TELEDYNE CETAC TECHNOLOGIES
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Application Note

Automated Standard Preparation

Improving Accuracy and Creating Time Savings in the Laboratory Workflow

Introduction

The SimPrep Automated Liquid Handling Station combines proven and tested technologies for an overall increase in laboratory efficiency. By combining the known and trusted Hamilton ML600 with intuitive software and the robust and reliable Teledyne CETAC Autosampler our customers are able to fully automate their sample preparation. This new product improves the accuracy and reproducibility of sample prep by eliminating time consuming hand pipetting.

Figure 1: SimPrep Automated Liquid Handling Station

Benefits of using automated dilutor

Pipettes can be problematic in any laboratory setting. Common problems include: significant variation between users, inconsistencies with different solution types, and performance variation at different elevations. These problems are eliminated with the Hamilton ML600. This dual syringe system allows for extremely accurate dilution/dispense of volumes on demand. The ML 600 can reduce RSD by more than 50% compared to hand pipetting methods. See Figure 2.

Combining a Hamilton dilutor with a CETAC autosampler and the SimPrep software allows the customer to enjoy all the benefits of a dual syringe system in a fully automated fashion. The combined package adds utility and flexibility to the standalone dilutor, but still has the accuracy (100% at +/- 1%), reproducibility (>.8% RSD on 10 replicates) and precision (100% at <0.2%) expected of these trusted units. These improvements to data quality are especially beneficial when considering standard preparation.

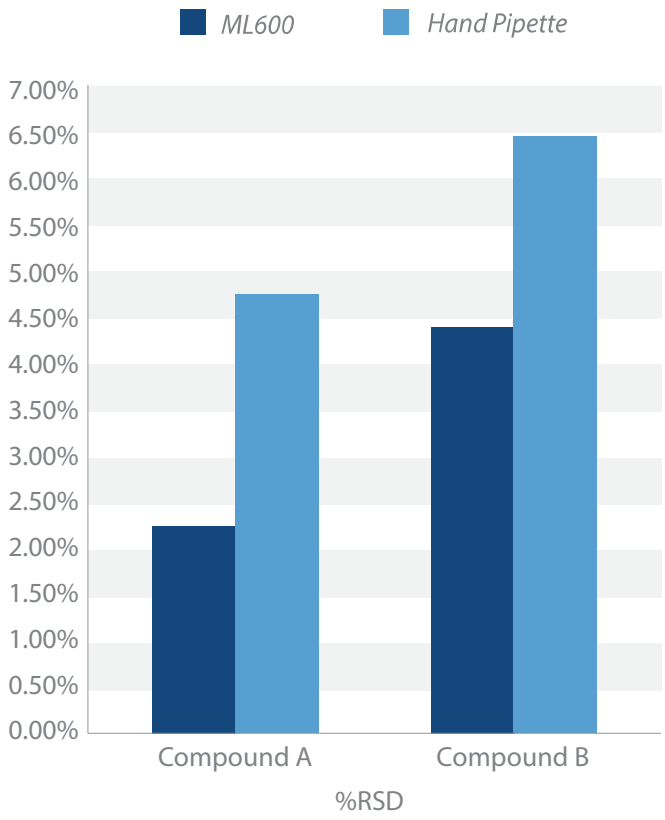

Figure 2: %RSD testing comparison between the ML600 and traditional hand pipetting.

Experiment

A calibration curve was made by diluting a 100 ppm stock solution from 10x to 2000x using the SimPrep Automated Liquid Handling System. The intuitive software was used to create a simple dilution sequence to be run on the ASX-560 and ML600. This was executed to create a 6 point, multi-element calibration curve. The prepared samples were then run on our ICP-OES system and the data is summarized in Figure 3 and Table 1.

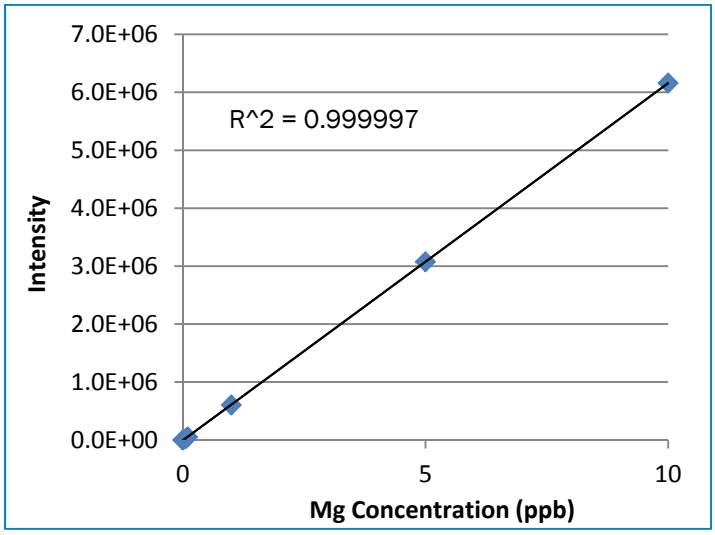

Figure 3: Autocalibration data from a 6 point curve. Standards were prepared from a 100 ppm stock at 10× to 2000× dilution.

Table 1: R^2 values are shown for a range of elements

Element	R^2	Element	R^2
As	0.999990	Mg	0.999999
Ca	0.999926	Mo	0.999998
Co	0.999994	Pb	0.999973
Cu	0.999992	Sb	0.999996
Fe	0.999981	Zn	0.999948

In order to achieve .9999 and greater across so many elements we used the SimPrep sequence settings summarized in Figure 4.

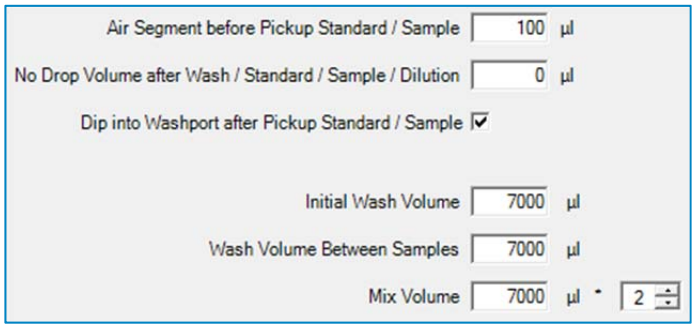

Figure 4: Sequence Settings for Standard Calibration

Results

Many aspects of the SimPrep software play a role in the overall performance of the system. Mixing the samples allows for better RSDs on the final analysis and improves the overall data quality of the lab. Having an airgap between the sample and the diluent reduces carryover that can be problematic with other sample prep methods. In addition, the programmable rinse settings allow the user to wash out as much or as little as is needed. All of these settings and more are open to be set by the Lab administrator when creating the sequence. The freedom and flexibility of the software make it easy to create methods and apply the liquid handling station to many aspects of the laboratory workflow.

Figure 3 shows the quality of calibration that can be reproducibly created by the SimPrep system. A more reliable calibration results in better performance on the ICP and time saved not only in doing the prep work but in avoiding re-runs and failed QC samples. By removing human error from the process we are able to save time and labor while creating more accurate, precise, and reproducible data.

Teledyne CETAC Technologies
14306 Industrial Road
Omaha, NE 68144 USA
+1.402.733.2829
teledynecetac.com

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