TACS University E-learning Webinar Series:

> SimPrep: Autodilutor for Coolants and 200.8

> > TELEDYNE ADVANCED CHEMISTRY SYSTEMS

Introducing the SimPrep

- Based on CETAC automation
- Recognized excellence of Hamilton micro station
- Use same sample racks ICP autosamplers and SimPrep
- Simple easy to use software
- Small mobile footprint
- Full sample homogenization
- Aqueous sample handling including
 - Soil digests
 - Mining
 - Drinking Water
 - Waste Waters
 - List goes on....

Current User Start Date			Method Creator			Metho	Method Date		
admin					admin		4/5/20	4/5/2018 2:36 PM	
	Sample				Dilution 1				
	Status	Position	Name	Position	Volume [µl]	Vol Sample	Vol Std	Name Std	
1		R1-A1	Multiprep	R2-A1	10000	1000	100	Standard 3 💌	
2		R1-A2	Multiprep	R2-A2	10000	1000	100	Standard 3 💌	
3		R1-A3	Multiprep	R2-A3	10000	1000	100	Standard 3 💌	
4		R1-A4	Multiprep	R2-A4	10000	1000	100	Standard 3 💌	
5		R1-A5	Multiprep	R2-A5	10000	1000	100	Standard 3 💌	
6	>	R1-A6	Multiprep	R2-A6	10000	1000	100	Standard 3 💌	
7	>	R1-A7	Multiprep	R2-A7	10000	1000	100	Standard 3 💌	
8	>	R1-A8	Multiprep	R2-A8	10000	1000	100	Standard 3 💌	
9		R1-A9	Multiprep	R2-A9	10000	1000	100	Standard 3 💌	
10		R1-A10	Multiprep	R2-A10	10000	1000	100	Standard 3 💌	
11		R1-A11	Multiprep	R2-A11	10000	1000	100	Standard 3 💌	
12		R1-A12	Multiprep	R2-A12	10000	1000	100	Standard 3 💌	

Stand Alone Software Package

- Familiar "Excel like" software layout
- Sample information can be added in many formats (1:10, 10% etc.)
- Air gap control to prevent cross contamination
- Full wash cycle control
- Sample homogenization



Software Flexibility

- Sample list can be easily adapted day to day.
- Able to select, deselect, and expedite samples
- Live Progress of Sample list.
- Can easily switch from one method to another for different sample types







Go: The line will be processed



Express: The line will be processed preferentially



Running: The line is in process



Done: The line is finished





More than Just Dilution

- Dispensing
- Dosing
- Serial Dilutions
- Split samples

- Spike samples
- Prepare Standards
- And More



EPA 200.8

FD CHEMISTRY

Samples often diluted at 10x to reduce salt load of sample and minimize interferences.

Laboratory contamination introduced during the dilution process is problematic as detection limits are lower with ICP-MS.

Dilutions can be time consuming, error prone, and a source of repetitive stress injuries.

Calibration Curve – 6 standards

- Hand Prepped via serial dilution technique
- All calibration standards were diluted from 100ppb stock
- Both Hand prep and SimPrep produce good calibration data
- On the hand preparation the curve was contaminated for Zinc

ELEDYNE

SYSTEMS

DVANCED CHEMISTRY



Calibration Verification





NIST Standards diluted at 5x

- NIST 1640a Trace Elements in Natural Water
- NIST 1643f Trace Elements in Water

Element		NIST 1640a			NIST 1643f	
	Certified	Measured	Recovery %	Certified	Measured	Recovery %
	Value	Value		Value	Value	
	(µg/L)	(µg/L)		(µg/L)	(µg/L)	
Aluminum	53.0	52.15	98	133.8	135.6	101
Antimony	5.11	4.93	97	55.45	56.05	101
Arsenic	8.08	7.72	96	57.42	58.95	103
Barium	151.8	151.23	100	518.2	521.47	101
Beryllium	3.03	3.09	102	13.67	13.15	96
Cadmium	3.99	3.97	100	5.89	5.98	102
Chromium	40.54	39.84	98	18.5	18.45	100
Cobalt	20.24	19.53	96	25.3	24.55	97
Copper	85.75	87.69	102	21.66	21.76	100
Lead	12.10	12.31	102	18.49	18.54	100
Manganese	40.39	39.63	98	37.14	36.47	98
Molybdenu	45.6	43.4	95	115.3	112.46	98
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Nickel	25.32	24.66	97	59.8	58.48	98
Selenium	20.13	18.42	92	11.7	11.02	94
Silver	8.08	7.95	98	0.97	1.00	103
Thallium	1.62	1.63	101	6.89	6.95	101
Uranium	25.35	24.57	97	-	-	-
Vanadium	15.05	14.07	98	36.07	36.52	101
Zinc	55.64	53.37	96	74.4	71.37	96



NASS-7 -Seawater

	Certified Value (µg/L)	Measured Value (µg/L)	Recovery %	
Arsenic	1.26	1.28	102	
Molybdenum	9.29	10.02	108	

- SRM from National Research Council Canada, sampled from the North Atlantic Ocean
- Digested according to EPA 200.8
- Diluted at 50x by the SimPrep

DRINKING WATER HEALTH ADVISORY

(HITCHCOCK NATURE CENTER) has high levels of Manganese.

DO NOT GIVE TAP WATER TO INFANTS UNDER 6 MONTHS OLD OR USE IT TO MAKE INFANT FORMULA

Sample results received (1/27/2020) showed manganese levels of 0.52 mg/L. This level is above the Environmental Protection Agency's (EPA's) short-term health advisory (HA) of 0.3 mg/L for infants under 6 months old.

Precision SimPrep vs Hand Prep





SimPrep Spike and Dilution of Samples

Sample	
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SimPrep spiked samples



■ LCS ■ Sample A MS ■ Sample A SD



Satisfy Stringent Requirements, Improve your Workflow

- EPA tightly regulates high standards of performance
- Sample volume is high
- Analyst time is precious

- SimPrep is equal to or better than hand preparation of samples
- Automation provides consistent performance
- Calibration curve, QCs and Matrix Spikes can all be prepared with little analyst intervention

Reduce reruns with reliable performance every day of the week!



Coolants

Analysis of coolant samples by ICP-OES is a growing part of the in-service marketplace

Samples are typically diluted 10x to reduce matrix effects.

Samples are tested for fluid contamination, excessive dilution, particulate contamination and to asses the health of the additive package.

This information is used to guide maintenance improving the lifetime of customer equipment and reducing equipment downtime.



Sample Preparation

- A local laboratory supplied various types of used coolants from commercial vehicles.
- A coolant of each type was randomly selected for analysis.
- Samples were diluted at 10x in triplicate by the SimPrep.
- They were also spiked for various elements in duplicate.
- One coolant was aliquoted 10x by the SimPrep to demonstrate the accuracy of the system.



	Sam	Sample		Dilution 1			
	Position	Name	Position	Volume [µl]	Vol Sample	Vol Std	Name Std
		Blank	R1-01	10000			-
ation Curve		Cal 1	R1-02	10000		50	Cal Parent 💌
		Cal 2	R1-03	10000		100	Cal Parent 💌
		Cal 3	R1-04	10000		1000	Cal Parent 💌
		Cal 4	R1-05	10000		2000	Cal Parent 💌

- The SimPrep prepared the calibration curve as shown.
 - All standards were prepared in 5% glycol
- The calibration curves for Copper and Boron are shown.
- Even with the difficult matrix, Correlation coefficients for all elements were 0.999 or greater.





ICV and CCV Recoveries



Hand Prep vs SimPrep

- Coolant samples can be challenging to dilute as samples are viscous.
- Traditional pipetting techniques can be subject to error as the sample viscosity interferes with the ability of the user to consistently expel all of the sample.
- Different analysts can have different technique, affecting the accuracy
- The SimPrep gave the most repeatable sample delivery.
- Incorporating this system in a laboratory workflow allows for consistent sample preparation regardless of the operator.



Sample Spikes

- The coolant samples and a 5% glycol blank were spiked with 0.5mL of a second source standard.
- The SimPrep was able to dilute the sample and spike it in the same preparation step.

Element	Spike
	(mg/L)
Copper	1.0
Tin	2.0
Silicon	2.3
Zinc	2.5
Al, Pb, Fe,	5
Ca, Mg	

Sam	ple	Dilution 1					
Position	Name	Position	Volume [µl]	Vol Sample	Vol Std	Name Std	
	LCS	R1-01	10000		500	Spike 💌	
	LCSD	R1-02	10000		500	Spike 💌	
R1-49	Coolant	R1-03	10000	1000		-	
R1-49	MS	R1-04	10000	1000	500	Spike 💌	
R1-49	MSD	R1-05	10000	1000	500	Spike 💌	

LCS and MS/MSD Recoveries



■ Si ■ Al ■ Pb ■ Zn ■ Fe ■ Cu ■ Ca ■ Mg ■ Sn



Sample Precision



■ LCS ■ C4 ■ C5 ■ C6 ■ C7 ■ C13



Reproducibility



■ Mo ■ B ■ P ■ Na ■ K

SimPlify your sample preparation

- Coolants analysis is a growing need in many labs
- Sample matrix can be difficult to work with
- SimPrep provides excellent reproducibility with all RSDs under 5%
- Calibration curve, LCSs and Matrix Spikes can all be prepared with little analyst intervention
- Compact system footprint saves valuable lab space

No Sick Days, No Vacation, Always ready to perform



SimPrep Automated Liquid Handling Station

Accurate	Ensure your samples are prepared to the highest standard prior to analysis
Reliable	Performs reproducibly every day of the week
Clean	Reduce potential sources of sample contamination
Simple	Easy to use software and hardware allows all analysts to obtain high quality sample preparation



Application Notes:

http://www.teledynecetac.com/resourcecenter/application-technical-notes

Any Questions?

