Battelle Case Study

Characterization of PFAS in Water, Solids and Air Discharged from a Wastewater Treatment Plant with a Collocated Sewage Sludge Incinerator

CHALLENGE

Per- and polyfluoroalkyl substances (PFAS) are a large class of chemicals that are widely used for many commercial and industrial applications. Some applications include aqueous film forming foams (AFFF), metal plating solutions, plastic molds, photographic films, semiconductors, and textile coatings. During the use and/or disposal of these products, PFAS can be introduced into wastewater treatment plants (WWTPs). Sewage sludge is a byproduct of the treatment of wastewater, and incineration is a common option for the disposal of the sludge. Due to the difficulty in destroying these compounds, it is important to understand their prevalence in WWTP discharge.

SOLUTION

In a first-of-its-kind assessment, Battelle evaluated the extent to which a full-scale WWTP with a collocated sewage sludge incinerator (SSI) disperses PFAS and their degradation byproducts into watersheds and the downwind atmospheric environment. Under typical steady-state conditions at an operational municipal WWTP/SSI, we measured PFAS concentrations in the WWTP's influent and effluent, the sludge, the effluents from the air pollution control devices, and in the incinerator stack gas. We estimated emission factors for PFAS and other fluorine-containing degradation byproducts in all WWTP/SSI effluent streams, as well as estimated the efficiency with which PFAS is removed and/or destroyed by thermal treatment in a fluidized bed incinerator operating at 830°C. Lastly, we measured PFAS in the ambient air upwind and downwind of the incinerator stack for comparison to concentrations predicted using dispersion modeling.

Over two days Battelle ascertained the steady-state mass admission and discharge rates of the influent and effluent streams at the WWTP/SSI and collected samples of potable water, nonpotable water, and solids. In these samples we measured inorganic fluoride by ion chromatography (IC) and target PFAS in our DoD-ELAP accredited laboratory by isotope

dilution high performance liquid chromatography tandem mass spectrometry (LC/MS/MS). We also performed flue gas sampling using Modified EPA Method 0010 (for target PFAS), Modified EPA Method 18 (for carbonyl difluoride [COF2] and total fluorine), and EPA Method 26A (for hydrogen fluoride [HF]). PFAS in the ambient air upwind and downwind of the stack was measured with Battelle's PFAS Air Insight™ technique, which is a modified version of EPA Method TO-13A. Wind speed, direction, and temperature were also captured.

OUTCOME

By developing the methods and conducting this assessment, Battelle has created a comprehensive dataset to understand the fate and transport of PFAS in WWTP processes and discharge.

Please contact our PFAS experts to discuss your needs.
800.201.2011 or **solutions@battelle.org**

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