PROJECT ID:
632

PFAS Sensor Multi-Site Field Demonstration

Analytical bottles used in the collection of water samples for analytical methods can be time consuming and costly.
(Image Credit: U.S. Navy photo by Mass Communication Specialist 1st Class Glenn Slaughter).

OBJECTIVE

The objective of this field demonstration is to validate 2Witech Solutions' per- and polyfluoroalkyl substances (PFAS) field screening system for rapid and cost-effective site assessments. The system comprises a PFAS sensor, analyzer, and consumables. This project aims to evaluate the performance of the system across various PFAS-impacted liquid media and to demonstrate their effectiveness in supporting field investigations and remediation evaluations.

PROBLEM STATEMENT

Field screening tools are widely used for conventional chemicals, but no equivalent exists for PFAS, making site assessments time-consuming and costly. US EPA Method 1633 provides compound-specific results that meet regulatory standards for detection limits but costs over $400 per sample and typically takes 4–6 weeks for results. A rapid PFAS field screening tool would offer the Navy a faster, more cost-effective option to support site investigations, evaluate remedial system performance, and conduct long-term monitoring activities.

DESCRIPTION

The project team will conduct a thorough evaluation of the 2Witech PFAS sensor and analyzer system, which uses a molecularly imprinted polymer (MIP) working electrode to selectively detect PFAS molecules such as perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). During sampling, the sensor is incubated in a water sample for approximately five minutes, allowing PFAS molecules to bind to specific cavities in the MIP layer through hydrogen bonding, electrostatic attraction, and carbon-fluorine interactions. The presence of PFAS reduces electrical current during redox reactions, and the resulting signal is analyzed using a portable potentiostat to determine PFAS concentrations via calibration curves.

The project team will collect relevant environmental samples from Navy installations representing different geochemical regions, with physical and chemical characterization performed prior to field testing. Site-optimized screening systems will be deployed in the field, with split samples analyzed using US EPA

Method 1633 for side-by-side comparison. The goal is for field measurements to achieve agreement within ±30% of lab results.

In addition to analytical accuracy, evaluations will assess the system's ease of use, speed of results, and operational costs. These comprehensive tests will help determine the 2Witech system's suitability as a faster, more cost-effective alternative to traditional laboratory analysis for PFAS in water.

RETURN ON INVESTMENT

With over 150 Navy installations dealing with PFAS-impacted sites, many of which are undergoing remedial investigations that rely on costly analytical chemistry labs for PFAS concentration testing, the expenses can quickly add up. If the demonstration is successful, the rapid screening sensor would achieve significant cost reductions and time savings. Even if only half of the samples are sent for certified confirmation, the potential savings could reach into the millions of dollars.

NAVY BENEFITS

Rapid, field screening methods could potentially be applied across all Navy PFAS-impacted sites and throughout all phases of the remediation process, enabling real-time optimization and confirmation of remedial strategies. Additionally, the device can support surface water monitoring before, during, and after storm events, serving as a screening tool to evaluate the effectiveness of best management practices (BMPs) for DoN facility discharges.

Expected benefits include:

- Limit of detection: <2ppt (sensitivity down to 1ppt) and compound specificity (PFOS and PFOA),
- Rapid, onsite results (2-3hr),
- Ease of operation, requiring minimal training and low power,
- Lower lifecycle costs by reducing lab analyses, shipping needs, and associated logistics.

TRANSITION DESCRIPTION

The results of this effort will be communicated through peer-reviewed publications, Navy Open Environmental Restoration Resources (OER2) webinars and Remediation Innovative Technology Seminar (RITS) conferences, technical reports, and social media, ensuring widespread distribution of findings to DoD, industry, and other environmental stakeholders. A detailed operational standard operating procedure (SOP) document will be developed to support Navy end-users in applying the sensor at their sites, particularly during remedial investigations, treatability studies, and pre-design efforts.

This project will also support early commercialization by validating sensor performance at Navy sites and building relationships with engineering firms, rental equipment suppliers, and laboratories to encourage broader adoption of the technology across federal and broader environmental sectors.

CONTACT

For more specific information about this project, contact the Principal Investigator at ramona.iery.civ@us.navy.mil.

ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development demonstration and validation program, sponsored by Office of the Chief of Naval Operations (OPNAV) Compliance and Mission Readiness Division (N4I1) and managed by the Naval Facilities Engineering Systems Command (NAVFAC) from the Engineering and Expeditionary Warfare Center (EXWC) in Port Hueneme, CA.

The mission of the NESDI program is to support Fleet readiness by minimizing operational constraints associated with environmental and human health risks and to reduce cost of environmental compliance by demonstrating, validating, and integrating innovative technologies, processes, materials, and by filling knowledge gaps.

For more information, visit the program's web site at www.navfac.navy.mil/nesdi
or contact the NESDI Program Managers at NESDI.fct@navy.mil