Application Brief

Environmental

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The Fastest and Smartest Way to Analyze Water Samples by ICP-OES

Using the Agilent 5900 SVDV ICP-OES for quick and reliable US EPA method 200.7 compliant analysis

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Determine all elements in a single measurement

Many environmental laboratories use ICP-OES to analyze large numbers of varied sample types; waters, soils, and sludges, using a regulated method such as US EPA 200.7. To generate high-quality results quickly, fast analysis times and error-free workflows are critical. Mistakes made during sample preparation or through sub optimal instrument performance can lead to samples having to be remeasured, reducing productive analysis time.

The Agilent 5900 synchronous vertical dual view (SVDV) ICP-OES is designed for high throughput labs that want the fastest sample measurement, using the least amount of argon. The 5900 improves analytical and instrument performance by using a series of smart features such as IntelliQuant and Early Maintenance Feedback (EMF) diagnostics. Gaining extra sample and operational insight reduces unexpected instrument downtime and remeasuring of samples, giving you greater confidence in your instrument operational performance and results.

Future-proof your ICP-OES analysis

Only the Agilent 5900 SVDV ICP-OES uses the dichroic spectral combiner (DSC)[1] optical component, which captures both axial and radial views in the one reading. The 5900 measures samples in half the time of any other ICP-OES instrument, delivering the most accurate results in the quickest possible time, with the lowest argon consumption per sample. By keeping control of the cost per analysis, your ICP-OES is ready to handle a higher sample load if your lab requirements change.

Use smart tools to reduce downtime

Proactive maintenance of an ICP-OES is critical in order to achieve the performance criteria specified in regulated methods such as US EPA 200.7. The 5900 ICP-OES uses smart EMF diagnostics to maintain peak performance, maximize instrument uptime, and avoid problems before they occur. The EMF tracks actual instrument usage and color-coded counters (Figure 1) show which maintenance activities should be done immediately (red), and which can wait (green). Something as simple as worn peri-pump tubing can critically affect the low detection limits usually required for water samples. The EMF system ensures that consumables are only replaced as needed. Basing maintenance decisions on actual use rather than a predefined schedule, saves time, effort, and money.

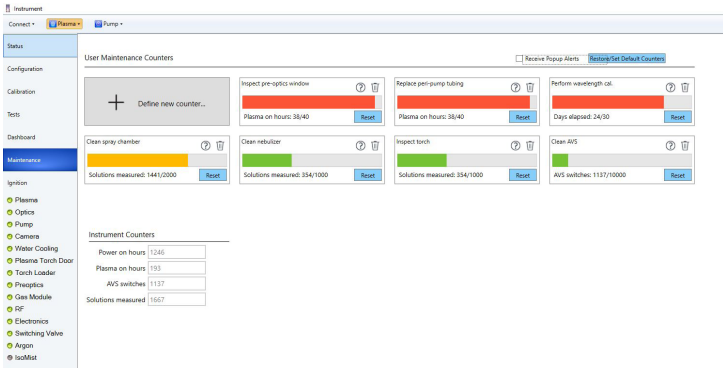

Figure 1. The EMF system monitors critical instrument parameters to maintain optimum analytical performance and reduce sample remeasurements.

Flagging outlying results

The outlier conditional formatting (OCF) feature in the ICP Expert software makes it quick and easy to find potentially problematic results in large data sets. It can be configured to highlight results that exceed a user-defined limit or that don't pass a test. For example, OCF can identify poor precision (high %RSD), often caused by a partially blocked nebulizer, worn pump tubing, or a dirty spray chamber. In Figure 2, the OCF flagged all results with a %RSD greater than 10% (flag "B").

As many samples analyzed using method 200.7 may contain high solids, partial nebulizer blockage could occur. To detect nebulizer blockages (or leakage), the 5900 continuously monitors the nebulizer backpressure against the expected value using the Neb Alert function. If the pressure threshold is exceeded, the operator is immediately alerted to a potential blockage, enabling a quick response.

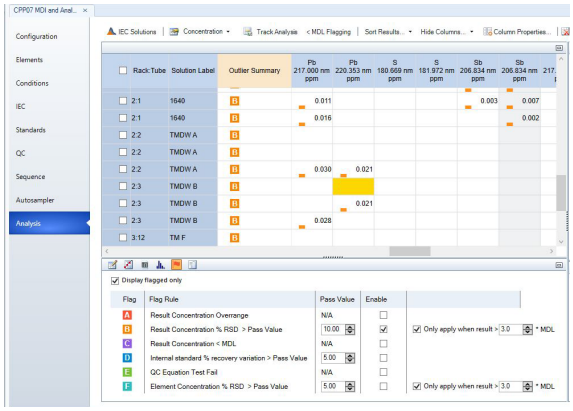

Figure 2. Flagging of water sample results. Flag B informs the analyst that the %RSDs are above the defined concentration range for replicate measurements, indicating a potential problem, such as a partially blocked nebulizer.

Method 200.7 compliant analysis

A 5900 SVDV ICP-OES, fitted with an integrated AVS 7 switching valve system, was used for the fast analysis of water samples according to method 200.7. The MDLs are shown in Table 1. All elements in each sample were determined in only 57 seconds, reducing argon use per sample and maximizing revenue. The EMF system ensured peak performance was maintained, minimizing QC failures, and therefore minimizing sample remeasurements.

Table 1. MDLs per method 200.7, n=6 (three runs on two instruments). Units: µg/L.

Element	MDL	Element	MDL	Element	MDL
Ag 328.068	0.3	Cu 324.754	0.5	S 180.669	6.4
Al 396.152	0.9	Fe 259.940	0.2	Sb 217.582	2.7
As 188.980	2.1	K 766.491	41.9	Se 196.026	3.4
B 249.772	0.3	Li 670.783	0.3	Si 250.690	1.0
Ba 493.408	0.1	Mg 279.078	2.0	Sn 189.925	0.8
Be 313.042	0.03	Mn 257.610	0.06	Sr 421.552	0.02
Ca 315.887	0.7	Mo 202.032	0.3	Ti 334.941	0.1
Cd 226.502	0.09	Na 589.592	8.2	Tl 190.794	2.1
Ce 418.659	2.3	Ni 231.604	0.4	V 292.401	0.4
Co 228.615	0.5	P 213.618	3.1	Zn 213.857	0.2
Cr 205.560	0.2	Pb 220.353	1.5	Zr 343.823	0.2

References

1. Synchronous Vertical Dual View (SVDV) for High Productivity and Low Cost of Ownership. Agilent publication no. 5994-1513EN

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