MONTROSE ENVIRONMENTAL | Water Quality

Article

Beyond Containment: The Evolving Landscape of PFAS in Waste Disposal

Across industries, PFAS is seen in markedly different ways: essential to product performance for its high resilience, but complex and costly to manage and dispose of as waste.

One of the focal points of the waste conversation is PFAS in landfills. While often the passive recipients of PFAS-contaminated waste, landfills nonetheless produce PFAS-contaminated leachate that can impact the wider environment. As a result, regulators have increasingly shifted focus to the management and removal of PFAS. The current designation of PFAS as hazardous substances under CERCLA underscores this, raising complex questions about potential cleanup liability for landfills.

As regulations tighten and public awareness grows, landfill owners and operators are facing a critical inflection point: adapt with proactive, site-specific treatment strategies or risk being left behind in a rapidly shifting regulatory and reputational landscape.

The path forward lies in innovation, integration, and strategic planning — building solutions that manage PFAS effectively while supporting continued operational and industrial growth.

TAKING THE LEAD ON LEACHATE CLEAN-UP

While the EPA continues to build out national PFAS policy and the establishment of Maximum Contaminant Levels (MCLs) in drinking water, many states are moving faster and enforcing stricter standards. States like Michigan, California, and North Carolina have already implemented PFAS monitoring requirements for landfill leachate, groundwater, and air emissions, often well ahead of federal mandates.

In 2022, the Waste Connections Champ Landfill, a modern municipal solid waste landfill in Missouri, was keen to proactively employ the PFAS removal technology for its leachate ahead of any regulatory changes.

It turned to Montrose, whose team of engineers, geologists, chemists, scientists, risk assessors, and field technicians researched, developed, and deployed a pilot treatment system. The treatment was Foam Fractionation (FOAM-X), a patented technology considered the optimal solution for treating leachate.

“Removing PFAS from complex water matrices like leachate has been historically challenging,” says Dave Kempisty, Vice President, Technology at Montrose Environmental Group.

“Our FOAM-X technology avoids a lot of the complications of pre-treatment. Put simply, air is passed through a reactor of PFAS-impacted water, creating a foam. The PFAS preferentially migrate to the air-water interface of the bubbles and are removed with the foam out the top of the reactor. Waters vary, but for every 10,000 gallons of leachate processed, you’ll get one gallon of concentrated foam that is then ready for a relevant destruction technology.”

As treatment technologies advance, operators are also navigating how to manage concentrated PFAS residual streams and exploring solidification, long-term containment, or destruction pathways as part of a full lifecycle strategy. FOAM-X is a low-energy consumption technology, reducing the carbon footprint and minimizing the environmental waste generated. The system installed at Champ Landfill now removes PFAS from over two million gallons of liquid monthly, ensuring regulatory compliance and sustainability.

INTEGRATED SOLUTIONS

This story of Champ Landfill is one of an integrated approach, starting with a full understanding of the regulatory landscape, particularly the EPA's Effluent Limitations Guidelines (ELGs) Program. The EPA determined that revisions to the ELGs for the landfills category (40 CFR Part 445) are warranted due to PFAS in landfill leachate, but no regulatory changes have been adopted as of now.

"We know the applicable rules very well," states Jorge Caspary, Senior Principal at Montrose Environmental Group and former Director at the Florida Department of Environmental Protection.

"In the US, we help develop environmental policy. We help clients prepare for regulatory eventualities, and the cost-benefit analysis or the engineering cost analysis. But we also have a ready-made solution."

For Champ Landfill, that ready-made solution began with consultants at Montrose first identifying specific details of the issue and advising on appropriate treatment technologies, involving their extensive testing capabilities to quantify it. Given matrix complexities and the short support timelines, it required customized analytical approaches and a higher level of technical support.

JP Verheul, Technical Solutions Team Lead, explains: "We have recently added 8 brand new ultra-high-performance liquid chromatography-mass spectrometers into our high-resolution PFAS laboratories. This new technology allows us to deploy and develop new methods that are really market disruptors, such as our rapid-turnaround time direct-inject approach.

"It also allows us to process some of these samples much more quickly. The sooner our clients have their data, the sooner they can optimize the treatment systems."

This integrated capability — identifying, quantifying, and treating all under one roof — gives Montrose's clients a real advantage.

BEYOND THE PFAS CHALLENGE

The success at Champ Landfill demonstrates how the right technology can transform a compliance challenge into operational advantage. But PFAS isn't the only issue creating complex treatment scenarios for landfill operators. Elevated temperature events below the surface can produce significantly more leachate requiring safe handling, treatment and disposal.

Montrose stepped in to remediate some elevated temperature events occurring inside cells at a landfill, which was causing as much as five times more leachate to be produced.

"It was a difficult matrix with many contaminants and large volumes of water to tackle," explains Dave. "In this case we used granular activated carbon (GAC) technology, considered a workhorse for projects requiring removal of a wide range of organics. We've been on site for a year now, continuing to treat effectively and keep the landfill in compliance.

"Once the initial emergency has been responded to, we look at how we can make the solution even better. We go back to the lab and use different methodologies to see if there are any additional steps we can add to improve the process and reduce overall costs."

A CLEARER PATH FORWARD

Montrose's continuous improvement approach shows how environmental stewardship and maximizing cost-benefit analysis allows for the advancement of our way of life without compromising the integrity of our environment.

Meeting the PFAS challenge requires combining innovation with environmental responsibility. When science, strategy, and stewardship come together, new solutions emerge. Success depends on site-specific strategies, smart planning for wastes generated during treatment, and staying aligned with evolving regulations. From early detection to long-term monitoring, the key is to plan ahead — not just react to change.

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