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Effective Use of Granular Activated Carbon (GAC) Treatment for Removing Hexafluoropropylene Oxide Dimer Acid (HFPO-DA) From Drinking Water

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Introduction

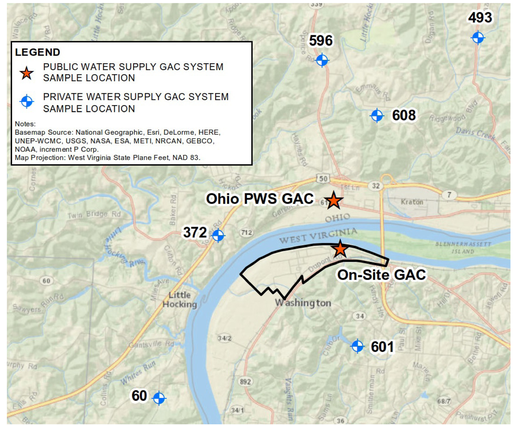
GenX refers to hexafluoropropylene oxide dimer acid (HFPO-DA) and HFPO-DA ammonium salt. HFPO-DA is included in a class of compounds called Perfluoroalkyl Ether Carboxylic Acid (PFECA). The use of HFPO-DA at a fluoropolymer manufacturing site in Washington, West Virginia, began in late 2011. Perfluorooctanoic acid (PFOA), which had been used at the site since the early 1950s, was completely phased out by May 2013 and was replaced by HFPO-DA.

Background/Objectives

In May 2007, a granular activated carbon (GAC) treatment system was installed to remove PFOA from drinking water at the fluoropolymer manufacturing site. The on-site GAC treatment system effectively removes PFOA from drinking water. Use of PFOA at the site was completely phased out by May 2013 and was replaced by HFPO-DA. HFPO-DA was subsequently detected in the water media at the site.

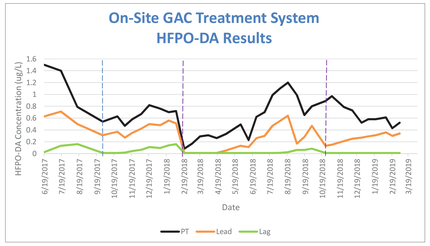
Starting in June 2017, monthly samples were collected for HFPO-DA analysis from the untreated water entering the on-site GAC treatment system (Prior to Treatment; PT) and after the lead and lag carbon beds (Bed1 and Bed2, respectively). In November 2017, sampling shifted to biweekly.

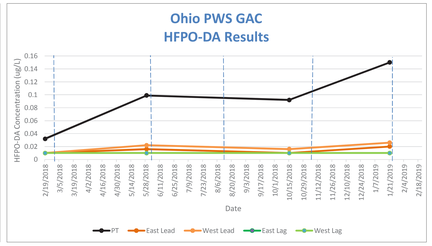
In February 2018, evaluation of an alternative GAC type for the on-site system began and is ongoing. During this same time frame, HFPO-DA sampling and analysis was conducted at six private GAC systems (5 in Ohio and 1 in West Virginia) and one public water supply (PWS) GAC treatment system in Ohio, near the facility.

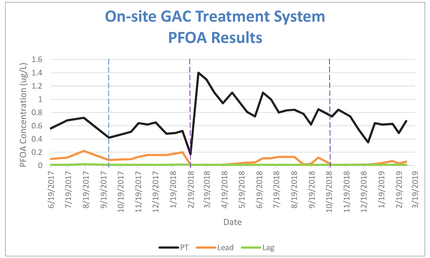


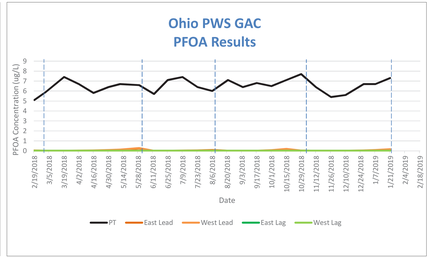
Approach/Activities

Samples were collected of the untreated water entering the GAC treatment system (PT) and after the lead and lag carbon beds. All HFPO-DA samples described above were analyzed by TestAmerica Laboratories, Inc. in Arvada, Colorado, using the method as specified in their Standard Operating Procedure DV-LC-0012, Rev. 14 (Analysis of PFOA and other PFCs and PFSs in Water and Soil by LC/MS/MS) with a reporting limit (RL) of 0.010 micrograms per liter (µg/L).









Results/Lessons Learned

While it is generally believed that GAC treatment is only somewhat or marginally effective for removal of HFPO-DA (Hopkins et al., 2018), the evaluation of results indicate that the existing GAC treatment systems are effective and practical for use in removing HFPO-DA from drinking water.

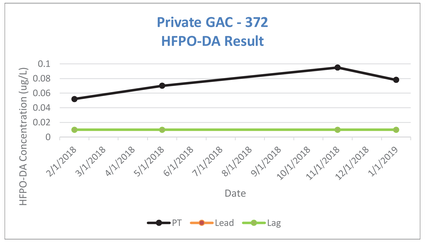
Results available for the six private and two PWS GAC treatment systems from June 2017 to date (March 2019) show GAC is effective in removing HFPO-DA to concentrations below the RL or to levels that meet program requirements.

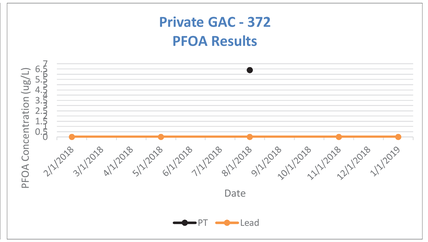
The range of concentrations of HFPO-DA in the PT samples during this time frame is 0.010 µg/L to 1.5 µg/L, the lead bed results were <0.010 µg/L to 0.71 µg/L, the lag bed results were <0.010 µg/L to 0.16 µg/L. These results confirm that GAC is effective in removing HFPO-DA.

Table of Results

Location	PT Results Range (ug/L)	Lead Bed Results Range (ug/L)	Lag Bed Results Range (ug/L)
On-site GAC	0.081 to 1.5 J	<0.010 to 0.71 J	<0.010 to 0.16
Ohio PWS	0.032 to 0.15	<0.010 to 0.026	<0.010
Private GAC - 60	0.010 to 0.052	<0.010	<0.010
Private GAC - 372	0.052 to 0.095	<0.010	<0.010
Private GAC - 493	0.011 to 0.017	<0.010	<0.010
Private GAC - 596	0.036 to 0.063	<0.010	<0.010
Private GAC - 601	0.044 to 0.064	<0.010	<0.010
Private GAC - 608	0.034 to 0.050	<0.010	<0.010

J - Analyte present. Reported value may not be accurate or precise.





As additional HFPO-DA sampling and analysis is completed for these GAC treatment systems, including the continued evaluation of alternative GAC types for the treatment system, the results will be evaluated for continued effective use in the project.