■				
Zinc		■	■	■		■												■

Hach lab instruments are designed to help you confidently meet compliance objectives in boiler/cooling and wastewater applications, as well as in your quality control lab.

PHOTOMETRIC & COLORIMETRIC

DR 1900 Spectrophotometer

- The lightest and most compact portable spectrophotometer
- Even in dusty or wet conditions, testing is easy
- With the highest number of preprogrammed methods and an easy-to-use interface

DR 3900 Spectrophotometer

- Easy step-by-step testing procedure
- Elimination of false readings
- Accurate results every time

DR 6000 Spectrophotometer

- Accessories for High Volume and High Accuracy Testing Needs
- Advanced Quality Assurance at Your Fingertips
- Guided Procedures and Elimination of False Readings
- Automatically Avoids Errors

TNTplus® Bar-Coded Chemistries

TNTplus vials work exclusively with the DR 6000, DR 3900, and DR 1900 Spectrophotometers.

- Error free and fast—instrument automatically detects and runs the correct method
- Easy, accurate recognition—color-coded parameters and ranges
- Best results—10 measurements in one rotation, eliminating outliers; optically superior glassware

DR 900 Colorimeter

- Fastest and simplest water testing for the most demanding field environments
- Your favorites, at your fingertips
- Field ready in every way possible
- Intuitive user interface
- Simple data communication

Hach Test Kits

From beakers to colorimeters, everything you need is supplied in Hach Single- and Multi-parameter Test Kits.

- Pre-measured reagents
- Accurate color matching
- Step-by-step instructions
- Upright reagent storage
- Rugged, chemical-resistant cases

2100AN Laboratory Turbidimeter and 2100Q Portable Turbidimeter

The primary standards for versatility, accuracy, and value in turbidity measurement.

- Pre-programmed calibration procedure
- Smart self diagnostics
- Meets or exceeds EPA criteria

ez COD® Recycling for Hach COD Vials

Reduce COD reagent recycling costs and simplify the task of recycling.

- One low price—includes container, pickup, and recycling fees
- Hassle free—place entire vial into receptacle
- Environmentally friendly—Silver and Mercury are reclaimed
- Convenient—order reagents and recycling from one source
- Right sized—pick from three programs based on your annual COD waste output (5, 20, and 55 gallons)

ELECTROCHEMICAL

HQd Meters & IntelliCAL™ Probes

Use a single handheld HQd meter and interchangeable IntelliCAL probes for quick, simple, and reliable measurements.

- Hach has developed a customized electrochemistry solution for water quality that takes the guesswork out of your measurements.
- Designed for your water applications, the Hach HQd smart probes automatically recognize the testing parameter, calibration history, and method settings to minimize errors and set-up time.
- Hach gives measurement flexibility and ease of operation with its HQd portable and benchtop meter and full suite of interchangeable IntelliCAL laboratory and field probes for testing Conductivity, DO, ORP, pH, Ammonia, and many more!

ELECTROCHEMICAL

sensION®+ Meters & Probes

Hach sensION+, an all-in-one system with guided menu navigation makes general testing fast and simple. Each system is designed to be used in a wide variety of applications and comes complete with everything you need to start testing.

Measurements for temperature, pH, conductivity, salinity, TDS, ORP, ammonia, nitrate, fluoride, sodium, chloride, and ammonium are available.

TITRAMETRIC & TOTAL OXIDANTS

Radiometer Analytical TitraLab® Workstations

Offers a variety of options for customizable titration measurement in the chemical industry. Accuracy, reliability and ease of use are the key features of these titration systems. For example, the TitraLab 965 Potentiometric Titration Workstation can perform acid-base determinations in aqueous/non-aqueous media, redox determinations, KF titrations, and much more. The TitraLab 870 Combined Conductivity and Potentiometric Titration Workstation provides pH, conductivity and ion measurements.

TitraLab® Automatic Titrators

TitraLab Automatic Titrators provide the perfect solution for routine measurements. With extremely fast and accurate results, these products require minimal training, push-button operation, and are simple to maintain. Karl Fischer moisture, pH, Hardness, Alkalinity, and many other parameters are available.

AutoCAT™ 9000 Automatic Chlorine Dioxide and Chlorine Amperometric Titrator

Use to monitor and protect RO membranes and ion exchange resins, optimize dechlorination processes and calibrate process instruments. Measure free and total chlorine, chlorine dioxide, and sulfite.

FLOW & SAMPLING

Sigma 950 Flow Meter from Hach Flow

With a full-range of sensor types for measuring flow velocity and/or level, the Sigma 950 Flow Meter from Hach Flow is all about flexibility. The Sigma 950 has non-contact ultrasonic sensors that allow you to monitor wastewater flow in extremely harsh environments. It also has specialty sensors designed specifically to capture pH and temperature readings. And with multiple output options to communicate with a wide variety of devices, as well as a built-in display and keypad for programming right onsite, the Sigma 950 is as convenient as it is flexible.

Hach Sigma SD900 Automatic Sampler

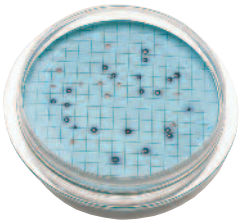
Delivers reliable results, easy operation and annual maintenance savings. Deploy the controller in various environments with a portable, indoor refrigerated or all-weather base.

- Easy-to-read display even in bright and dimly lit environments
- Simple programming and set up (less than 2 minutes for sampler routine) for fewer programming errors
- Extended pump tubing life (20,000 cycles) reduces annual maintenance costs and pump down time

MICROBIOLOGY

Microbiology Media

Hach's ready-to-use Microbiology Media eliminates measuring, mixing, and autoclaving necessary to prepare media. Glass and plastic ampules, bottled media, agar plates, powder pillows, and containers afford maximum shelf life and ease of use. Available for testing/ measuring total coliforms, *E. coli,* yeast and mold, Heterotrophic bacteria, PRY, and more.



BART™: Easy Bacterial Detection

A simple and effective way to detect specific bacterial groups and algae in water. The Biological Activity Reaction Test (BART*) provides an excellent method for determining which specific type of bacteria is the source of an existing problem.

**BART is a trademark and patented product of Droycon Bioconcepts, Inc., U.S. Patent 4,906,566*

LuminUltra Total Living Biomass Assessment (ATP)

Microbiological testing solutions provide feedback on contamination sooner for proactive control!

- Detect total active microorganisms in any type of sample
- Results in minutes - not hours or days - for real-time results
- Lab or field operable for maximum flexibility

Hach process instruments help you save money by controlling energy and chemical costs and optimizing staff efficiencies throughout the chemical facility.

CONTROLLERS

Hach Digital Controllers

Use any of the digital family sensors with the sc200 Digital Controller that accepts up to two sensors or the sc1000™ Universal Controller that accepts up to eight sensors in any combination.

- Plug-and-play operation without special ordering or software configuration
- Many communication options including MODBUS® and wireless modes

Hach's Digital Sensor family includes ammonia, chlorine, chlorine dioxide, conductivity, DO, Nitrate, ORP, ozone,pH, phosphate, sludge blanket level, suspended solids, turbidity, and UV absorption.

si792 2-Wire Transmitter

A full-featured, intuitive 24 Vdc loop-powered electrochemistry transmitter for monitoring pH, ORP, and conductivity. Rugged construction is designed for Class I, Division 2 (C1D2) or Intrinsically Safe (IS) applications. Standard digital communication capabilities include HART®, PROFIBUS PA, or Foundation FIELDBUS.

FREE / TOTAL CHLORINE

CL17 Free/Total Chlorine Analyzer

0.035 to 5 mg/L free or residual chlorine

EPA COMPLIANT

Dependable, colorimetric DPD free and total chlorine analysis.

- Chlorine analysis independent of pH, temperature, and sample flow
- Unattended operation up to 30 days
- Colorimetric DPD chemistry—fast, reliable, economical

CLF10 sc and CLT10 sc Free and Total Reagentless Chlorine Analyzers

Hach's answer to reagentless amperometric chlorine measurement.

- Compatible with Hach's "Plug-and-Play" Digital Controllers
- Real time process control
- EPA compliant according to Method 334.0

EPA COMPLIANT

CONDUCTIVITY

3700 sc Digital Inductive (Electrodeless) On-Line Sensors

200 to 2,000,000 µS/cm

Blowdown, chemical concentration, leak detection, and dilution concentrations can be effectively monitored and controlled. There is no direct contact between the measuring element and the sample so they are contamination and corrosion resistant.

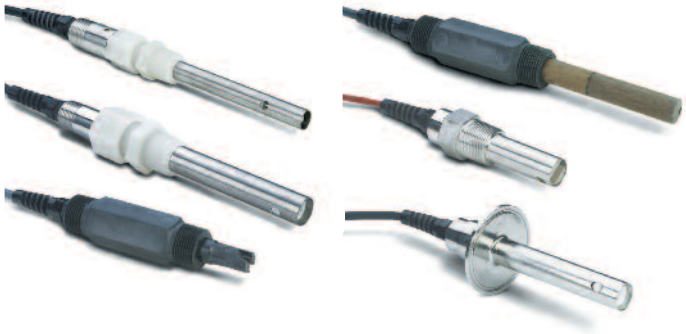
- Ideal for demineralizer regeneration
- Rugged, non-fouling design
- Sensor requires a Hach sc200™ or sc1000™ Digital Controller

Contacting Conductivity/Resistivity Sensors

0.057 to 200,000 µS/cm

Monitor membrane health and demineralizer beds with any of these Contacting Conductivity/Resistivity Sensors. Offered in a variety of materials and mounting styles to exacting tolerances to accommodate most configurations.

- High accuracy using Hach's DRY-CAL™ method
- Accurate temperature measurement



DISSOLVED OXYGEN

Hach LDO® Model 2, Optical Process Dissolved Oxygen Probe

Hach's next generation LDO (Luminescent Dissolved Oxygen) Probe requires no calibration for the entire 2 year life of the sensor cap, which means it is ready to start measuring your DO (Dissolved Oxygen) right out of the box. With an added cutting-edge 3D calibration procedure that is conducted prior to shipping, the probe will not drift and is more accurate than ever before.

ORBISPHERE K1100 Optical Dissolved Oxygen Sensor

The first maintenance-free optical oxygen sensor for power plants.

- Only 1 calibration per year
- No membranes = 2 minutes of annual maintenance
- Compatible with Orbisphere 28 mm flow chamber for a low cost retrofit

HARDNESS

SP 510™ Hardness Monitor

Maximize your softener cycle time and minimize your regeneration cost.

- Low maintenance—operates unattended for two months
- Low reagent consumption
- Rugged, lightweight, and self-contained
- Immediately signals hardness breakthrough to activate regeneration

ORGANICS

UVAS sc Sensor, 1 mm, 2 mm or 5 mm, with sc200 Controller

Continuous UV 254 Absorbance/Transmittance measurements with the UVAS sc Sensor can be used to protect plant treatment processes from high organic loads or for surrogate BOD, COD, and TOC measurements, with repeatable, accurate measurement.

- On-line analysis allows treatment plants to operate more efficiently
- Flow through design with no sample chamber and self-cleaning wipers to reduce maintenance
- Stable factory calibration saves time and reduces maintenance costs

pH / ORP

pHD™ Digital Differential On-Line pH/ORP Sensors

For moderate- or high-conductive applications (>10 µS/cm) such as monitoring cooling water blowdown, drum boiler water, or raw water treatment.

- Field-proven differential electrode measurement technique offers better accuracy
- Replaceable salt-bridge/protector simplifies maintenance and extends sensor life
- Sensor requires a Hach sc200 or sc1000 Digital Controller

SILICA

Series 5500sc Silica Analyzer

Lower Maintenance. Less Downtime.

- Only two liters of reagent are required for the analyzer to perform unattended for up to 90 days.
- The industry's only pressurized reagent delivery system eliminates the frequent maintenance associated with pumps.
- Predictive diagnostic tools, including Hach's proprietary Prognosys technology, warning LEDs, and high-visibility notification screens let you avoid unplanned downtime.
- No more dripping reagents on the instrument, the floor, or your clothing while fumbling with tubes and straws. Match the color-coded cap to the sealed reagent bottle and twist.
- Grab Sample In and Grab Sample Out features allow quick analysis of a grab sample poured into the analyzer, and facilitate taking a sample out of the analyzer to verify in a lab test.

SODIUM

9240 Sodium Analyzer

0 to 10,000 ppb, freely programmable 0 to 200 ppm with Cation-kit option

Low-level sodium measurement in high purity water.

- Automatic reactivation ensures optimum response time and performance; no acid etching required!
- Easy to operate and maintain with automatic calibration
- 100 days between reagent changes
- Up to 4 channels to analyze different sample streams on the same instrument
- 9245 Sodium Analyzer, single channel model, also available

SLUDGE LEVEL

SONATAX sc Sludge Blanket Level Probe

Ideal tool to optimize sludge extraction, manage recirculation, and warn of potential solid wash outs, or process upsets by continuously measuring the depth from the surface or height from the tank floor. Maintenance is reduced with the probe's innovative wiper design. Automatic frequency adjustment provides superior accuracy.

TOTAL ORGANIC CARBON

Hach BioTector B7000 TOC Analyzer

A patented self-cleaning oxidation technology enables BioTector analyzers to easily handle difficult samples and significantly reduce the maintenance schedule and costs associated with traditional on-line measurement. BioTector analyzers eliminate build up issues from salts, particulates, fats, oils and greases that lead to drift and high maintenance. Configurations are available for TOC, TOC/TN, and TOC/TN/TP.

- Superior Reliability—Typically 99.7% uptime
- High Dependability—Patented two-stage advanced oxidation (TSAO) technology handles even the most challenging applications
- Smart Design—Self-cleaning technology and oversized tubing eliminates filtration and prevents clogging and sample contamination

Hach BioTector B3500c Analyzer

Maximum uptime and reliability for TOC analysis in condensate applications. Using patented technology, only requiring scheduled maintenance every 6 months, allowing for dual stream monitoring, and having one of the most compact analyzer footprints, the Hach BioTector B3500c delivers 99.8% uptime in condensate applications with the lowest operating cost.

- Worry-free TOC
- Lowest Cost of Ownership
- Small footprint = Critical Wall Space Savings
- Reagent Costs that Don't Kill the Bottom Line
- One Instrument for Multiple Streams

TSS sc Turbidity and Suspended Solids Sensor

TSS sc probes can measure both online suspended solids and turbidity in one instrument. They cover the total measurement range from the finest turbidity to solids over a wide range. TSS sc probes have been specially developed for industrial applications in production processes in the chemical sector and for the requirements of industrial wastewater plants.

1720E Low Range Turbidimeter

Provides the sensitivity and stability required to continuously monitor turbidity at very low levels (0 to 100 NTU).

- Bubble removal system eliminates the most significant interference in low level turbidity measurement
- Simple plug-and-play connections
- Two year warranty

FilterTrak 660™ sc Laser Nephelometer

The laser turbidity method used in the FilterTrak 660 sc Laser Nephelometer makes ultra-low measurement of turbidity possible to optimize RO filtration systems.

- 0.0 to 5.0 NTU range
- Detects submicron-size particles, a precursor to larger particles

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- Automatic samplers and flow meters
- Local sales and service teams
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For more information, visit hach.com/chemicalguide or call toll-free 800-227-4224.

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