Gasification of PFAS – Destruction Efficiency Results from a Technology Transfer Lab

Bill Malyk, Justin Gal, Sean Gormley and Marie Bevier, WSP

The USEPA's 2021 PFAS Innovative Treatment Team and USEPA's 2024 Interim Guidance on the Destruction and Disposal of PFAS identified gasification as a potential PFAS destruction technology with limitations on the understanding of products of incomplete combustion and PFAS emissions. Before the USEPA issued these guidance documents, WSP USA Earth and Environment Inc., in collaboration with the Naval Facilities Engineering Command Engineering and Expeditionary Warfare Center, the University of Guelph – Ridgetown Campus, and Matter Global Solutions created a gasification study on PFAS impacted matrices at a bench/laboratory level. The first phase of the study was completed in early 2024 and consisted of eleven (11) trials, each continuously processing PFAS impacted feedstock. The feedstock included PFOS at an average concentration of 5,502 micrograms per kilogram (ug/kg), PFOA at an average concentration of 8,768 ug/kg. These concentrated inputs were evaluated using several analytical methods to account for potential PFAS transformations and fluorine mass balance, including USEPA's 4th Draft Method 1633 for PFAS in solids, USEPA OTM-45 for PFAS in gas, and total fluorine analysis of the solids and gas. Solid discharges from seven out of the eleven trials did not have detectable concentrations of the 40 analyzed PFAS. Of the four trials where PFAS concentrations were detected in the solid discharge, the total PFAS concentration ranged from 0.07-1.53 µg/kg and only four PFAS were detected, PFOS, PFOA, PFHpA, and FOSA. PFOS was detected once at 0.83 µg/kg, a concentration reduction by four orders of magnitude. PFOA was detected in four of eleven trials at concentrations ranging from 0.06-0.60 µg/kg, a reduction in concentration by four to five orders of magnitude. PFOS gas concentrations during eight trials were found undetected or below blank concentrations and the remaining trials ranged between 3.11 -19.89 nanograms per cubic meter (ng/m3). PFOS and PFOA destruction efficiency (DE) ranges were 99.986-100.000% and 99.993-100.000%, respectively. Total PFAS, total perfluoroalkyl carboxylic acids, perfluoroalkyl sulfonic acids, short chain PFAS, and precursors were also evaluated in terms of concentrations and DE. These data will be included in our presentation, along with lessons learned on how studies and full-scale applications may evaluate PFAS destruction with potential air emissions, fluorine mass balance data, and details on the experimental plan.

Bill Malyk

Bill Malyk is a Senior Principal Engineer with more than 30 years of experience in managing industrial water and waste treatment projects. His experience in PFAS management includes water treatment system design and treatability, residuals and biosolids management, treatment selection and design, operational troubleshooting and economic evaluation for PFAS management and treatment systems. His PFAS experience has been developed working on projects in Canada, the United States, and the UK. Mr. Malyk is a Board Certified Environmental Engineer as accredited by the American Academy of Environmental Engineers and Scientists (AAEES).