



PFOA & PFOS DESTRUCTION IN LANDFILL LEACHATE

A case study of a Michigan-based Centralized
Waste Treatment Facility

Aclarity

CASE STUDY

Technology Profile

Aclarity's offers a first of its kind, patented electrochemical process that destroys PFAS in-situ on raw landfill leachate

The Aclarity Difference

Whereas Aclarity destroys PFAS compounds forever, current PFAS remediation strategies merely displace PFAS. Common tactics involve removal of PFAS using technology such as Granular Activated Carbon (GAC) and a second disposal step, usually sending carbon filters to a landfill. Other times liquid waste from other removal technologies is disposed of using deep well injection or incineration.

Ideal for...

Aclarity's technology is ideal for any high concentration PFAS application such as landfill leachate, AFFF sites, reverse osmosis concentrate or ion exchange brine.

Aclarity: Destroying PFAS, Forever.



Due to the ubiquity of PFAS in consumer products and the exceptional physical, chemical, and biological stability, PFAS is found at high concentrations in landfill leachate – the water is produced when precipitation lands on the piles and percolates through the soil and compacted trash. While PFAS may be found at parts per trillion (ppt, or ng/L) concentrations in surface waters, PFAS concentrations in landfill leachate can exceed parts per billion (ppb or µg/L) concentrations. Combined with high levels of salts, ammonia, heavy metals, and natural organic matter, treating landfill leachate by conventional treatment techniques is expensive and merely transfers the PFAS from one phase (the leachate) to another, such as activated carbon.

Aclarity, Inc. has developed an electrochemical oxidation system that not only degrades PFAS but can also destroy other components in leachate including ammonia and other organic compounds. While separation and disposal of leachate by conventional methods can cost in excess, the Aclarity system costs less and destroys PFAS forever, breaking the PFAS cycle back to the environment.

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Application

Landfill Leachate PFAS Destruction

Client Profile

Consolidated Waste Treatment Facility in Michigan

Client Challenges

- High PFOA levels exceeding 1,200 ng/L
- PFOS exceeding 800 ng/L
- Current PFOS & PFOA regulations
- Concerns around upcoming CERCLA designation of PFOA and PFOS as hazardous material

Key Takeaways

- Destruction of PFAS & other organic compounds using full scale reactor
- PFOS destroyed to below detection limits; PFOA destroyed to below regulatory limits
- Low power usage; less than 100 W-hr/gallon

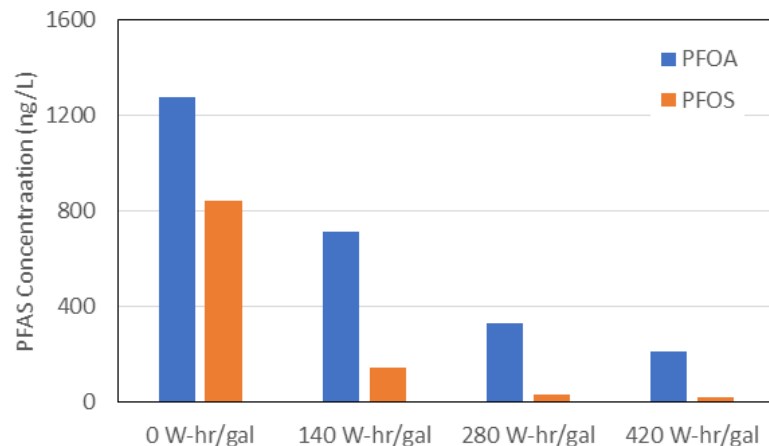


PFAS Destruction at a Consolidated Waste Treatment Facility in Michigan

Michigan currently regulates PFAS in landfill leachate. With the recent rulemaking from USEPA, it is likely that the rest of the country will be following over the next few years.

An Aclarity client who operates a consolidated waste treatment facility sought to evaluate PFAS destruction in several different leachates, initially, with an Aclarity Mobile Bench System. Results are shown in Figure 1, below.

Figure 1: PFOA & PFAS Degradation



At present, Aclarity is conducting a month-long pilot test at a Michigan Landfill. The testing is being carried out in an Aclarity mobile trailer, which is sized at 1 gpm, contains a full-scale reactor, industrial power supply, and controls/HMI. The testing is evaluating a range of operational parameters including power and flow settings. A significant portion of the test is geared towards evaluating the impacts of variability in feed concentration on performance as well as towards evaluating fouling of the electrodes and cleaning techniques.



Photograph of Leachate Before (right) and After (left) Aclarity Process

Reducing Energy Requirements for Destruction

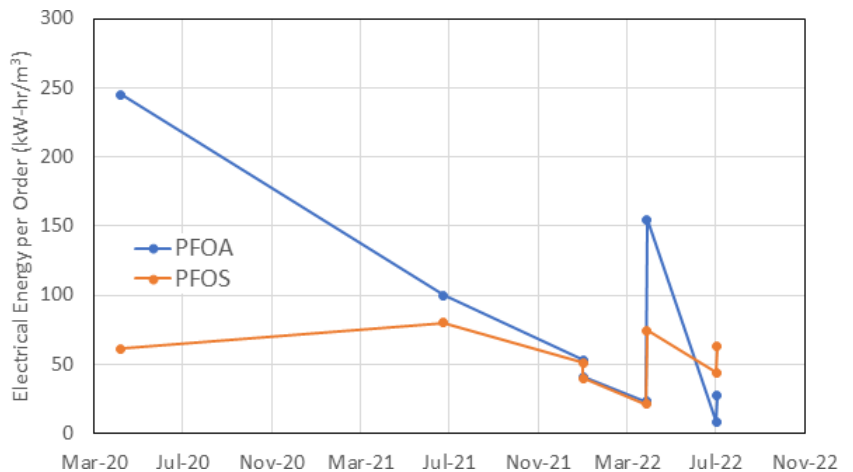
While Aclarity has been very successful in eliminating PFAS in aqueous streams, we are constantly striving to reduce the amount of energy used to accomplish this task.

Early testing on low concentrations of PFAS spiked into tap water demonstrated that we could achieve non-detectable levels of PFAS at an applied power of between 800 and 1200 W-hr/gal treated. Subsequent tests conducted in July 2021 (Michigan Landfill 1) on higher concentrations achieved similarly low levels of PFAS at an applied power use of 650 W-hr/gal.

The testing conducted during 2022 on Michigan Landfill 2 and the Massachusetts Landfill have shown that applied power of less than 100 W-hr/gal can achieve the low levels of PFAS required to meet stringent regulatory requirements.

Figure 2 shows a plot of EEO – Electrical Energy per Order, or the amount of electrical power (kW-hr) per cubic meter of water needed to degrade a contaminant by 90%. As seen in this figure, Aclarity has significantly reduced the amount of power needed to destroy PFAS, and especially PFOA.

Figure 2. Electrical Energy per Order versus Time



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Next Steps:

PFAS Destruction at a Consolidated Waste Treatment Facility in Michigan

Aclarity continues to compile data at the Michigan landfill site, with plans for a 500gpm full scale installation. With the full set of data gathered from this pilot, Aclarity will also be publishing a full case study and whitepaper outlining the improvements made and milestones hit.

Existing pilot improvements made in 2022 have been:

- Relocation of sensors to improve measurement
- Installation of management and reporting software
- Improved safety features



Above: Raw leachate (right) and other samples after treatment through the Aclarity system (middle and left).



Above: Chief Executive Officer, Julie Bliss Mullen (right) operating the Aclarity pilot system along with Aclarity Chief Science Officer, Oren Schneider (left)



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