Agilent’s NEW Atomic Workflow Automation Solutions - ADS 2

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Trusted Answers

The Agilent Atomic Spectroscopy Portfolio

Agilent's 55 and 200 Series includes the *world's fastest flame AA* and the *world's most sensitive furnace.*

Agilent's 4210 MP-AES runs on air for the *lowest cost of ownership* and *improved safety.*

Agilent's 5110 ICP-OES is the *world's most productive, and only Synchronous Vertical Dual View* ICP-OES.

Agilent's 7900 ICP-MS is the *most robust, sensitive, and easy to use* ICP-MS ever.

Agilent's 8900 ICP-QQQ provides *applications capabilities and research opportunities never before possible*.

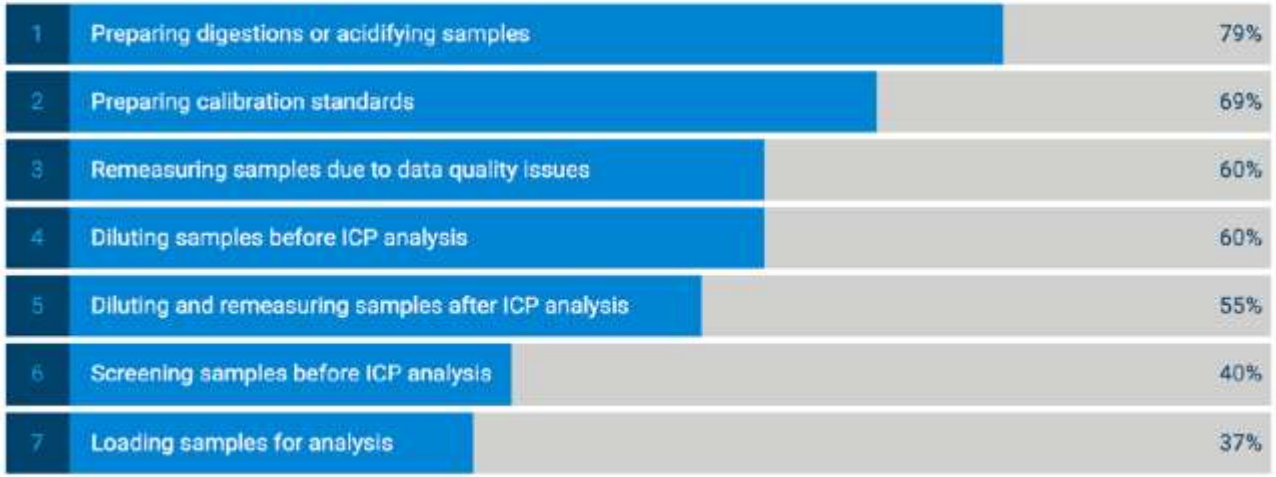
Leading the way in atomic spectroscopy innovation

What's Limiting Your ICP Workflow Efficiency?

Manual Handling of ICP Samples: See How Your Lab Compares

Here are the results from our lab poll so far

Not long ago, you received our "Manual Handling of ICP Samples" poll, where we asked you to rank sample handling activities from most time consuming to least. We thought you might like to see the results to date.



2. Preparing calibration standards.

4. Diluting samples before and after analysis

5.

Less work. More flow.
The Agilent ICP Workflow Automation Solution

Looking for ways to get more out of your ICP analysis workflow? While increasing automation can boost lab efficiency, bringing in third-party automation accessories can add complexity.

Only Agilent offers a completely integrated ICP workflow automation system—comprising hardware, software, and support—designed to free up your analysts for more productive pursuits. Our simple and reliable single-vendor solution integrates automated calibration, dilution, analysis, and reporting to lower your cost-per-sample and turnaround time while improving the quality of your results.

Reduce the hassle of dealing with multiple vendors and improve your lab's efficiency with the Agilent ICP workflow automation system.

Less work. More flow.

The Agilent ICP Workflow Automation Solution

Increasing Level of Automation

- Most routine labs are using autosamplers to introduce sample to the ICP

Agilent ICP-OES/-MS + SPS 4

Novel SPS 4 Autosampler

- High capacity
- Higher speed
- Integrated cover
- Embedded extraction
- Small footprint

Less work. More flow.
The Agilent ICP Workflow Automation Solution

- High throughput labs have standardized on switching value technology
  - ➢ AVS increase sample throughput – improves key metrics of Turn-Around Time (TAT) and cost/sample

- Most routine labs are using autosamplers to introduce sample to the ICP

Increasing Level of Automation

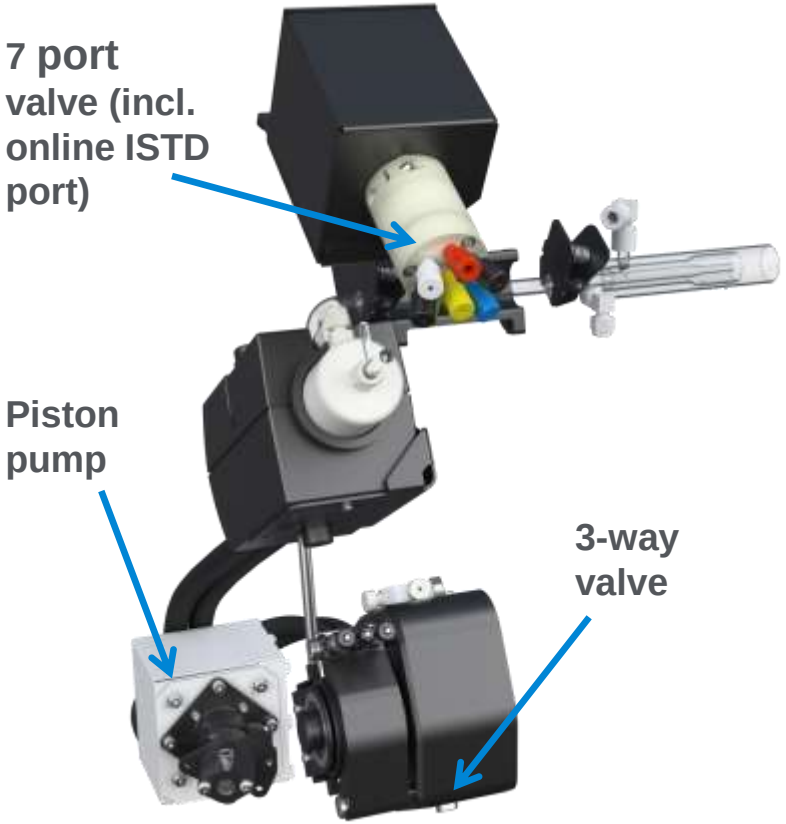

Agilent ICP-OES/-MS + SPS 4 + AVS/ISIS


Agilent ICP-OES/-MS + SPS 4

Fully Integrated Advanced Valve System (AVS)

AVS-6/7 for Agilent ICP-OES

AVS-MS for Agilent ICP-MS



AVS-6/7 for ICP-OES

Reduce sample uptake, stabilization time and rinsing

Simple

- Installation
- Control with integrated software
- Lower maintenance

Fast

- Up to 2 x sample throughput
- Smaller sample volume
- Shorter rinsing times

Precise

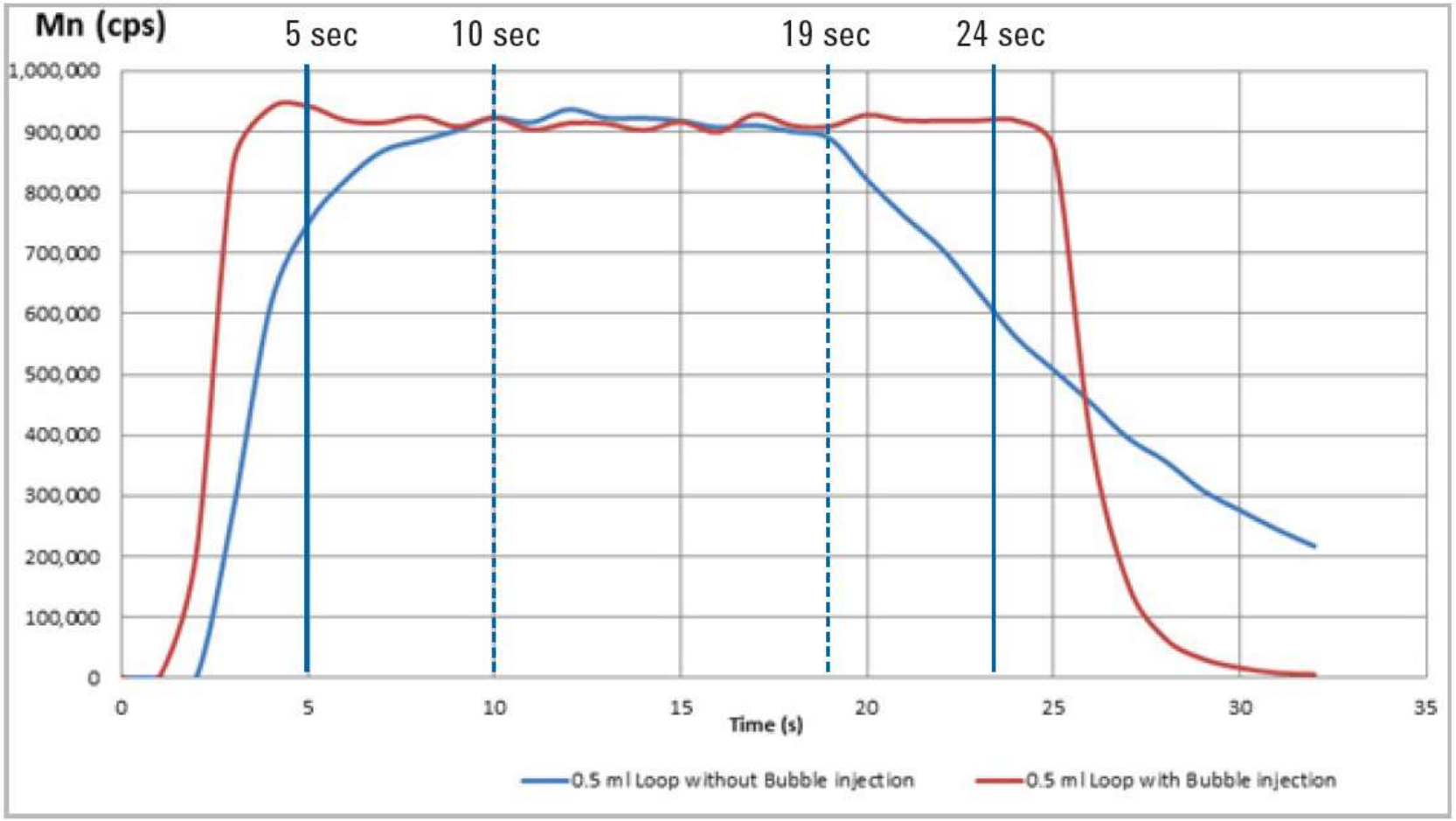
- Controlled Ar bubble injection improves long term stability

AVS 6/7 for ICP-OES

Fully integrated Advanced Valve System

Bubble injection

- Reduces stabilization time
- 19 s without bubbles
- 9 s with bubbles



AVS-MS for ICP-MS:
The software can overlap the process

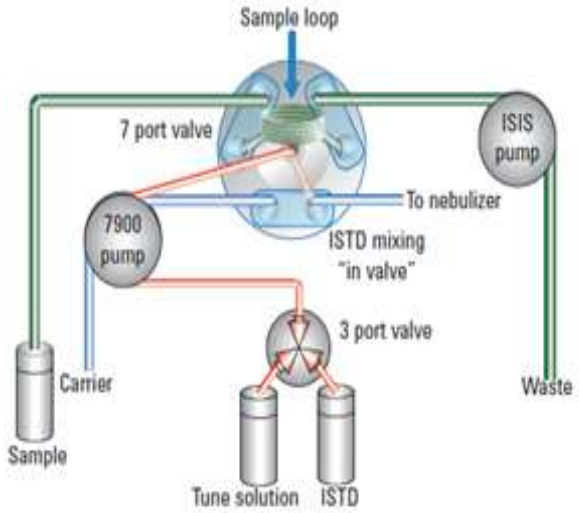
Normal analysis programs run in a ‘linear’ fashion; each step needs to finish before the next can start
(‘First Rinses” usually includes probe rinse & any initial rinse chemistry)

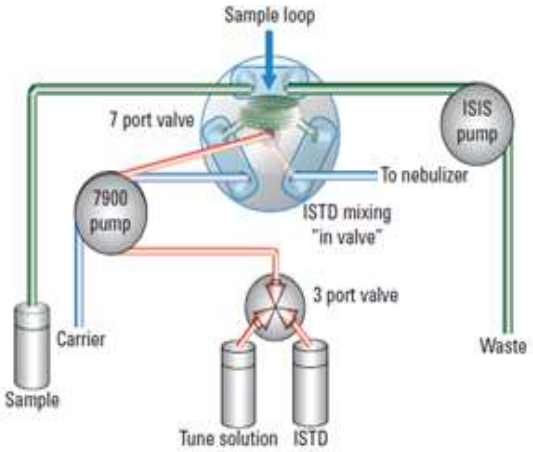
Pre-emptive rinse overlaps the rinse and acquisition steps, reducing the total sample analysis time

This can save about 60 samples per analysis cycle.
For a typical 3.5 minute run this is now reduced to 2.5 minutes…

AVS-MS for ICP-MS
Summary

The key benefit of AVS-MS is washout and throughput





- The sample is presented to the ICP-MS JUST for analysis, uptake and rinsing are to waste flow paths.
- The Separated flow paths means uptake can be very rapid
  - AVS-MS uses a very fast displacement pump
  - (not peristaltic pump, not vacuum pump)
- Tuning can be automated without replumbing the tubing.
- Shorter run means less Argon consumption.
- Samples spends little time in the sample introduction, reducing memory effect
- Less matrix, amount and time, in the system, reducing the cleaning frequency

Less work. More flow.

The Agilent ICP Workflow Automation Solution

- Addition of ADS 2 adds a new industry standard
  - Boosts throughput & free's up the Operator's time
  - Automates analysis dilution tasks
  - Further reduces TAT, cost/sample & human error

- High throughput labs have standardized on switching value technology
  - AVS increase sample throughput – improves key metrics of Turn-Around Time (TAT) and cost/sample

- Most routine labs are using autosamplers to introduce sample to the ICP

Increasing Level of Automation

Agilent ICP-OES/-MS + SPS 4 + ADS 2

Agilent ICP-OES/-MS + SPS 4 + AVS/ISIS

Agilent ICP-OES/-MS + SPS 4

Why Automate your ICP Workflow with Advanced Dilution System

Efficient

- Increase throughput
- Improve data quality
- **Reduce use of disposable plastic lab ware**
- Increase revenues

Simple

- Less sample handling and contamination
- **Reduces injury from repetitive tasks**
- Reduces operator dissatisfaction from repeated manual tasks

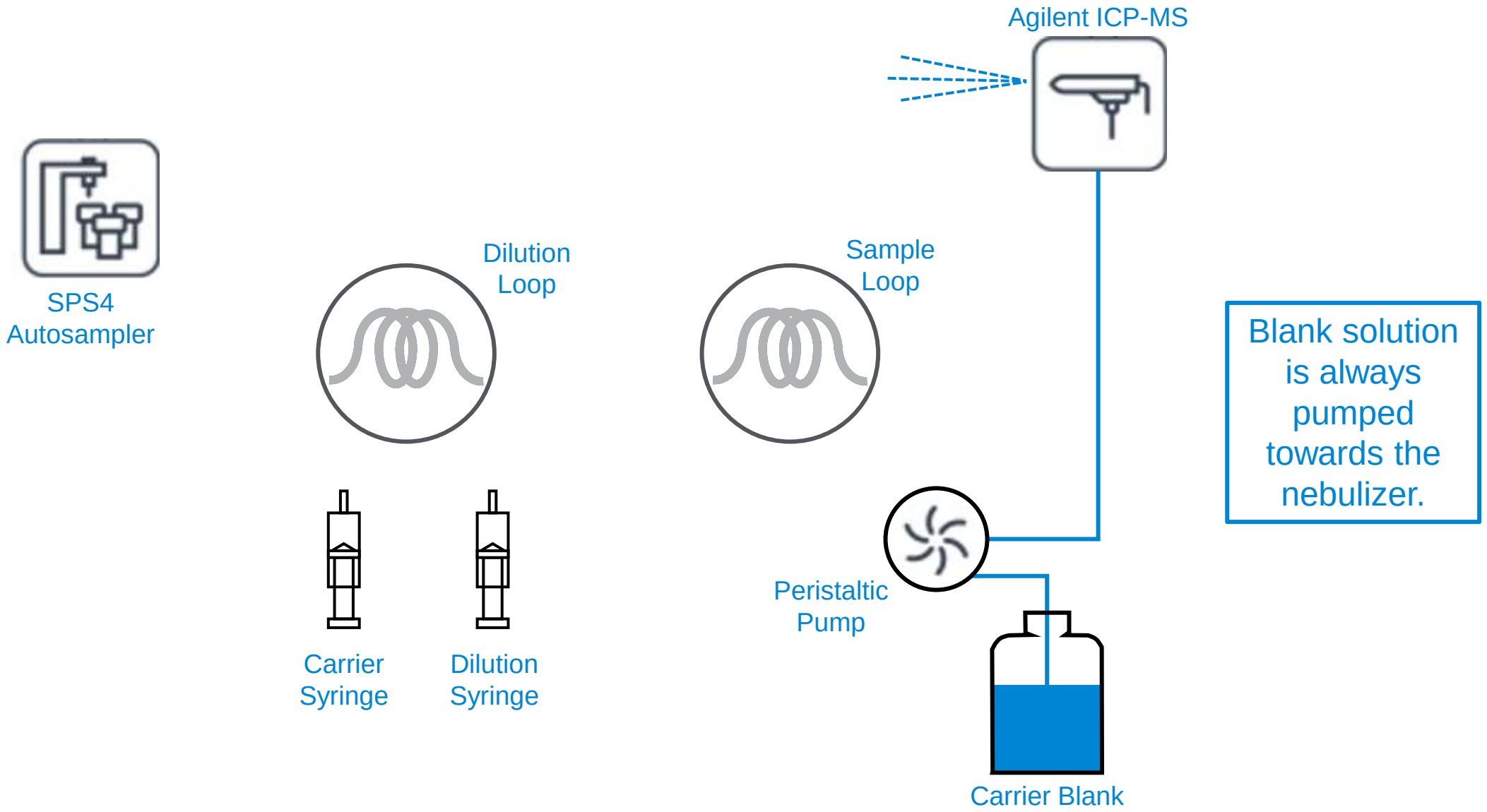
Fully Integrated

- **Single piece of control software for less staff training**
- Preset parameters for quick start up
- On board diagnostics for self service repair

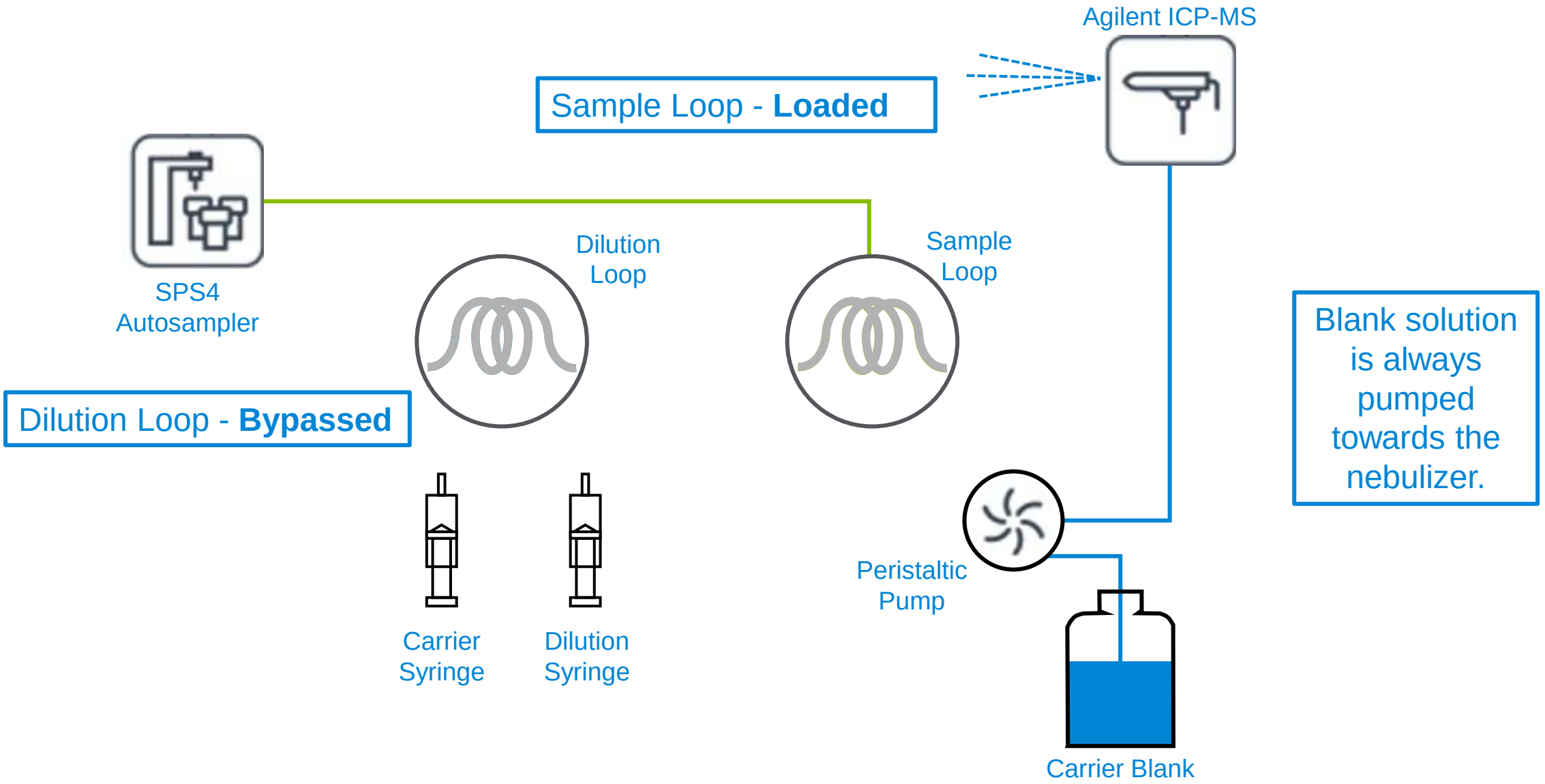
ADS 2 - Advanced Dilution System

- Optimized Design
  - Simple two-syringe system designed for lowest cost of ownership
  - Compact design that fits on the bench right next to the ICP allowing for close coupling to ensure fast results
  - Full software automation and optimization
  - All tubing is color-coded and labeled for easy installation and maintenance
- High throughput functionality
  - using discrete sampling as default for samples not requiring dilution
  - Integrated directly with Agilent's Advanced Valve System (AVS)
  - Up to 400x dilution on samples and stock standards
- Automated autodilution system using accurate liquid dilution
  - Autocalibration to create calibration curves
  - Reactive dilution for over-range samples
  - Prescriptive dilution for user-defined sample dilution
  - Prescriptive dilution with reactive dilution to dilute over-range samples with a user-defined dilution

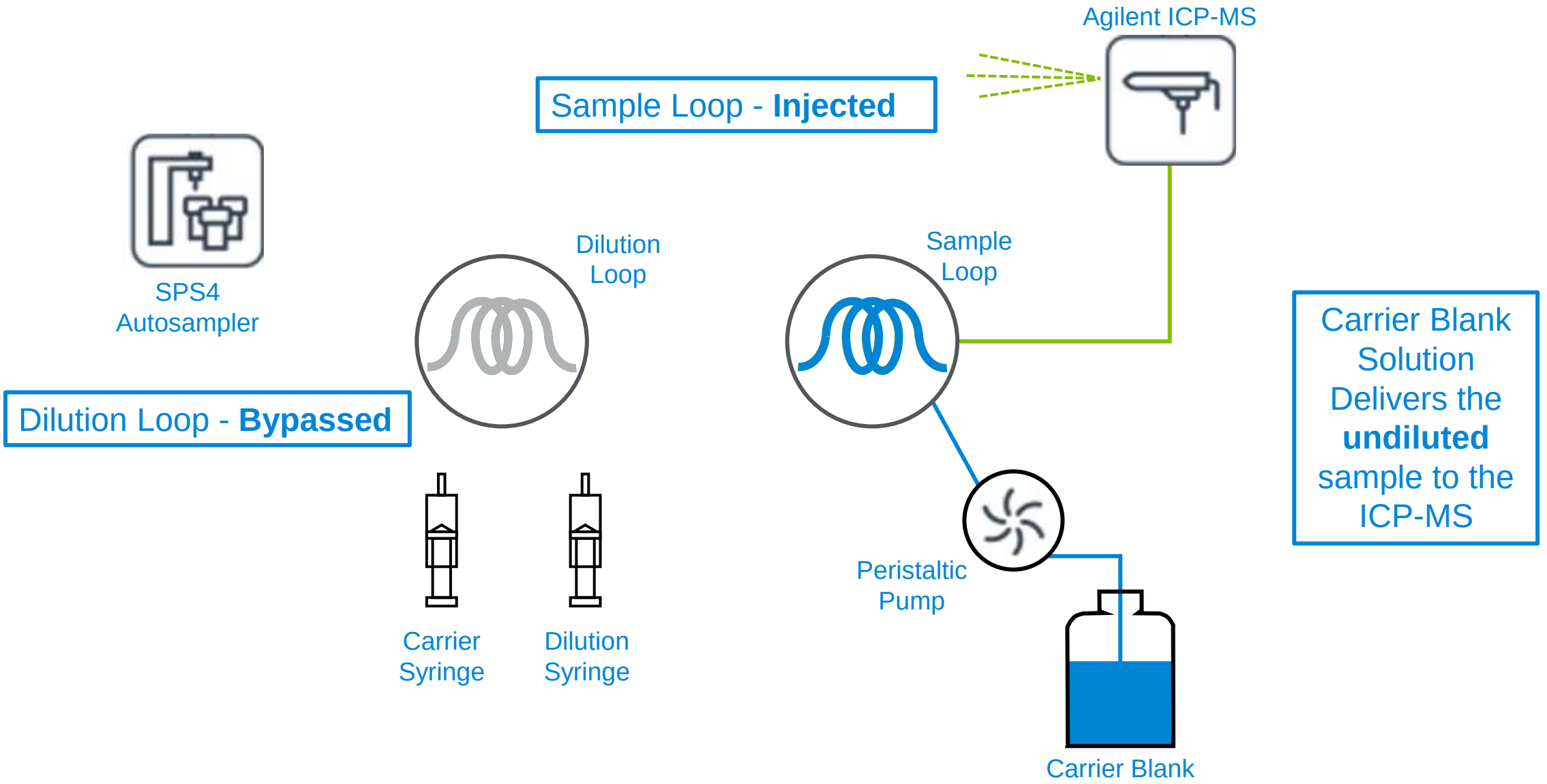
ADS 2 – Simple Flow Diagrams



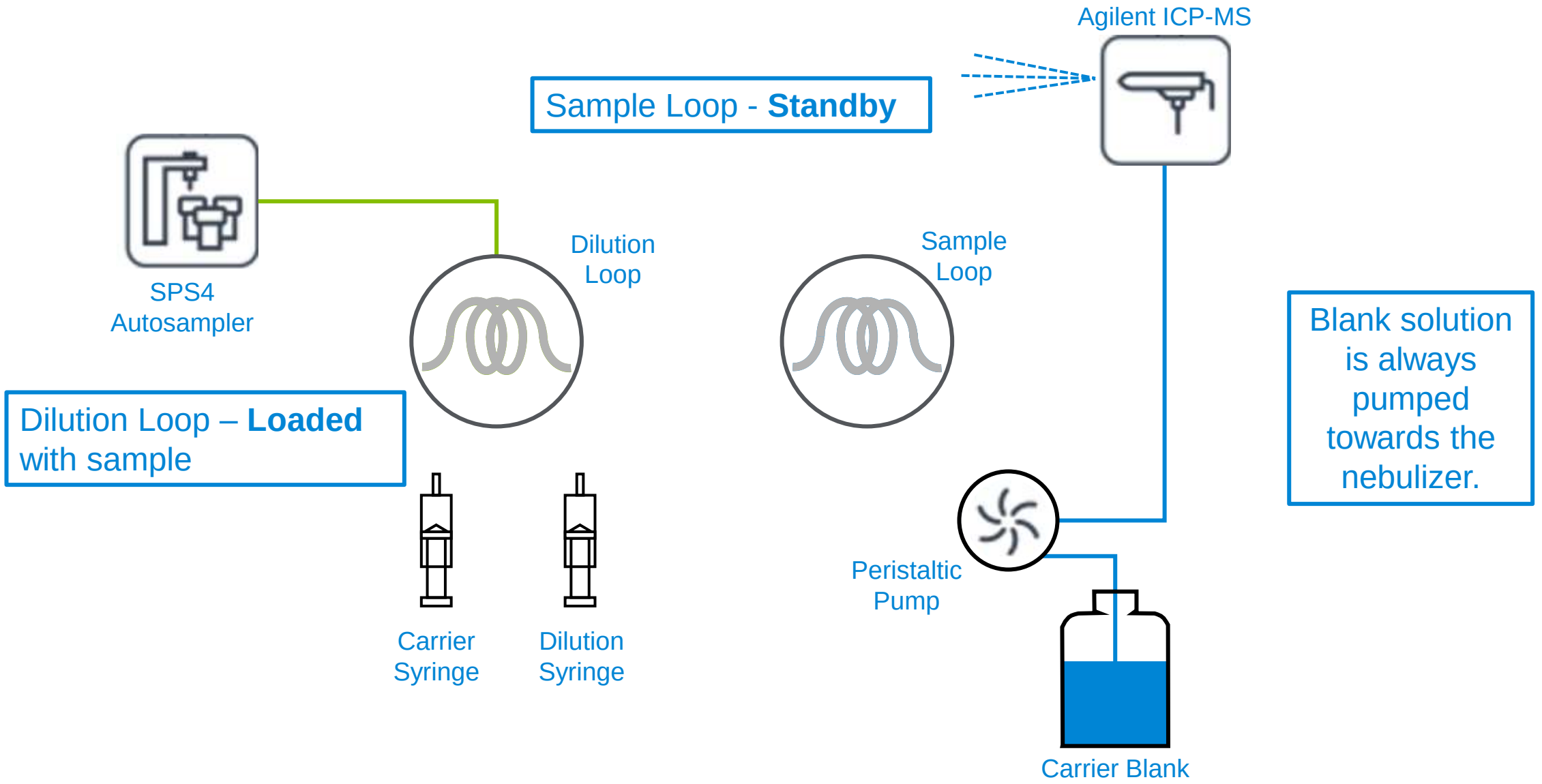
ADS 2 – **No Dilution** - Loading



ADS 2 – **No Dilution** - Injecting



ADS 2 – **Dilution** - Dilution Loop Loading



ADS 2 – **Dilution** - Sample Diluted and Loaded into Sample Loop

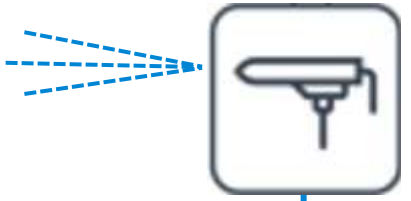
SPS4
Autosampler

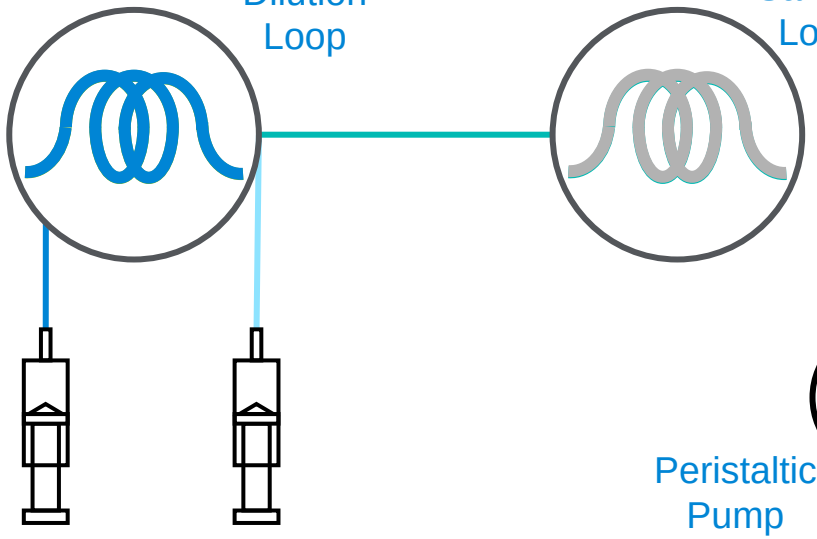
Carrier Syringe pushes the undiluted sample out of the loop while the **Dilution Syringe** dilutes the sample as it passes from the loop.

The ratio between the syringes determines the dilution factor.

Sample Loop – **Loaded** with the **diluted** sample

Agilent ICP-MS





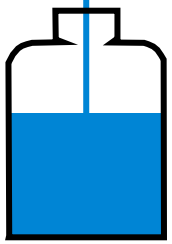
Dilution Loop

Sample Loop

Carrier Syringe

Dilution Syringe

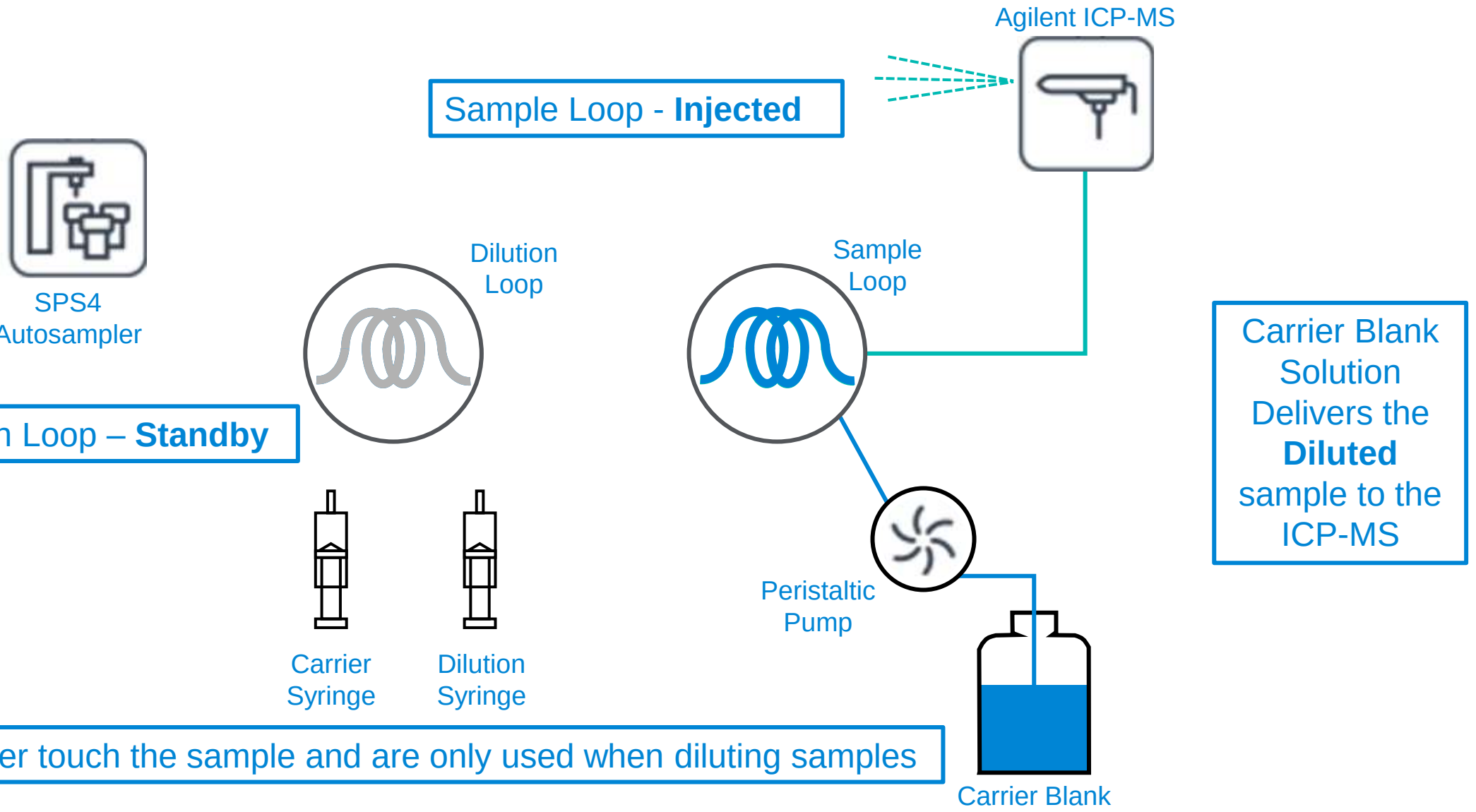
Peristaltic Pump



Carrier Blank

Blank solution is always pumped towards the nebulizer.

ADS 2 – **Dilution** - Diluted Sample Injected



Advanced Dilution System ADS 2

Less Work. More Flow.

Less work. More flow.

The Agilent ICP Workflow Automation Solution

Each workflow automation system features :

- An Agilent smart ICP, 5800 or 5900 ICP-OES **OR** 7850 or 7900 ICP-MS or 8900 ICP-MS-MS
- Autosampler, SPS 4
- Switching valve, Advanced Valve System, AVS
- Autodilutor, the **NEW** Advanced Dilution System, ADS 2
- Integrated Software to seamlessly control it all, ICP Expert or MassHunter

Less work. More flow.

The Agilent ICP Workflow Automation Solution

Our all-Agilent workflow automation systems:

- Are fully-integrated and supported by Agilent - No 3rd party.
- Are optimized for Agilent ICPs.
- Are designed to work as one system, with all settings included in the method and advanced features that can only be achieved when software and hardware are designed as one.
- Offer a simpler purchasing process and faster product support from a single point of contact
- Require less staff training with only one software platform to learn
- Contain no surprises. The system is tested to Agilent's strict QC requirements.

Agilent ICP-MS Automation System

Agilent ICP-OES Automation System

Automatic Calibration Standard Preparation

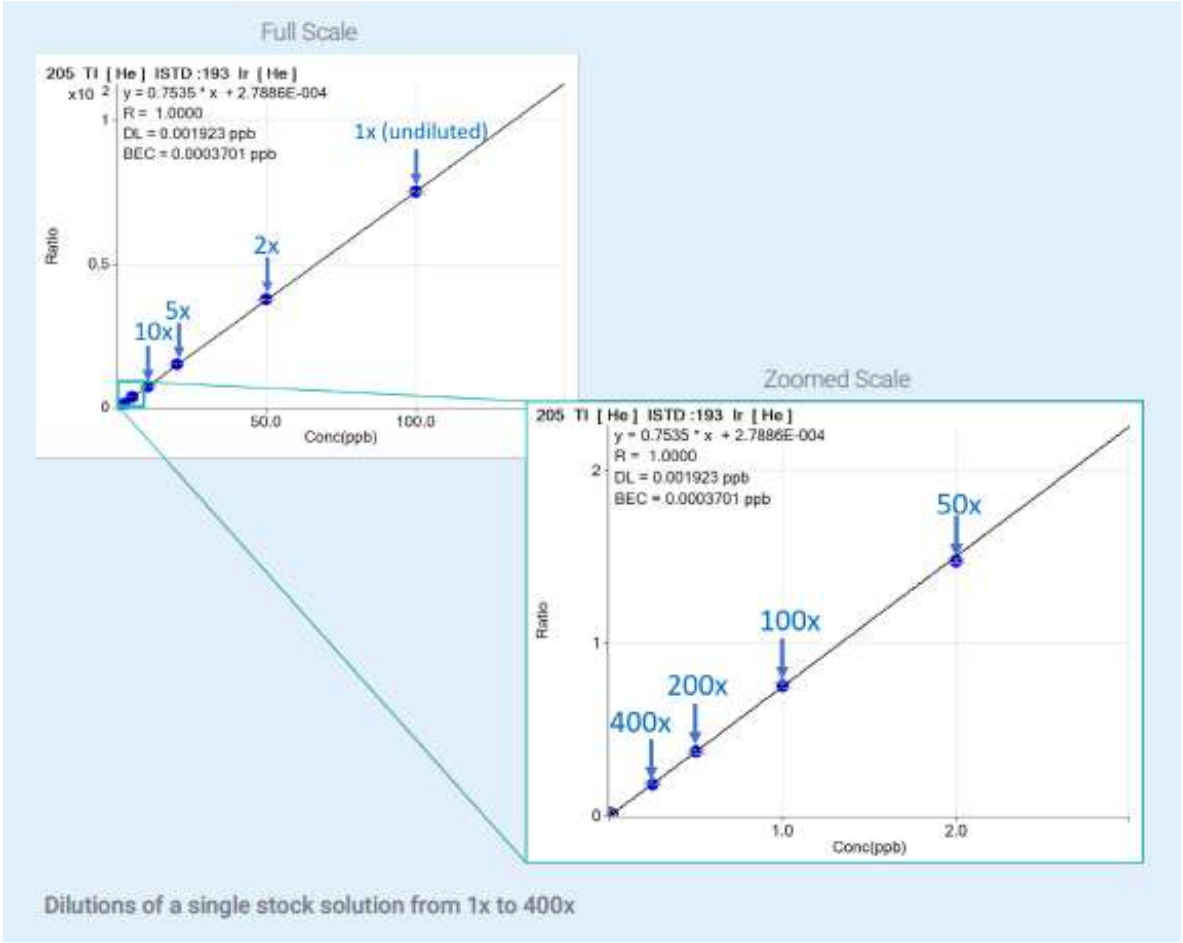
AutoCal

The ADS 2 can automatically prepare calibration standards from one (or more) stock standards

- A Stock Standards Library is available and can be updated with your custom standards.
- Autocalibration Assistant can help with calculation of your calibration curve.

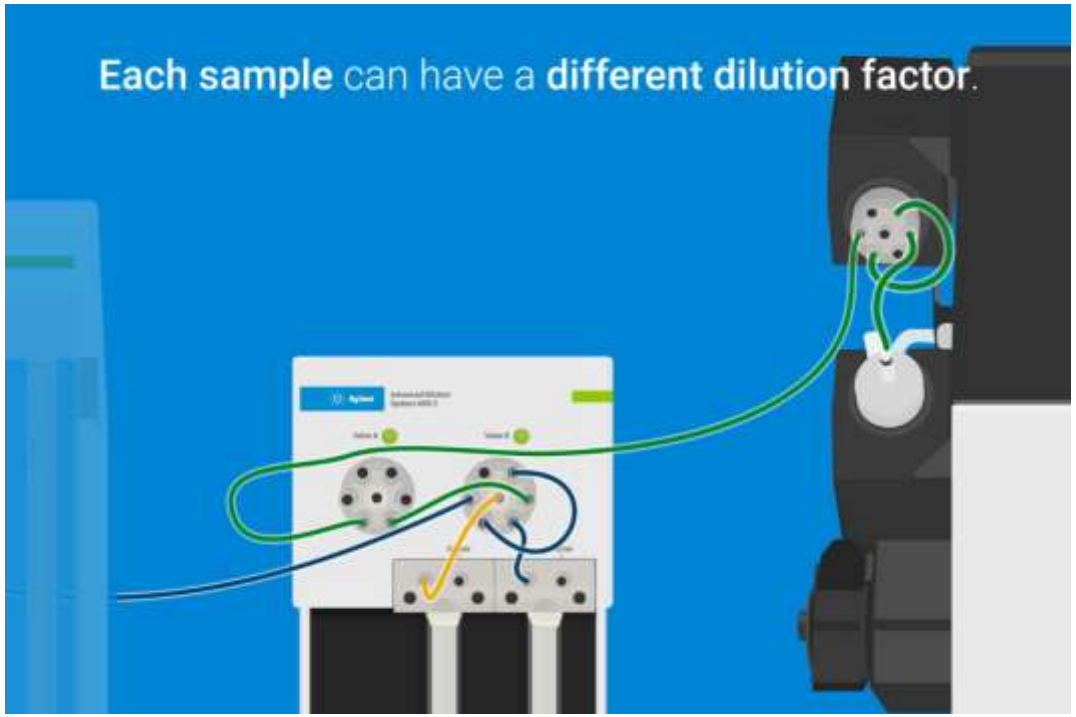
By automatically preparing standards on-line the ADS 2 improves data accuracy and repeatability.

- Your working standards are made fresh for analysis
- Remove any potential for human error in standard preparation
- Reduce any potential for contamination with less handling
- Achieve excellent calibration coefficients R = >0.9999



Dilutions of a single stock solution from 1x to 400x

Pre-analysis (Prescriptive) dilution



The ADS 2 automatic dilutes samples prior to analysis

Predefined dilution factors from 2x to 400x can be selected in the instrument control software, for the system to automatically perform the required dilution prior to analysis

The ADS 2 can remove the tedious repeatable manual task of diluting samples before analysis which:

- Removes the need to manually dilute samples before measurement
- Prepares samples with high repeatability
- Removes the risk of error associated with manual dilution procedures
- Frees up analysts to work on more valuable tasks

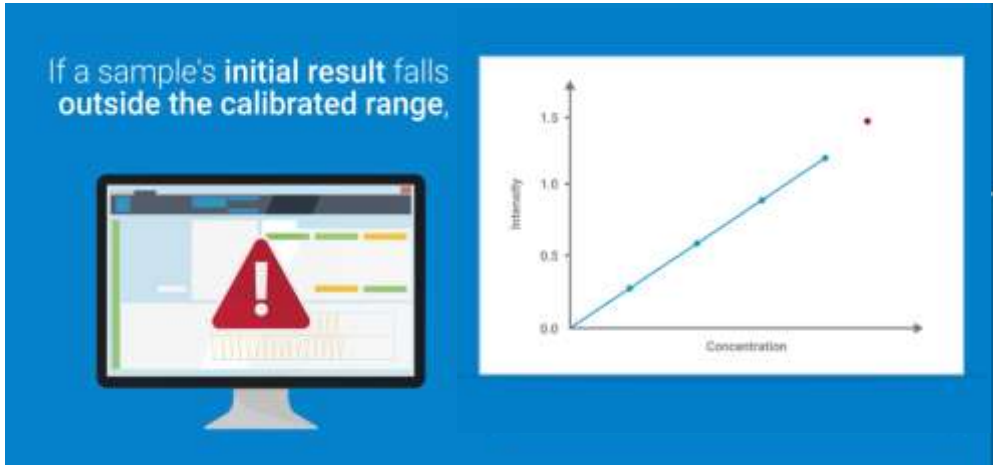
Reactive dilution

The ADS 2 can automatically perform a dilution following an unexpected result.

- Measured result is above the calibration range

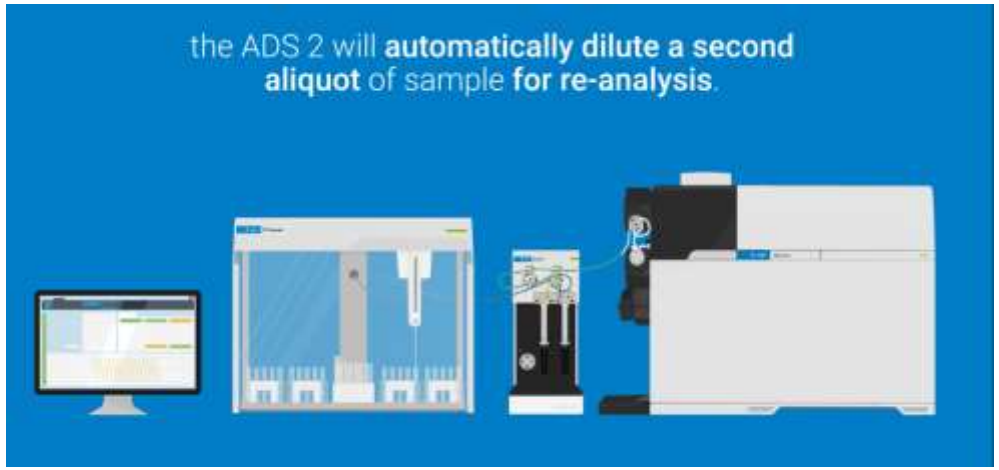
  OR

- Internal standard ratio out of limits



Benefits of automatic reactive dilution:

- Automatic calculation of appropriate reactive dilution factor
- No user intervention required
- Eliminates time consuming rework
- Simplifies analysis
- Ensures switch turnaround times, with a complete data set at the end of a run



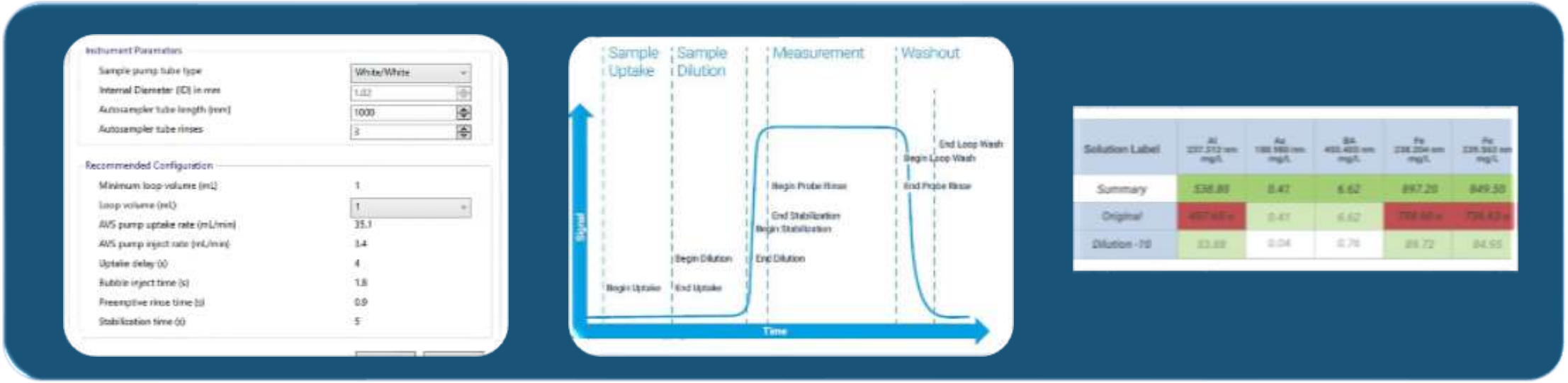
ADS 2 Advanced Dilution System – Software integration

MassHunter ICP-MS system control software

ICP Expert ICP-OES system control software

- Optimized integration of the software with firmware and hardware reduces complexity and delivers the best workflow user experience across both of Agilent's ICP system platforms.
- Autodilution method development and reporting tools are seamlessly embedded within both software packages and provides a similar user experience
- Early Maintenance Feedback (EMF) and Help and Learning Tools ensures maximum uptime and lowest cost-of-ownership.
- Fully integrated compliance solution ADS 2 functionality is available in 21 CFR Part 11 for both ICP Expert and MassHunter

Simplified Method Development and Data Analysis



Conditions Calculator

provides recommended timings on method parameters from defined tubing type and length for **easy method development.**

Timing Monitor

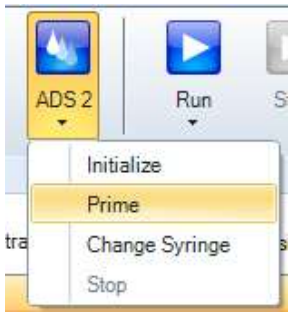
shows the acquired signal during the whole method sequence to check or further **optimize method conditions**.

Autodilution Summary

streamlines data analysis using a smart algorithm to filter from all the available measurements of a sample and **presents the best result for each element.**

Integrated Operation and Troubleshooting

Clear ADS 2 Controls and Status integrated seamlessly into the instrument software

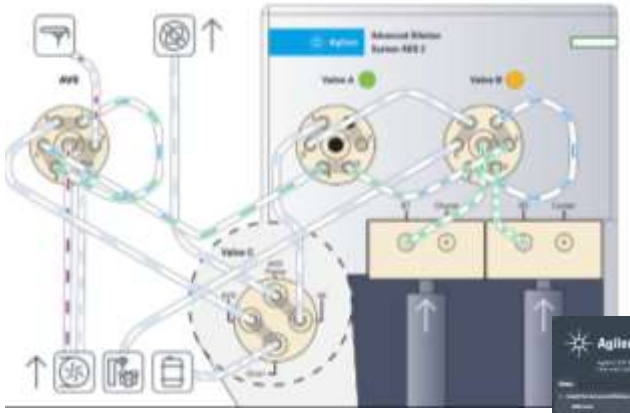


Early Maintenance Feedback Counters

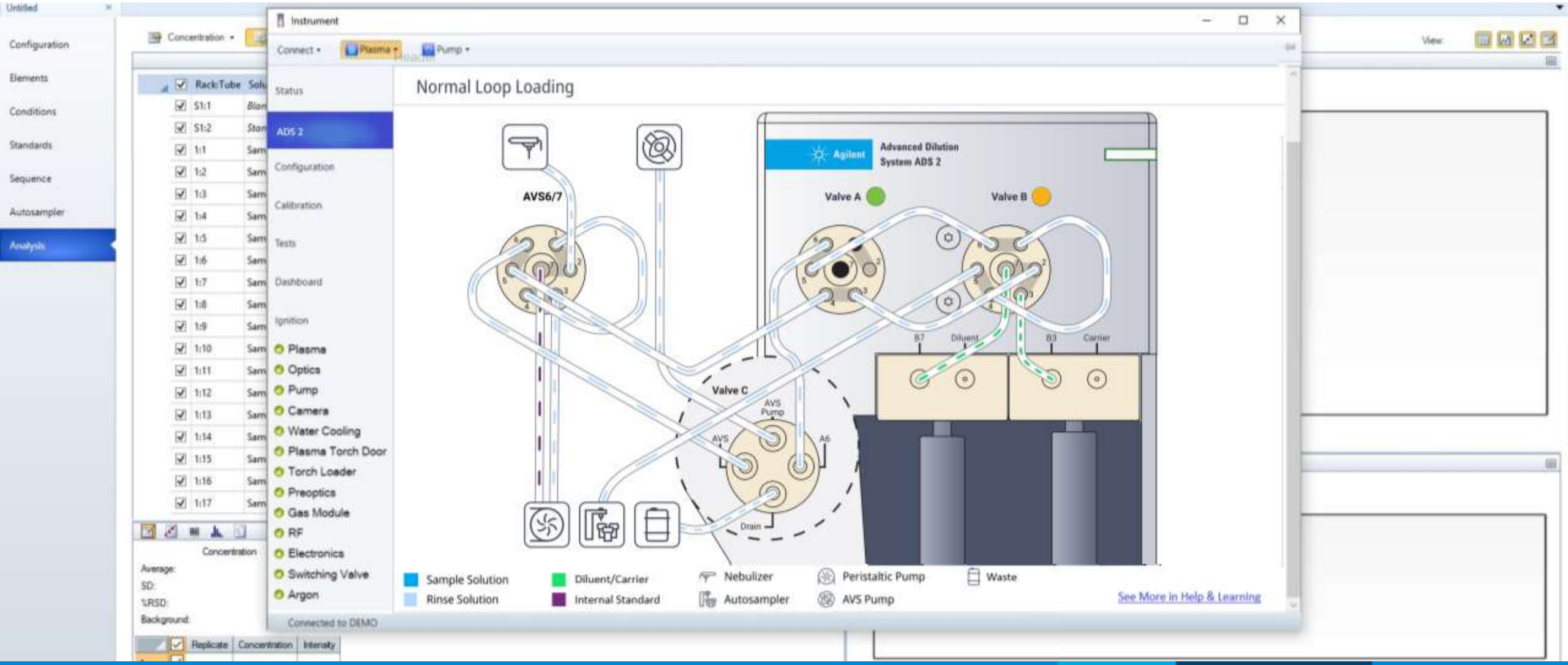
- Track system maintenance tasks for ICP, AVS and ADS 2
- Specific ADS 2 counters, valve switches and syringe actuations

ADS 2 Troubleshooting

- **Timing Monitor** functionality for optimization and troubleshooting
- Real-time ADS 2 **Flow Path Diagram**
- Comprehensive **Help and Learning Center** with detailed information and videos on operation, maintenance and troubleshooting



Flow Path Diagram in Software



How ADS 2 enables automation of existing ICP workflows

	ReWork *Lab efficiency affected by rework (calibration overranges, Internal Standard / QC failure)*	**PreScreen** *Lab efficiency affected by pre-screening*	**PreDilute** *Lab efficiency affected by pre-dilutions*
	These samples would normally be **manually diluted and remeasured** after an unexpected result Typically, between **10 – 20%** of samples need re-work	This is where **all samples are pre-screened** on an ICP-OES or ICP-MS, and then diluted if required before re-measuring them on the instrument.	**All samples are pre-diluted** multiple dilution factors i.e. neat, 10x and 100x before measurement to ensure a valid result is measured during the analysis.
	**Reactive dilutions** on overrange result or out of range internal standard Additional washout option to reduce carry-over prior to dilution	**Prescriptive dilution** based on results from pre-screening	**Prescriptive dilutions** at user-defined factors Added benefit of **Reactive dilutions** for any unexpected result

Sustainability

The automation of manual tasks with the ICP workflow automation systems

- Increases Productivity
- Reduces Energy Consumption
- Reduces Waste of single-use plastic including:
  - Pipette Tips
  - Sample Vials
  - Gloves

Agilents' ICP Workflow Automation Systems will lower the cost-of-analysis and reduce the environmental impact of analysis, helping labs to become more sustainable.

Fully integrated workflow automation solution

Specifically designed to integrate into Agilent solution

The Integrated, All-Agilent ICP Automation System

Increasing productivity


Aqua regia 2 %

Agilent

Trusted Answers

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