Dual Lumen Probe

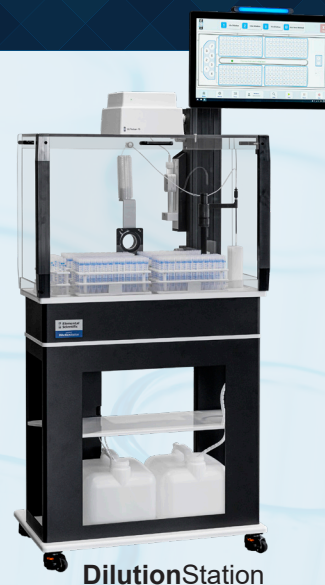## DilutionStation
Diluting & Mixing
Automated preparation
of >1000 samples in a workday
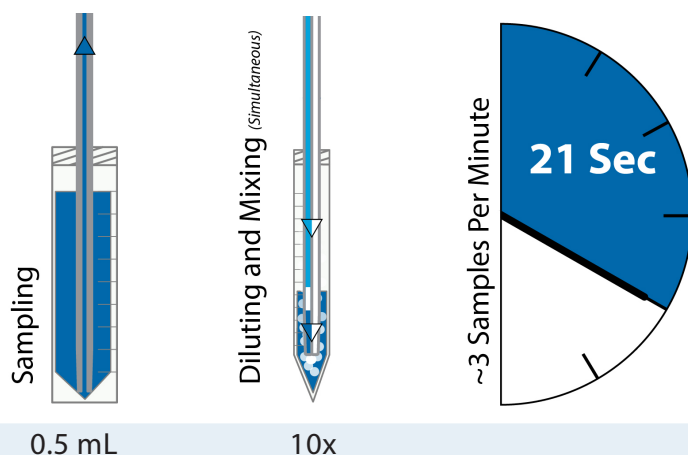(~ 3 samples per minute)

DilutionStation

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Evaluation of an Automated High Throughput Sample Preparation Method Using **Dilution**Station

Synopsis

DilutionStation is a high-speed, automated liquid handling system designed to streamline sample dilution and mixing in high-throughput analytical workflows. This study evaluated its performance over an 8-hour workday, preparing samples for ICPMS analysis. A 0.5 mL aliquot of a multi-element solution was automatically diluted tenfold with 2% HNO_3 to a final volume of 5 mL, incorporating simultaneous mass flow controlled mixing to ensure thorough homogenization. Over the course of the workday 1,380 samples were prepared – equivalent to ~ 3 samples per minute or 180 samples per hour. By automating this time-consuming step, the **Dilution**Station removes a major bottleneck in sample preparation, allowing ICPMS instruments to operate at full analytical capacity. Its speed and consistency make it an ideal solution for laboratories focused on maximizing throughput and efficiency.
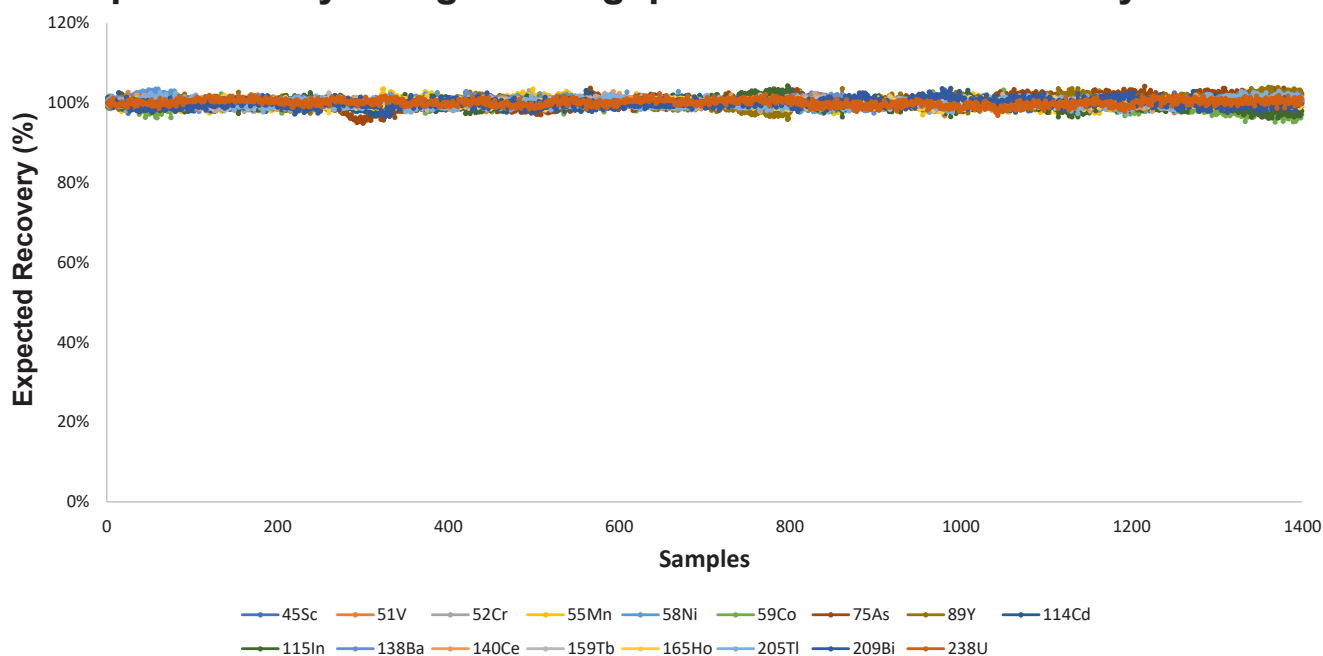
Sampling

Diluting and Mixing *(Simultaneous)*

~3 Samples Per Minute

21 Sec

0.5 mL   10x

DilutionStation's high throughput dilution enables preparation of ~3 samples per minute, including a rinse cycle between each sample. The Dual Lumen mixing probe simultaneously dilutes and mixes, significantly enhancing throughput efficiency.

Learn More

Reproducibility of High Throughput 10x Dilution Verified by ICPMS

Legend: 45Sc · 51V · 52Cr · 55Mn · 58Ni · 59Co · 75As · 89Y · 114Cd · 115In · 138Ba · 140Ce · 159Tb · 165Ho · 205Tl · 209Bi · 238U

Automated 10x dilution and high throughput sample preparation using the **Dilution**Station. A total of 1,380 samples were automatically diluted 10-fold using the **Dilution**Station over an 8-hour period, followed by ICPMS analysis. Each sample was prepared by diluting a 0.5 mL aliquot of a 100 ppb multi-element stock solution to 10 ppb. The solution contained Sc, V, Cr, Mn, Ni, Co, As, Y, Cd, In, Ba, Ce, Tb, Ho, Tl, Bi, and U. Average preparation time per sample, including an automated rinse cycle, was approximately 21 seconds. ICPMS results demonstrated excellent precision, with an average relative standard deviation (RSD) of 0.94% across all elements over the analysis period.

Accuracy and Precision in High Throughput 10x Sample Dilutions

Element	Average % Recovery	RSD %	Element	Average % Recovery	RSD %
Sc	100.1	0.7	In	99.7	1.2
V	99.9	0.7	Ba	100.3	0.8
Cr	100.1	0.8	Ce	100.1	0.7
Mn	100.0	1.1	Tb	100.1	0.7
Ni	100.0	1.0	Ho	99.9	0.7
Co	99.6	1.2	Tl	100.0	0.9
As	100.4	1.5	Bi	100.0	1.0
Y	100.3	1.2	U	100.1	0.8
Cd	100.0	1.0			

Average recovery and RSD for the 17 elements measured across 1,380 samples prepared with **Dilution**Station. Excellent recoveries (~100%) and low RSDs (≤1.5%) demonstrate the accuracy, precision, and reproducibility of the automated 10× dilution and gas-mixing process.

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