PFAS Destruction

Test Series 2

February 2024

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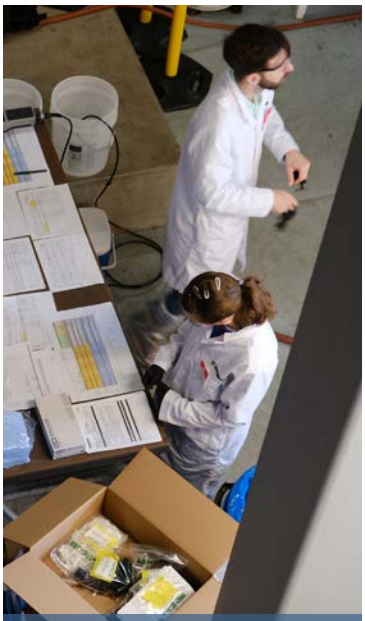
General Atomics, PFAS Destruction Technology

OVERVIEW

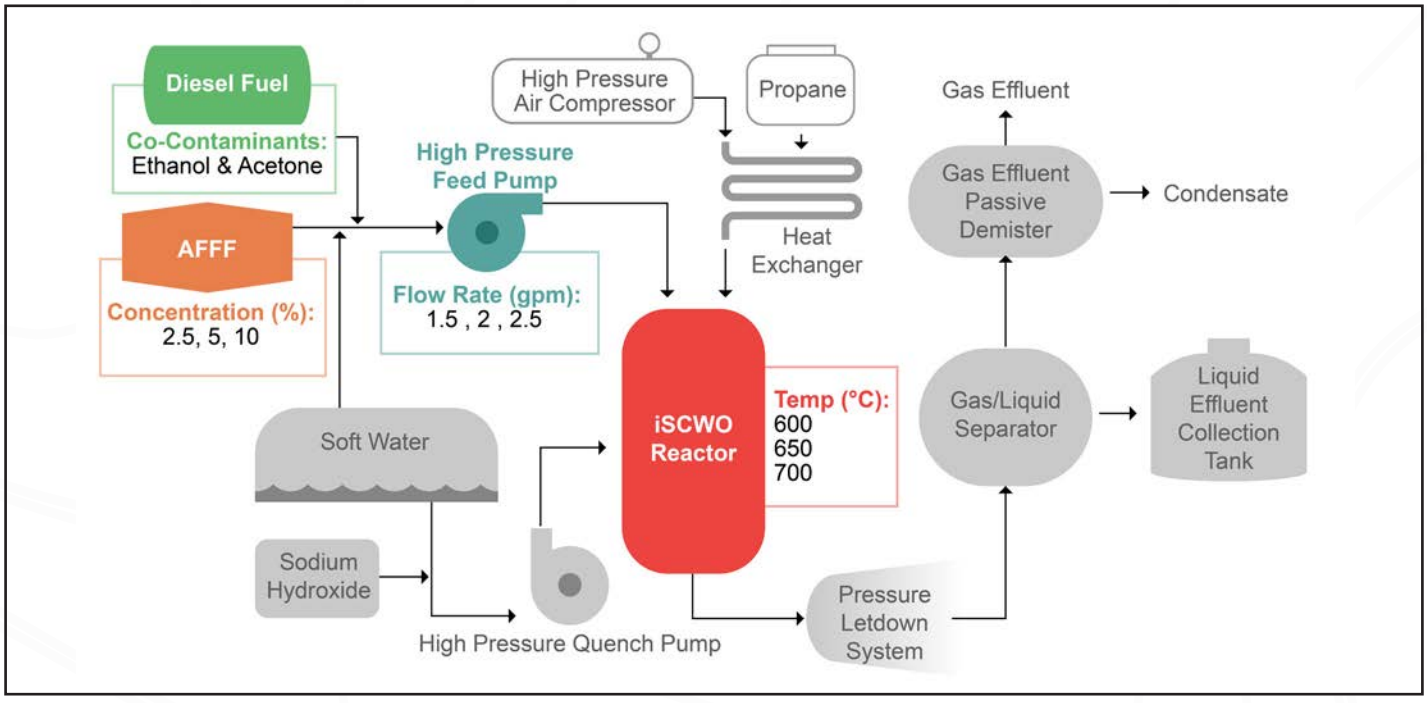
Bay West continues research using supercritical water oxidation (SCWO) technology in the destruction of per- and polyfluoroalkyl substances (PFAS) compounds. The research, awarded by the US Army Engineer and Research Development Center (ERDC), aims to identify operating costs and practical operational ranges of SWCO technology to destroy PFAS compounds. Bay West researchers recently completed Test Series 2 using a mixture of aqueous film-forming foam (AFFF) products obtained from Minneapolis, MN area fire departments. The team used General Atomics' (GA) proprietary Industrial Supercritical Water Oxidation (iSCWO) system in San Diego, CA for Test Series 2.



Bay West researchers preparing tests for the iSCWO system

TEST SERIES 2 DESIGN

Bay West researchers designed Test Series 2 to push the limits of the iSCWO system and to evaluate PFAS destruction and removal efficiency (DRE) under a range of operating conditions. The team varied the influent PFAS concentration, influent flow rate, or reactor temperature while the other operating conditions remained constant. Test Series 2 produced data necessary to design practical operating conditions for future PFAS destruction field deployments using iSCWO. Additionally, the team investigated the effect of co-contaminants and energy content of the influent waste stream on PFAS DRE and fuel use of the iSCWO process.



Block diagram showing iSCWO reactor process and variables in Test 2

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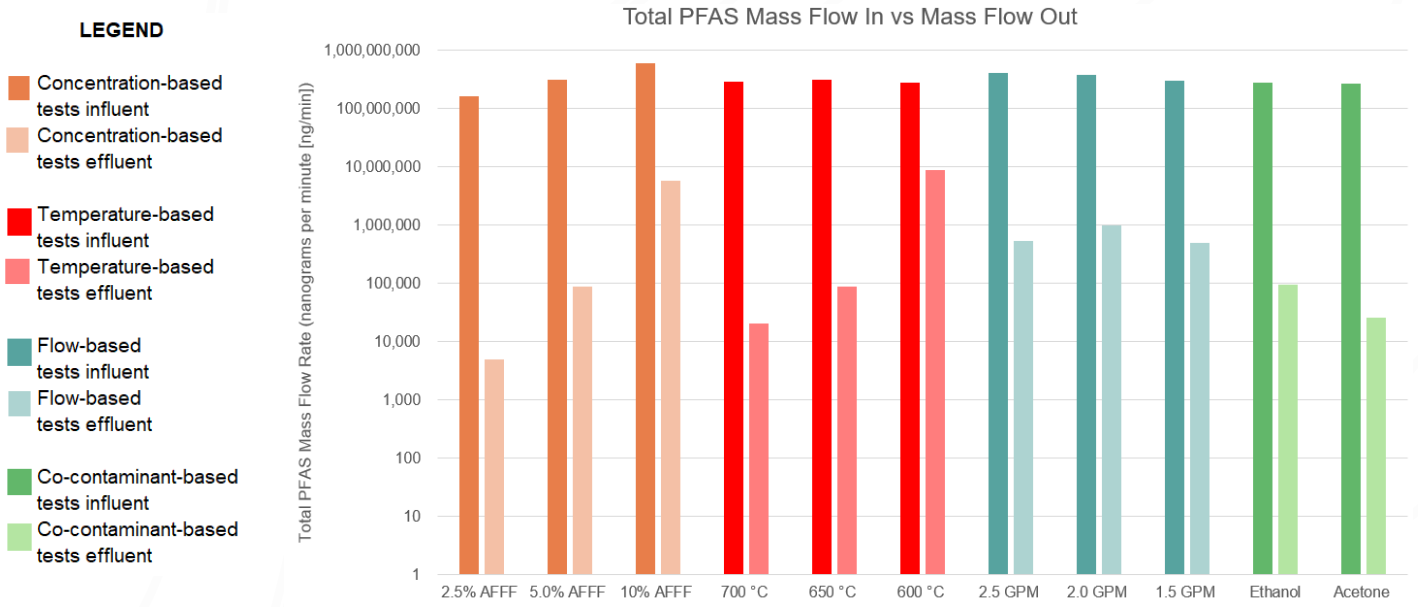
EVALUATION AND INITIAL RESULTS

Test Series 2 results suggest an influent total PFAS concentrations in the range of 20 to 40 milligrams per liter (mg/L) can be processed at an average rate of 2 gallons per minute (gpm) with reactor temperatures maintained between 650°C and 700°C to produce effluent water near drinking water criteria for PFAS and air concentrations below current recommended PFAS health-based values established by some states. Test Series 2 results show: PFAS DRE increases as reactor temperature increases (within the tested temperature range of 600 to 700 °C); PFAS DRE decreases as influent PFAS concentrations increase above 20 mg/L; and PFAS DRE did not noticeably change with varied influent flow rates ranging from 1.5 to 2.5 gpm. Additionally, the study co-contaminants did not affect PFAS DRE and increases in influent energy content reduced fuel consumption. Test data also indicates that future iSCWO operators should consider the chemical make-up of influent waste streams while evaluating discharge options as metals or inorganic ions (e.g. fluoride, chloride, sulfate, nitrite) concentrate in effluent streams.

The Bay West team conducted the Test Series 3 in June 2024 to further evaluate PFAS DRE with iSCWO using state-of-the-art laboratory analytical methods. Results of Test Series 3 will be reported in a separate summary.



Influent AFFF Concentration (%)	2.5%	5.0%	10.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Reactor Temperature (°C)	650	650	650	700	650	600	650	650	650	650	650
Influent Flow Rate (gpm)	2	2	2	2	2	2	2.5	2	1.5	2	2
Co-contaminant	None	None	None	None	None	None	None	None	None	Ethanol	Acetone
Estimated Destruction Efficiency (%)	**99.997**	**99.972**	**99.047**	**99.993**	**99.972**	**96.378**	**99.871**	**99.740**	**99.830**	**99.960**	**99.989**
Estimated Total PFAS Destruction Rate (grams per hour)	**9.97**	**19.0**	**35.7**	**17.0**	**19.0**	**14.1**	**25.1**	**22.5**	**17.8**	**14.6**	**14.2**