

Concentration of Samples Complying to US EPA 8270

Parallel evaporation technology for high solvent and analyte recoveries

¹Jeff Reid, ¹Daniel M. Meier, ²Greg Lawrence
¹BUCHI Corporation, 19 Lukens Drive, New Castle, DE 19720, United States
²Phoenix Environmental Laboratories, 587 East Middle Turnpike, Manchester, CT 06040, United States

Introduction

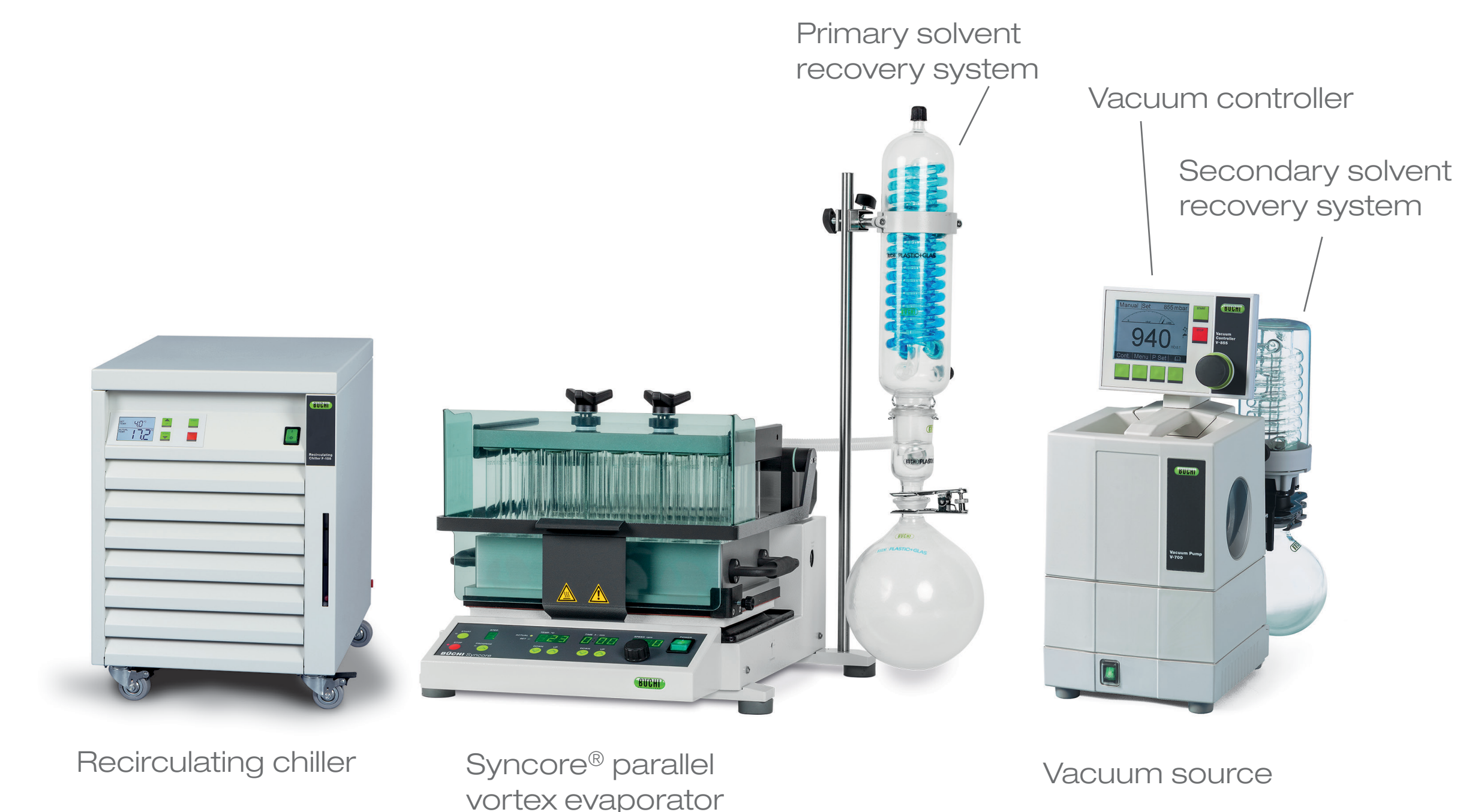
Sample concentration and analytic findings for US EPA method SW-846-8270 to determine the concentration of semivolatile organic compounds (SVOC) in extracts from solid waste matrices, soils, and water samples are highlighted.

During the concentration step traditionally performed by Kuderna-Danish (KD) or nitrogen blowdown devices, organic solvent fumes could escape into the environment. These solvent vapors are harmful to exposed operators and persist in the atmosphere.

Only recently, commercial laboratories were enforced to control their solvent emissions, non-compliance led to high monetary fines.

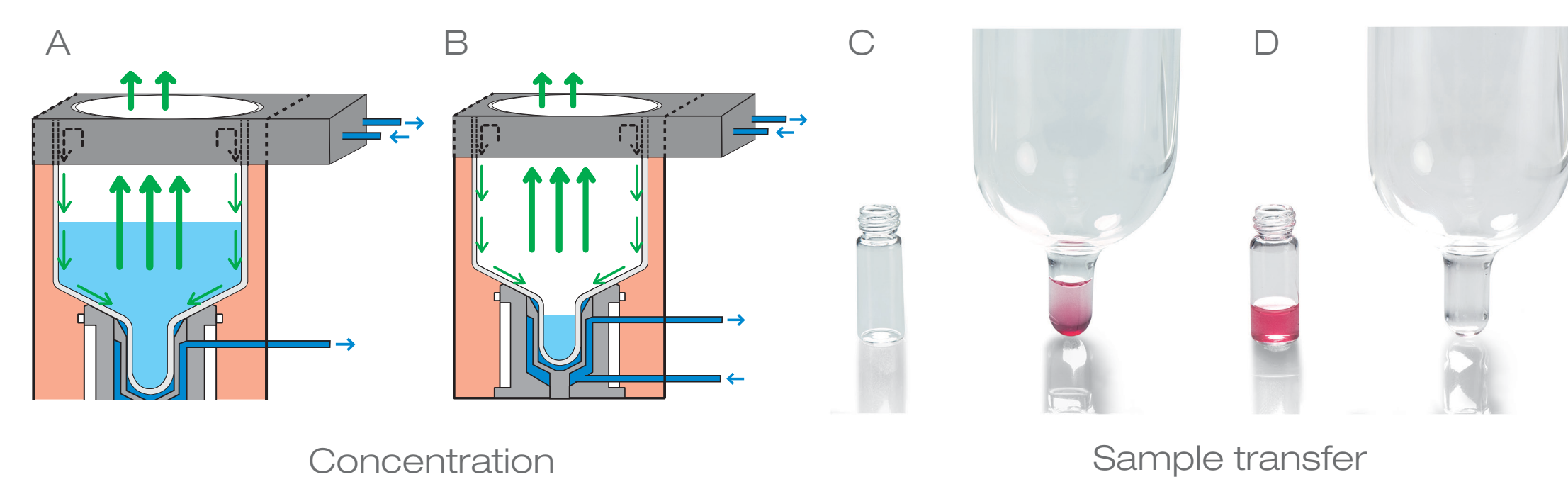
Here, thanks to the BUCHI Syncore® Analyst more than 95 % of the solvent evaporated during concentration is recovered and high analyte recovery rates reported.

Experimental Set-up



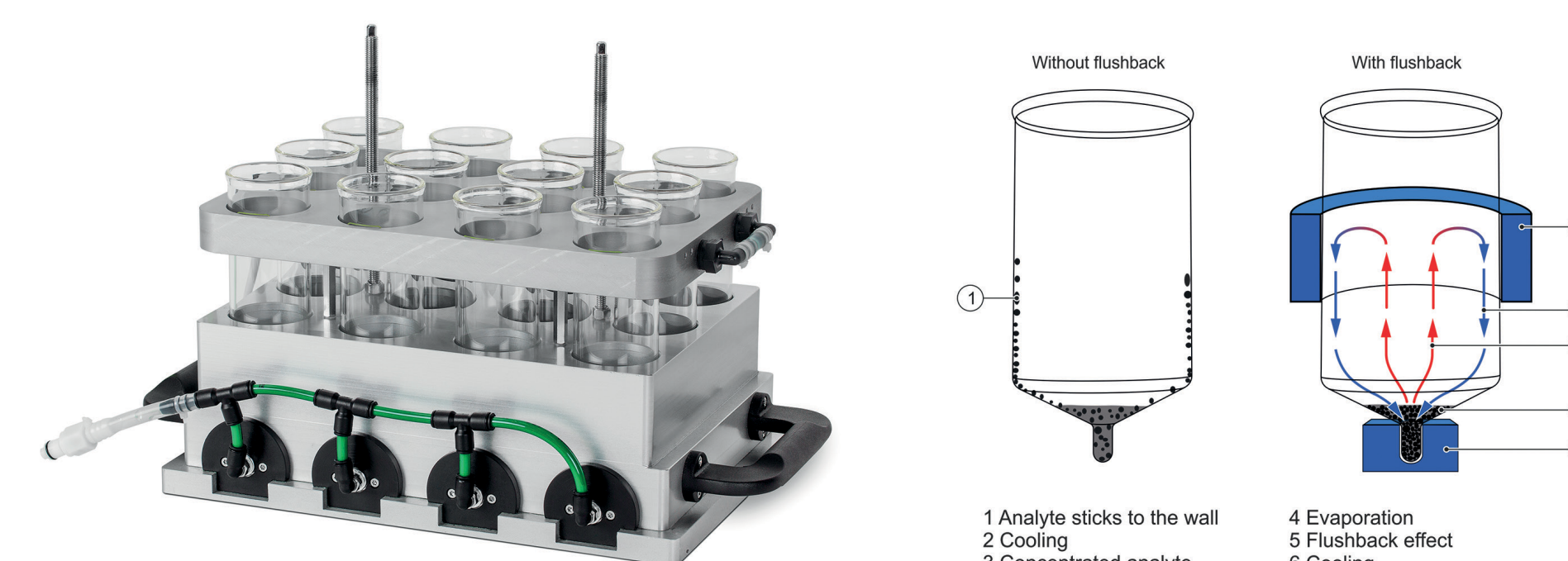
Cooled appendix technology

Due to the cooled appendix technology the sample is automatically concentrated to the predefined volume of either 0.3, 1 or 3 mL (A→B). The appendix is cooled by the recirculating chiller. After concentration the sample is transferred to the sample vial (C→D).



Flushback effect

The Flushback module partially condenses the solvent vapor at the top of the sample vessel generating a continuous rinsing along the glass wall. Adsorption of analytes at the glass wall is avoided and high analyte recovery rates obtained.



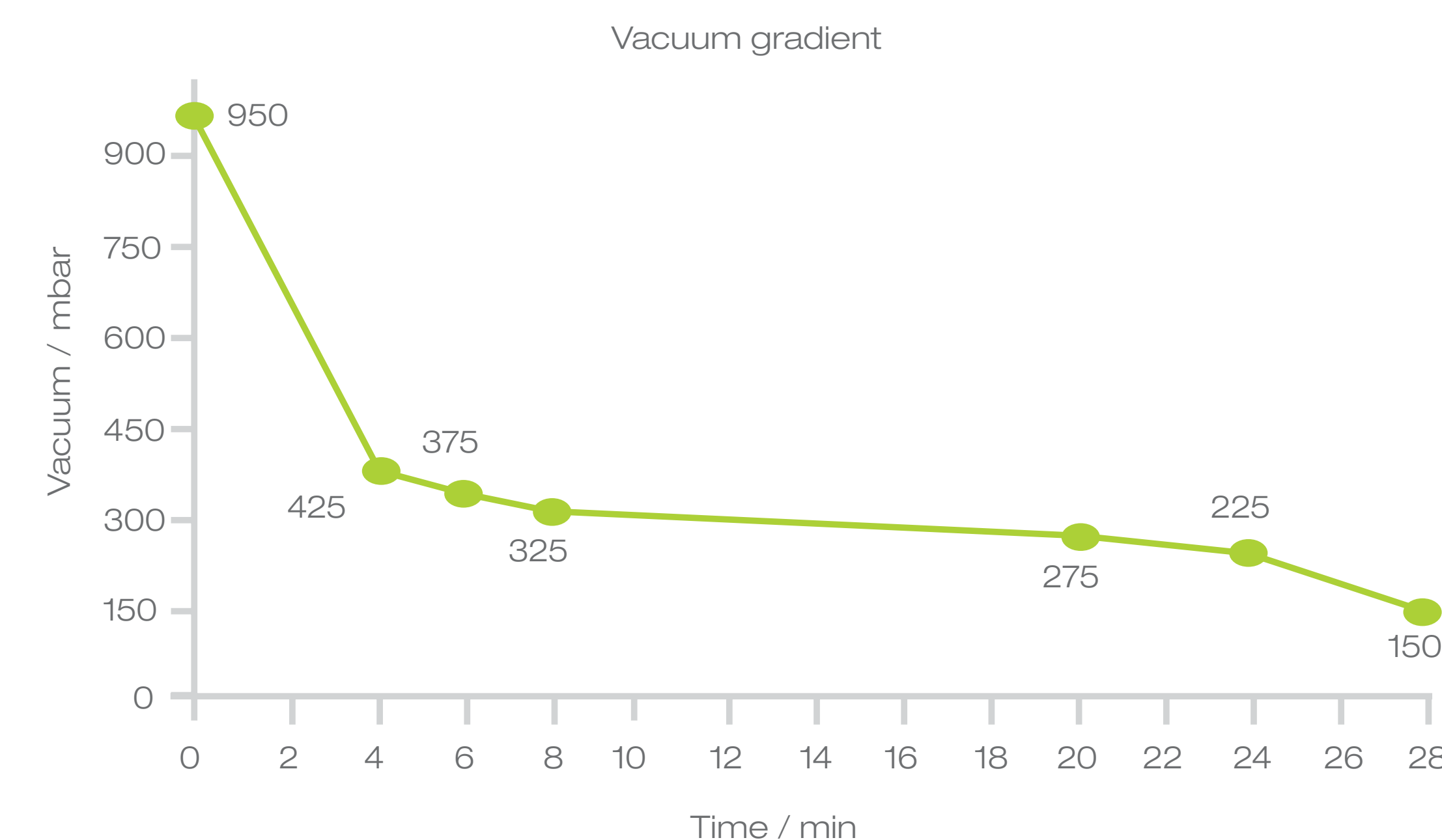
Parallel concentration process

Application specific on-site support is offered to effectively prepare your environmental sample.

An environmental benign sample concentration process is performed by applying the following parameters and a programmed vacuum gradient.

Solvent	DCM
Starting Volume	40 mL
Final Volume	1 mL
Heating plate	65 °C
Cover temp.	55 °C
Cooling temp.	5 °C
Orbital movement	200 rpm

Twelve samples are concentrated in parallel using the Syncore® Analyst R-12 in only 28 minutes, i.e., 2.3 minutes per sample. The solvent, dichloromethane (DCM), is recovered at a 95 % efficiency and no nitrogen used.



Analytical results

Spiked (50/75 ng) and concentrated laboratory control samples were analyzed by GC/MS for all compounds mentioned in US EPA SW 846-8270.

Analytical Method	CAS Number Equivalent	Parameter Name Surrogate Compounds	Spike Level (ng)	Percent Recovery % LCS #1	Percent Recovery % LCS #2
SW8270	367-12-4	% 2-Fluorophenol	75	79	88
SW8270	98904-43-9	% Terphenyl-d14	50	107	114
SW8270	120-82-1	1,2,4-Trichlorobenzene	50	86	92
SW8270	541-73-1	1,3-Dichlorobenzene	50	85	90
SW8270	88-06-2	2,4,6-Trichlorophenol	50	103	106
SW8270	51-28-5	2,4-Dinitrophenol	50	99	98
SW8270	91-58-7	2-Chloronaphthalene	50	95	98
SW8270	95-48-7	2-Methylphenol (o-cresol)	50	89	87
SW8270	91-94-1	3,3'-Dichlorobenzidine	50	162*	164*
SW8270	534-52-1	4,6-Dinitro-2-methylphenol	50	106	107
SW8270	106-47-8	4-Chloroaniline	50	99	96
SW8270	100-02-7	4-Nitrophenol	50	114	105
SW8270	98-86-2	Acetophenone	50	99	99
SW8270	56-55-3	Benz(a)anthracene	50	98	99
SW8270	205-99-2	Benzo(b)fluoranthene	50	104	108
SW8270	85-68-7	Benzyl butyl phthalate	50	97	100
SW8270	39638-32-9	Bis(2-chloroisopropyl)ether	50	99	91
SW8270	218-01-9	Chrysene	50	100	101
SW8270	84-66-2	Diethyl phthalate	50	99	98
SW8270	117-84-0	Di-n-octylphthalate	50	104	105
SW8270	118-74-1	Hexachlorobenzene	50	106	102
SW8270	67-72-1	Hexachloroethane	50	87	89
SW8270	91-20-3	Naphthalene	50	91	93
SW8270	621-64-7	N-Nitrosodi-n-propylamine	50	95	91
SW8270	87-86-5	Pentachlorophenol	50	103	111
SW8270	129-00-0	Pyrene	50	101	105

* The elevated % recovery is related to the instrument.
 For complete list, please visit http://www.buchi.com/epa_8270

Conclusion

- High solvent recovery > 95 %
- High analyte recovery for SVOC
- Excellent reproducibility
- Compliance with waste minimization and pollution prevention
- Automation and intensification → cost reduction
- Also applicable for US EPA 8270/625 SVOC, 8081A,B/608 organochlorine pesticides, 8082/608 polychlorinated biphenyls, and 8015 non-halogenated organics

