

Automated Vacuum-Based SPE Cleanup for PFAS Analysis by USEPA Method 1633

Streamlined Automated Extraction and Cleanup of Solid-Matrix Extracts Using Mixed WAX / Graphitized Carbon Black Cartridges

Automation-Cleanliness-Compliance

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Fluid Management Systems, Inc.
Automated SPE Solutions for PFAS Compliance

INTRODUCTION

USEPA 1633 is the most comprehensive PFAS method, with analysis of 40 native PFAS compounds and 24 labeled surrogates. The method spans a wide variety of matrices, including biosolids, fish tissue, groundwater, landfill leachate, soil, surface water, and wastewater. The TurboTrace® PFC takes a slow, error-prone PFAS SPE workflow and turns it into a fully automated, high-throughput process with low background, strong reproducibility, and broad matrix compatibility.

- It automates extraction, drying, concentration, and bottle rinsing in a single workflow, reducing hands-on time and human error.
- It can run up to 8 samples simultaneously, which is a big advantage for labs doing routine PFAS work at scale.
- It supports both vacuum and positive pressure loading, so it can handle clean samples quickly and dirtier matrices more effectively.
- It uses programmable sample loading and a liquid-level sensor, which helps make runs more consistent and reduces the chance of incomplete transfers.
- It supports standard SPE cartridges, but FMS recommends certified prepacked PFAS cartridges for the cleanest background and best low-level performance.

40

Native PFAS Analytes

24

Labeled Surrogates

7

Sample Matrices Covered

Matrices in Scope

Biosolids · Fish Tissue · Ground Water

Landfill Leachate · Soil

Surface Water · Wastewater



TurboTrace PFC Dual Pump Solid Phase Extraction system

No-Teflon-wetted path is not a feature add-on. It is the core contamination-control strategy for PFAS sample prep. PEEK, stainless steel, Delrin, polyethylene, LDPE, and plastic collection tubes in place of PTFE-contact surfaces.

WHY IT MATTERS

PFAS are persistent, bioaccumulative contaminants found across drinking water, wastewater, soil, and tissue. Method 1633 provides the analytical foundation for reliable, defensible compliance monitoring across every regulated matrix. For PFAS work, contamination control matters as much as throughput, and the TurboTrace PFC is designed as a closed system with PFAS-focused low-background components and certified cartridges. That combination is especially valuable when labs are chasing low detection limits or trying to avoid reruns caused by contamination or inconsistent recoveries. It is also positioned for EPA PFAS methods such as 533, 537.1, and 1633, which makes it attractive for compliance-driven labs

METHOD 1633: SOLIDS WORKFLOW

Extraction of solids in methanol is followed by sample concentration, exchange into water, Solid Phase Extraction, and cleanup — one of the key processes described in the method. This final cleanup step has prompted attempts to automate the process, using loose carbon or cartridges containing carbon.

- 1 Methanol Extraction of Solid
- 2 Sample Concentration
- 3 Exchange into Water
- 4 Solid Phase Extraction
- 5 Cleanup (Carbon / Cartridge)

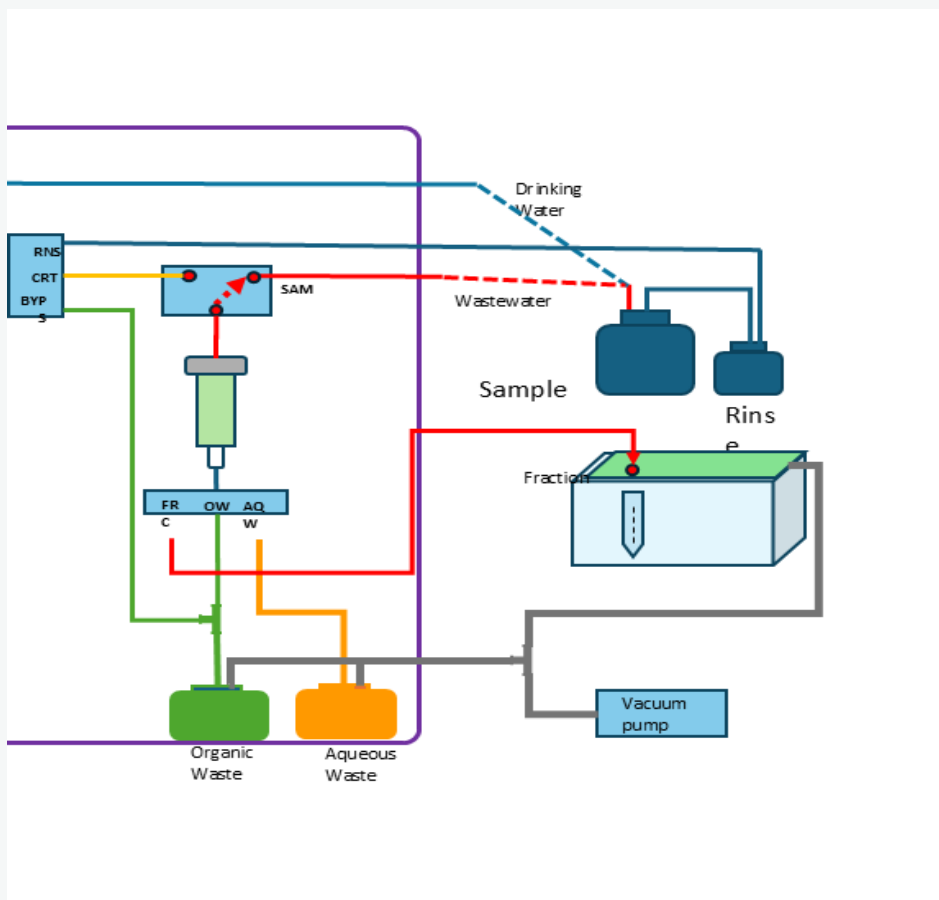


SuperVap 12 PFC Concentrator 50ml Centrifuge Tubes

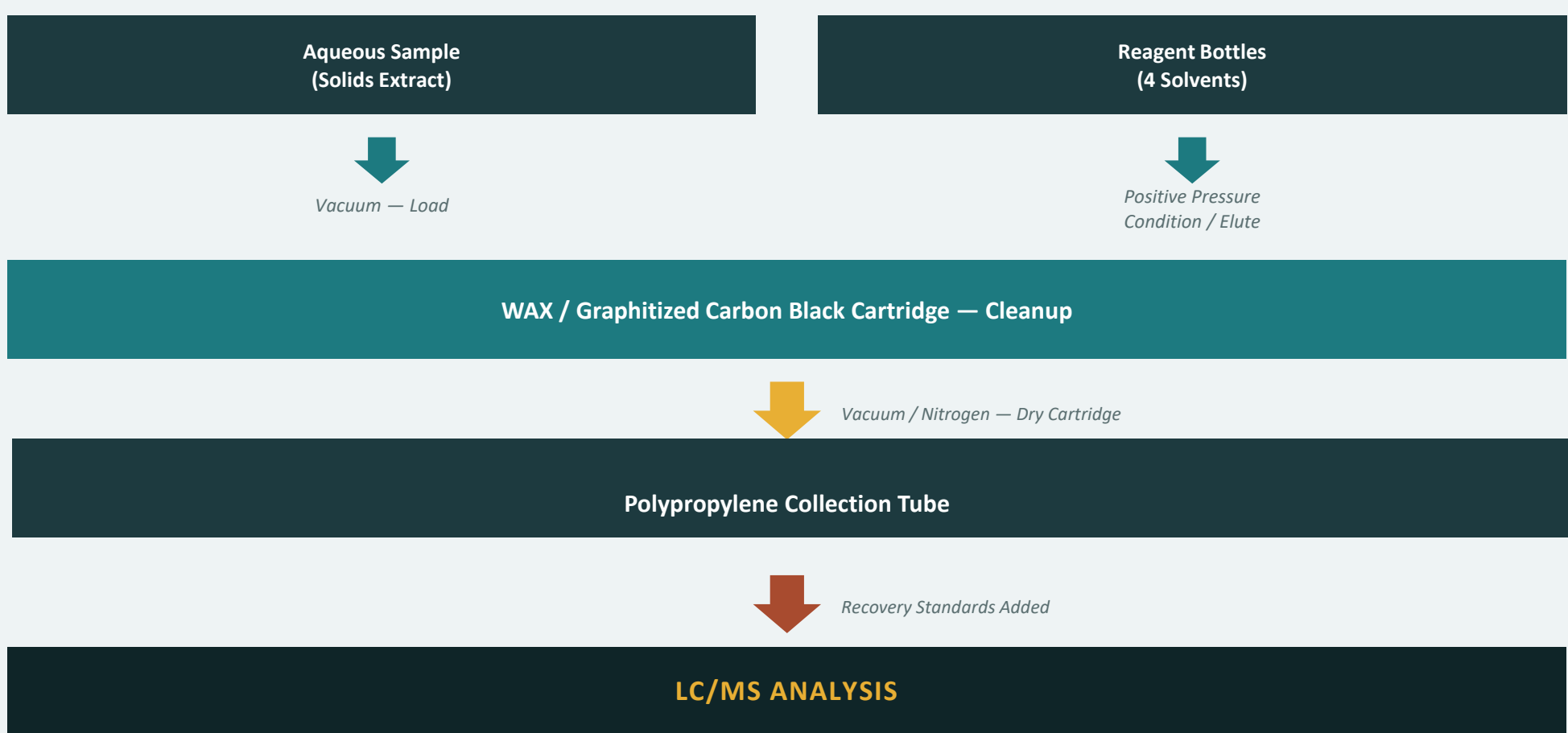
Designed specifically for Concentrating PFAS
Solid extractions for Cleanup

AUTOMATED EXTRACTION AND CLEANUP SYSTEM DESIGN

An automated vacuum-based system was designed with a minimum number of valves and a short, simple pathway from extract to cartridge. Although initially intended for wastewater samples containing particulate matter, the system can also be used to clean up graphitized carbon black (GCB) in a Weak Anion Exchange (WAX) cartridge. This design prevents clogging and over-pressurization, which other systems experience. The lines are simple to clean or replace if necessary.



SYSTEM FLUIDIC PATHWAY



REAGENTS USED

1% Methanolic Ammonium Hydroxide

Formic Acid in Water

Reagent Water

Formic Acid in Methanol

AUTOMATED PROCEDURE

- 1 **Load**
Sample loading facilitated by vacuum pump
- 2 **Condition / Elute**
Conducted using positive pressure
- 3 **Dry**
Cartridge drying achieved with vacuum / nitrogen
- 4 **Bottle Rinse**
Nitrogen used to spray-rinse the bottle
- 5 **Collect**
Extracts collected in polypropylene tubes — no further concentration
- 6 **Recovery Standards**
Added before LC/MS analysis

SYSTEM ADVANTAGES

- Minimal valve count, short and simple flow path to prevent sample clogging and system failure
- Dual Pump System: It supports both vacuum and positive pressure loading, so it can handle clean samples quickly and dirtier matrices more effectively
- It automates extraction, cleanup, drying, concentration, and bottle rinse in one workflow, which cuts hands-on time and reduces human error
- It can run up to 8 samples simultaneously, which is a big advantage for labs doing routine PFAS work at scale
- It uses programmable sample loading and a liquid-level sensor, which helps make runs more consistent and reduces the chance of incomplete transfers.
- It supports standard SPE cartridges, but FMS recommends certified prepacked PFAS cartridges for the cleanest background and best low-level performance
- No Teflon-wetted surfaces is the core strategy for low background and eliminating contamination

SOIL SAMPLE PREPARATION

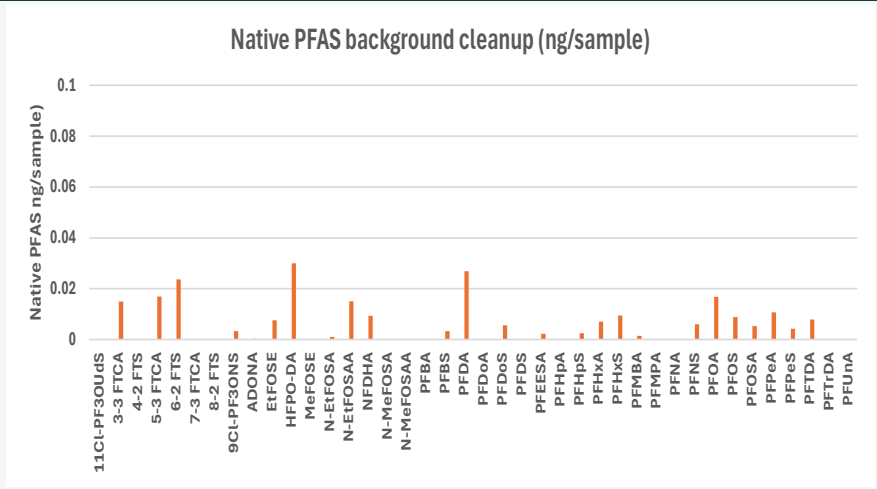
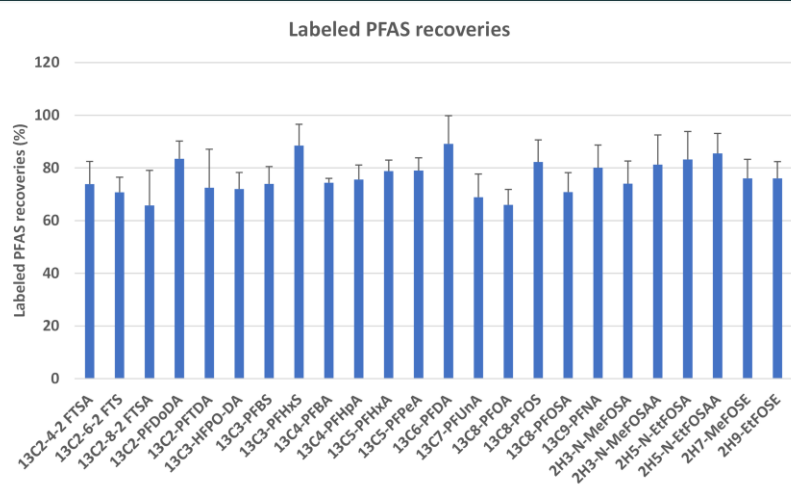
Soil samples were manually extracted in 0.3% ammonium hydroxide/methanol, concentrated to a few mL of methanol, and diluted with water to 50 mL. Extracts then underwent the same Solid Phase Extraction and cleanup process described above.

>70%

Labeled Recovery — 24 Surrogates

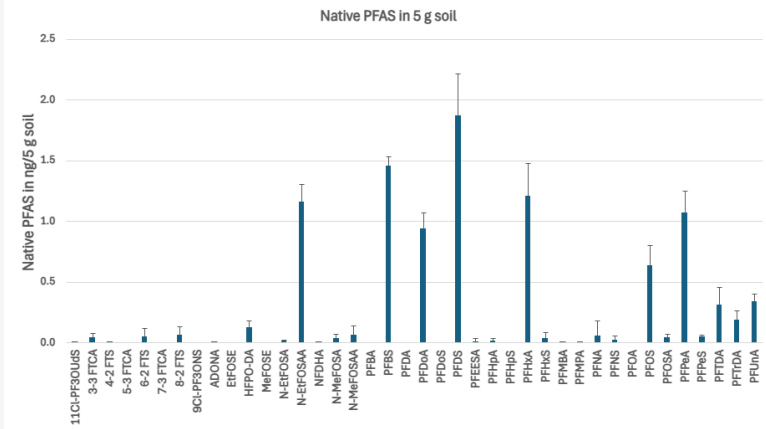
< 0.03 ng/L

System Blank (all PFAS)



5 g manual soil extraction and automated cleanup.

Native PFAS background from automated extraction and cleanup system (ng/sample)



Native PFAS in 5 g soil with manual extraction and automated cleanup (in ng/5 g soil).

RESULTS & CONCLUSIONS

The automated system can be used effectively for the cleanup step of PFAS analysis in solids, with particularly good recoveries. Mixed WAX / graphitized carbon black cartridges deliver excellent cleanup performance.

- Automated vacuum-based cleanup performs effectively on solid-matrix PFAS extracts
- Mixed WAX / graphitized carbon black cartridges provide excellent cleanup
- Labeled surrogate recoveries exceeded 70% across all 24 compounds
- Minimal valve count and a simple flow path support straightforward automation minimizing clogging and instrument failure

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REQUEST A DEMO

See the automated vacuum-based SPE Extraction/Cleanup system in action for your PFAS workflow.

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SCAN FOR MORE INFORMATION

