

The latest water analysis  
systems from a proven leader



**Agilent Technologies**

# Manage the Flow of Knowledge

The world of water analysis is constantly changing. Regulatory standards evolve. Productivity demands increase. New technologies and applications are necessary. With nearly four decades of industry experience, Agilent has a proven record of helping environmental laboratories, not just today but year after year, sample after sample.

Agilent offers a complete portfolio of water analysis solutions. Discover the new products that push the boundaries of performance, such as the first solid inert source GC/MSD with its unmatched sensitivity for active compounds. Learn about Agilent innovations in systems including the LC/MSD Trap XCT, LC/MSD TOF, and ICP-MS with Octopole Reaction System (ORS) technology. Agilent's instruments, supplies, and services are designed specifically to meet the challenges of environmental analysis. Solve problems more reliably, more efficiently, and with higher quality results than ever before.

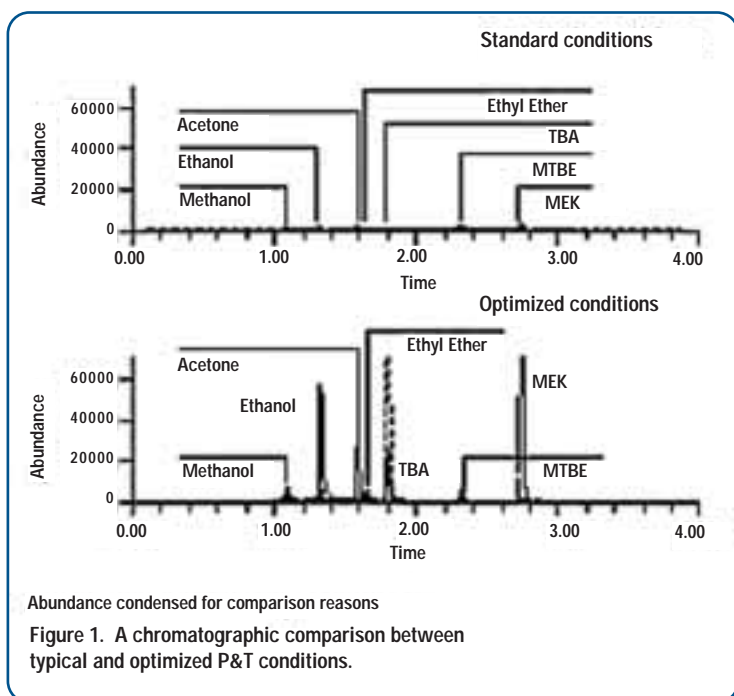


## On the forefront of change

### **A sampling of water analysis applications using Agilent systems:**

- Fast Semivolatiles Analysis in Less Than 10 minutes Using the Agilent 5973 inert GC/MSD
- Rapid Screening of More Than 500 Pesticides and Endocrine Disrupters by GC/MSD
- Extraction, Identification, and Quantitation of Phenolic Compounds by Solid-Phase Extraction and GC/MSD Analysis
- Meeting Worldwide Regulatory Requirements for Trace Metals in Water Using the Agilent 7500 ICP-MS
- Validated Method for the Determination of Phenyl Urea and Triazine Herbicides in Water by LC/MSD
- Rapid and Sensitive Identification of Steroids in Water by Ion Trap LC/MS/MS
- Rapid Screening of Paraquat and Diquat by LC/MSD Using Selective Ion Monitoring and Large Volume Injection
- Determination of Trace-level Acidic Herbicides in Water by LC/MSD Using Selective Ion Monitoring

For access to detailed information about these applications and more, go to: [www.agilent.com/chem/environmental](http://www.agilent.com/chem/environmental)



(figure 1) Many laboratories have been asked to analyze groundwater samples for contamination from methyl tert-butyl ether (MTBE), ethanol, methanol and other oxygenates in fuel. Because these analytes are so polar, low-level analyses using conventional methodologies are very difficult. Agilent applications scientists have responded quickly with a method to quantitate oxygenates in water at the part-per-billion level. This method uses optimized purge-and-trap conditions with Agilent's DB-VRX column and the GC/MSD. The figure compares chromatographic response for the standard and optimized purge-and-trap conditions.

## Clear Solutions for Environmental Analysis

Agilent systems will allow your lab to separate and quantify ultra-trace levels of compounds in a wide range of matrices.

### Volatiles

Volatile organic compounds (VOCs) are typically analyzed by Purge & Trap (P&T) or Headspace preconcentration followed by capillary GC separation and detection. Agilent's GC/MS system has become the "gold standard" for this analysis because of its high sensitivity and ability to routinely confirm compound identity at low concentrations (see figure 1).

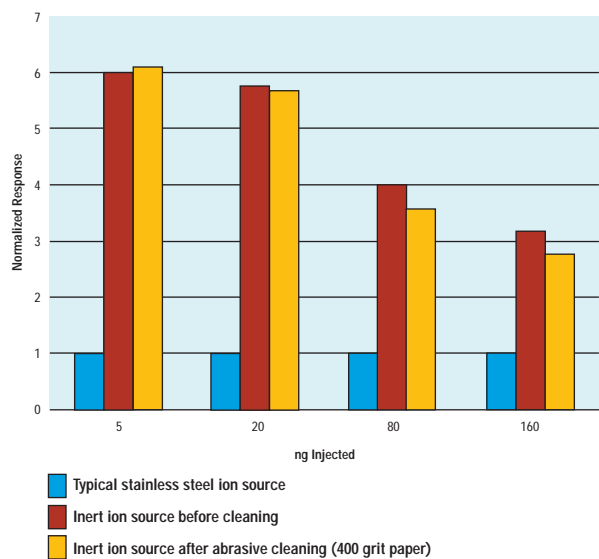
Software specifically designed for environmental analysis provides full instrument control and makes reviewing

and reporting of analytical results simple and rapid. Whether your needs require a P&T or a Headspace sampler, Agilent provides a total solution for measuring VOCs allowing complete automation that will increase productivity in every analytical step — from sample preparation and introduction to analysis and reporting.



The Agilent 5973 inert GC/MSD

Figure 2. Enhanced Response for 2,4-Dinitrophenol.



(figure 2) Relative to stainless steel sources, the solid inert source of the 5973 delivers superior performance for active compounds. This example shows that the inert source provides up to six times the response for low levels of 2,4-dinitrophenol. This acidic compound can be difficult to analyze, especially at trace levels where sample adsorption becomes an issue. The 5973 inert source handles the analysis with ease. The source is manufactured from a solid inert material that does not wear away with cleaning. So you continue to see enhanced performance sample after sample.

## Semivolatiles and pesticides

Analyzing semivolatiles and pesticides in water demands exceptional system performance. Agilent has designed GC and GC/MS systems that can routinely detect these compounds at ultra-trace levels. The 5973 inert MSD is our most sensitive GC/MS, as well as the most rugged. The proprietary inert ion source design delivers the ultimate performance for active compounds such as pesticides (see figure 2).

For greater productivity, Agilent's exclusive Retention-Time Locking (RTL) dramatically simplifies laboratory standard operating procedures — reducing costly analytical mistakes and minimizing analyst training. You get the same retention times from day to day and instrument to instrument. With RTL, there are no variations depending on operators, detector types, or column maintenance. Agilent offers universal methods and turnkey RTL databases for a wide range of applications (see figure 3), including:

- Pesticide and Endocrine Disruptors
- Volatile Organic Compounds
- Polycyclic Aromatic Hydrocarbons
- Polychlorinated Biphenyls
- Organotin Derivatives
- Phthalates
- Phenols

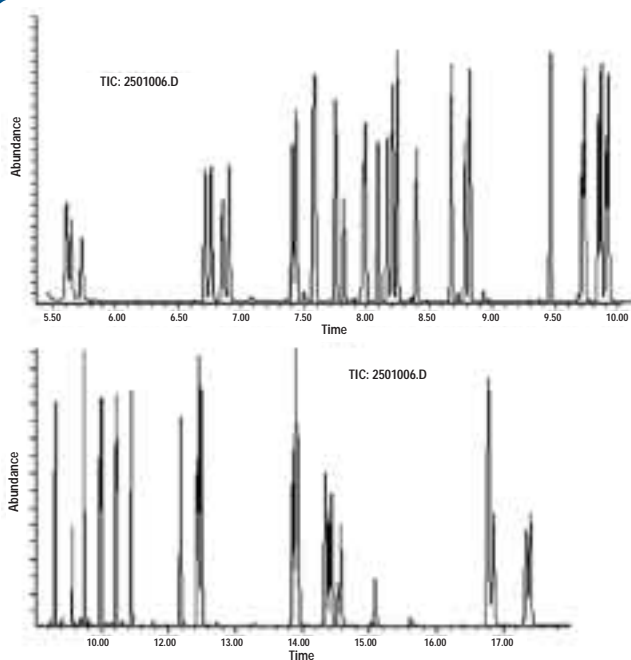
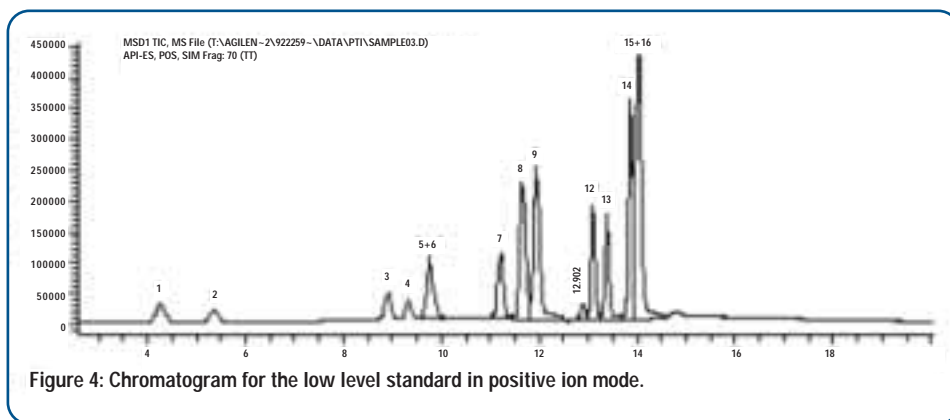


Figure 3: Total ion chromatogram of more than 50 PAHs injected from isoctane.

(figure 3) Many of the compounds referred to as polycyclic aromatic hydrocarbons (PAHs) have been characterized as carcinogens, mutagens, and teratogens. Therefore the presence of PAHs in water is regulated and monitored around the world by environmental agencies. Here, more than 50 PAHs were analyzed in under 18 minutes, using a retention-time locked GC/MSD method that assists in unknown PAH identification.



(figure 4) The Agilent LC/MSD is the instrument of choice for analysis of trace levels of triazine and phenyl urea herbicides in drinking water or groundwater. This chromatogram shows the positive ion mode selected ion monitoring analysis of these herbicides at a low 0.1 µg/L level. The time-programmable fragmentor voltage of the LC/MSD enables sensitive analyses across a range of chemical structures.

Like the GC and GC/MS systems, Agilent's LC and LC/MS systems are designed from the ground up for ruggedness, reliability, and ease-of-use. These systems are well-suited for the reproducible analysis of polar pesticides and other environmental contaminants that are difficult or impossible to analyze with GC or GC/MS.

These developments made LC/MS more routine and rugged; enhanced sensitivity and stability; reduced chemical background noise; and made it easier to adapt existing LC methods to LC/MS. Even trace-level analyses now yield strong signals and unequivocal results (see figure 4).

Early LC/MS instruments lacked the qualifications required for reliable environmental analyses. In the early 1990s, Agilent pioneered a number of innovations to bring the power of mass spectrometry to the liquid chromatographer. These included an orthogonal atmospheric pressure ionization source, a fixed-position nebulizer, a built-in calibrant delivery system, and an automatic tuning



The Agilent 1100 Series LC/MSD TOF



The Agilent 7500 series ICP-MS

## Metals

The analysis of trace metals in water requires increasingly lower levels of detection and higher instrument productivity. Agilent's new 7500 series ICP-MS system combines ppt-level sensitivity with the throughput of the fastest optical ICP instruments. And for greater efficiency, an Agilent ICP-MS system equipped with our innovative Integrated Sample Introduction System (ISIS) provides unsurpassed automation, ease-of-use, and reliability. When Agilent's ICP-MS is integrated with the separation power of our LC or GC systems, the result is a powerful solution for the identification and quantification of metallic and organometallic species in addition to total metals.

The standards for sensitivity and productivity are being rewritten by Agilent's new ICP-MS systems with Octopole Reaction System (ORS) technology and enhanced ion optics. With the Agilent system, laboratories can exceed all worldwide drinking water criteria for toxic metals in a single, rapid analysis without the use of complex mixed or reactive gasses in the collision cell (see figure 5). Innovations in the ICP-MS software have been designed specifically for the highly regulated environmental industry. The result: hardware optimization, method setup, sample analysis, and QA/QC that are simple and straightforward for high productivity. Once tedious regulatory compliance tasks become routine with enhanced security and audit trail functions. Streamline your analyses and increase your confidence in the pure results from Agilent.

Analyte	World Health Organization Standard (mg/L)	EC Directive 98/83/EC (mg/L)	Japan Drinking Water Standard (mg/L)	USEPA Primary MCL (mg/L)	Agilent 7500 MDLs* (mg/L)
Aluminum (Al)	-	0.2	0.2	0.02-0.2	0.000054
Antimony (Sb)	0.005	.005	0.002	0.006	0.000035
Arsenic (As)	0.01	.01	0.01	0.01	0.000052
Barium (Ba)	0.7	-	-	2	0.000027
Beryllium	-	-	-	0.004	0.000028
Boron (B)	0.5	1	1.0	-	-
Cadmium (Cd)	0.003	0.005	0.01	0.005	0.000025
Chromium (Cr)	0.05	0.05	-	0.1	0.000019
Copper (Cu)	2	2	1.0	1.3	0.000023
Iron	-	0.2	0.3	0.3	0.00125
Lead (Pb)	0.01	.01	0.05	0.015	0.000017
Manganese (Mn)	0.5	.05	0.05	0.05	0.000020
Mercury (Hg)	0.001	0.001	0.0005	0.002	0.000005
Molybdenum(Mo)	0.07	-	-	-	0.000030
Nickel (Ni)	0.02	0.02	0.01	-	0.000024
Selenium (Se)	0.01	0.01	0.01	0.05	0.000047
Silver (Ag)	-	-	-	0.01	0.000027
Sodium	-	200	200	-	0.0276
Thallium	-	-	-	0.002	0.000021
Uranium	0.002	-	0.002	0.030	0.000015
Zinc (Zn)	-	-	-	5.0	0.000101

(figure 5) Worldwide regulatory limits for trace metals in drinking water compared with Agilent 7500 ORS method detection limits. By combining simple collision/reaction cell chemistry with carefully controlled kinetic energy discrimination (KED), the Agilent 7500 ORS series of ICP-MS systems can easily exceed regulatory limits without compromising dynamic range or robustness.

# A Single Source For All Your Needs

Columns, supplies, and services are vital parts of a complete solution from Agilent, the world's largest supplier of GC instruments, columns, and related products. Having a single source for these essential operating needs makes service and supply a routine part of your laboratory operation instead of a source of error and delay.



## Columns

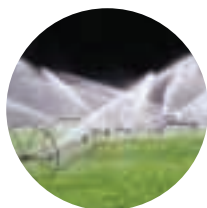
For trace levels of analysis, Agilent GC columns offer unsurpassed sensitivity by supplying the best column inertness and low column bleed. For fast, high resolution HPLC analyses, look to our line of rugged and reliable StableBond and Eclipse ZORBAX Rapid Resolution, 3.5  $\mu\text{m}$  columns.

We test each and every GC and HPLC column that we manufacture. Our tight release specifications and manufacturing processes ensure high quality, reproducible chromatography from column to column.

resources to optimize performance and ensure accuracy. And with highly trained engineers attending to your instruments, your analysts are free to focus on analysis. Look to us for maintenance, repair, education, consultation, telephone support, lab resource management and more. You have the flexibility to select the services you need with our pre-bundled plans, saving you money right from the start. It's all part of our commitment to helping you get the job done with extreme precision. So you can make real progress and achieve critical goals.

## Support You Can Trust When Change Comes Fast

Keeping up with environmental requirements and regulations demands in-depth research, global expertise, and deep resources. Back up your laboratory with an Agilent partnership. For reliable, efficient solutions, Agilent is the proven choice.



## Supplies

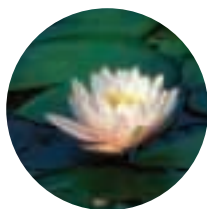
PerfectFit supplies and replacement parts for your Agilent instruments are treated as mission-critical components of your analytical system, and are designed by Agilent engineers. Agilent chromatography and solid phase extraction products, flowmeters, syringes, vials, gas purifiers, and other consumable supplies are manufactured to Agilent's rigorous standards, then exhaustively tested before delivery. Consistent quality, performance, and maximum uptime are assured with Agilent supplies — along with the convenience of service from a single vendor.

## Agilent Support Services

Optimize your assets. Extend the life of your equipment. Maximize uptime. These are just some of the real benefits you can expect from Agilent support services.



As budgets grow tighter and expectations climb higher, it is essential you get the most out of your existing equipment. And who best to service your Agilent equipment than Agilent certified engineers. From workhorse machines to precision components, our engineers possess the expertise, tools, and



# A Commitment to Performance

In 1976, Agilent Technologies created the first bench top GC/ MS. The tradition of innovation continues with the new 5973 inert MSD, a system with outstanding benefits for environmental analysis. Agilent also offers pioneering LC/MS systems that exceed standards of flexibility and reliability. Innovations in ICP-MS with Octopole Reaction System (ORS) technology allow the measurement of multiple analytes in the most challenging sample matrices. Improve speed, accuracy, and productivity with environmental solutions from Agilent.

## For more information

To learn more about how you can benefit from Agilent's water analysis expertise, call us at 800-227-9770 or visit our Web site at [www.agilent.com/chem/environmental](http://www.agilent.com/chem/environmental). On our Web site, you'll find extensive Internet resources such as application notes and product information.

[www.agilent.com/chem/environmental](http://www.agilent.com/chem/environmental)

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## Agilent's Value Promise

Agilent is the only analytical instrument company offering customers 10 years of guaranteed value on all new product purchases. The Agilent Value Promise:

- Guarantees you at least 10 years of instrument use, from the date of purchase, or we will credit you with the residual value of that system when you upgrade to a replacement model.
- Applies to Agilent gas and liquid chromatography systems, including GC/MS, LC/MS and ICP-MS.
- Ensures a safe purchase. Agilent stands behind our systems to maximize your return on investment.



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