



Executive Summary

Per- and polyfluoroalkyl substances (PFAS) are persistent synthetic chemicals that contaminate drinking water supplies for more than 200 million Americans. Thermobind Technologies has developed TPBP 261, a proprietary thermo-responsive polymer, together with the Thermobind Continuous Flow Processing (TCFP) skid. The system binds PFAS in aqueous solution at ambient temperature, then uses mild heating above the polymer's lower critical solution temperature (LCST) to form easily filterable flocs. Laboratory testing achieved high removal efficiencies across multiple PFAS species in wastewater streams (i.e. RO concentrate, foam reject, industrial) and **>98% reduction in the volume of PFAS-containing waste**, dramatically lowering the cost of terminal destruction. Thermobind Technologies' approach delivers a **scalable, continuous, and cost-effective solution for the PFAS waste disposal**, one of the most challenging environmental remediation problems today.

The PFAS Challenge

Per- and polyfluoroalkyl substances (PFAS) comprise a family of over 4,000 man-made compounds. These chemicals are widely used in the manufacture of water-, temperature-, and friction-resistant materials, including polymer additives, lubricants, fire retardants, firefighting foams, surfactants, paints, pesticides, and microelectronics. Because of their high-water solubility and extreme resistance to conventional treatment methods, PFAS have been detected in landfill leachate, municipal and industrial wastewater, dust, and drinking-water sources. Their environmental persistence and tendency to bioaccumulate raise serious human-health concerns and create major remediation challenges.

The Thermobind Technologies PFAS Treatment Solution

Thermobind PFAS Binding Polymer 261 (TPBP 261) is a novel thermo-responsive polymer engineered for PFAS removal. At room temperature the polymer dissolves readily in aqueous solutions and rapidly binds PFAS molecules when mixed with PFAS contaminated waste streams. **When the treated waste stream is heated above the polymer's lower critical solution temperature (LCST), it undergoes a reversible phase transition, forming dense PFAS-rich flocs that are easily separated by simple filtration.**

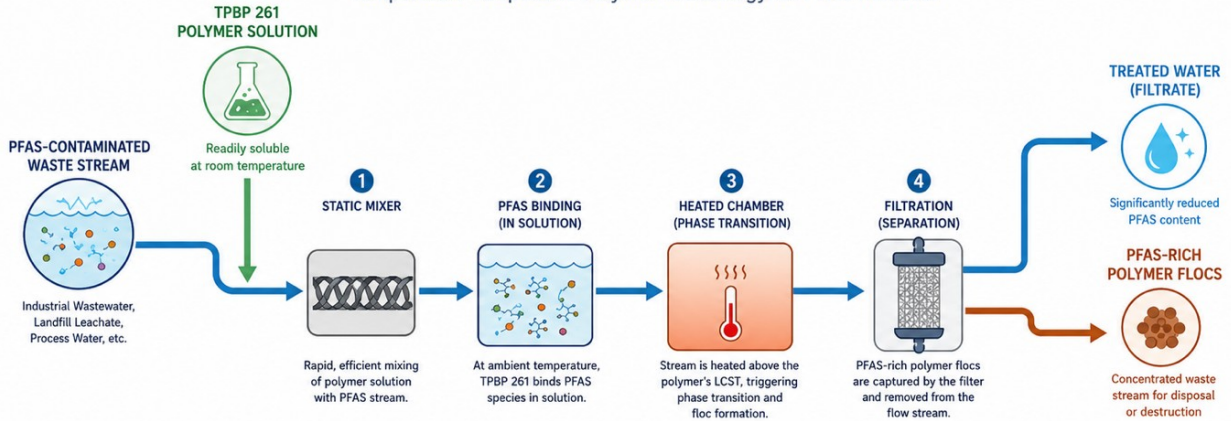
Thermobind Continuous Flow Processing Skid (TCFP Skid) - Thermobind Technologies has developed a proprietary Continuous Flow Processing skid (Fig. 1) that translates the polymer's chemistry into a continuous, scalable treatment system.

Thermobind PFAS Binding Polymer 261 (TPBP 261)



THERMOBIND CONTINUOUS FLOW PROCESS SKID (TCFP SKID)

Temperature-Responsive Polymer Technology for PFAS Removal



1 MIX Polymer solution is injected and rapidly mixed with the PFAS waste stream.	2 BIND TPBP 261 binds dissolved PFAS species at ambient temperature.	3 INDUCE PHASE CHANGE Heating above the LCST causes the polymer to precipitate, forming PFAS-rich flocs.	4 SEPARATE Filtration removes the flocs, producing treated water and a concentrated waste stream.
--	--	--	---

KEY BENEFITS

- ✓ High removal efficiency across multiple PFAS species
- ✓ >98% reduction in PFAS waste volume
- ✓ Continuous, scalable, automated operation
- ✓ Lower disposal and destruction costs

OUTCOME: CLEANER WATER. SMALLER WASTE FOOTPRINT. LOWER DISPOSAL COST.
An innovative, temperature-responsive polymer solution for today's PFAS challenge.

Thermobind PFAS Binding Polymer 261 (TPBP 261)



Results: >98% PFAS Waste Volume Reduction

Two spiked test solutions containing seven common PFAS compounds (each at 100 ppb) were prepared in our laboratory and processed through the TCFP skid using TPBP 261. The system achieved:

- Binding of PFAS to the polymer in the flow stream.
- Heat-induced flocculation and bound PFAS capture.
- Physical removal of the PFAS-bound flocs by filtration.

Treating each spiked PFAS solutions with TPBP 261 and the TCFP skid produced water with significantly reduced PFAS content by 62% and **delivered >98% volume reduction of the PFAS-containing waste**, substantially lowering the cost of subsequent terminal destruction (**Fig. 2**). The concentration (ppb) for untreated and TPBP 261 treated spiked PFAS solution are shown in **Table 1**.

Sample 2	PFAS Concentration (ppb)	
Species	Spiked PFAS Untreated	Spiked PFAS Treated w/ TPBS 261
PFBA	69	66
PFHxS	66	21
PFOA	88	45
PFOS	43	2
PFNA	75	13
PFDA	56	3
Total	397	150

Average Removal efficiencies for representative species included:

- PFOS: 94%
- PFDA: 91%

Table 1: PFAS Concentration of Untreated and Treated Spiked PFAS Solutions

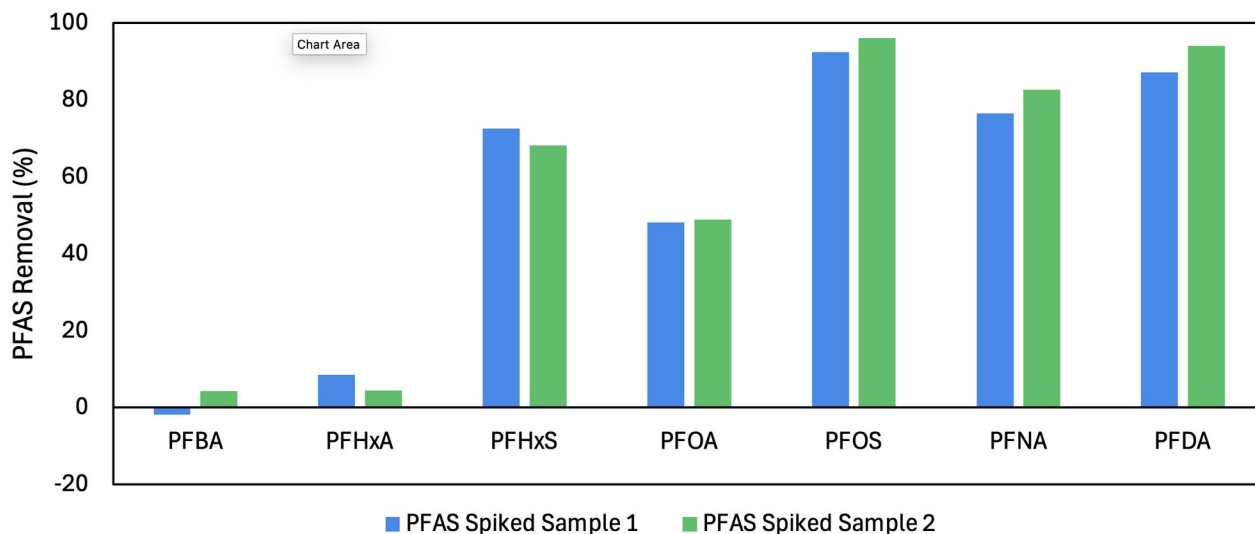


Figure 2: PFAS Removal Efficiencies Using TPBP 261 and the TCFP

Conclusion

Thermobind Technologies' thermo-responsive polymer technology offers a smart, efficient, and practical solution for PFAS reduction. By binding contaminants in homogeneous solution at ambient temperature and then inducing controlled flocculation with mild heating, the system concentrates PFAS into a minimal-volume solid that is readily separated from treated water. The continuous-flow TCFP skid enables straightforward deployment across a wide range of waste streams while delivering high removal rates and dramatic waste-volume reduction. The

Thermobind PFAS Binding Polymer 261 (TPBP 261)



TPCF Slid has a low footprint which can readily be deployed and integrated with existing PFAS treatment trains to reduce the cost of PFAS disposal. This approach represents a significant advancement toward sustainable and cost-effective management of PFAS contamination.

For More Information Contact: jwyse@thermobindtech.com