PROJECT FACT SHEET

PROJECT – INVESTIGATION OF TECHNOLOGY READINESS LEVEL 3-4 FLUORINE FREE FOAMS

Objective

Aqueous Film Forming Foam (AFFF) is an aqueous-based firefighting agent used by military and civilian firefighting agencies to combat fires involving hydrocarbon fuels. Historically, AFFF concentrates contained long chain fluorotelomer surfactants comprised of per- and polyfluorinated substances (PFASs). Commercial and research entities have developed numerous fluorine-free fire suppression agents (FF_FSA), however, none meet the firefighting performance criteria required in MIL-PRF-24385F (MIL-SPEC) needed for DoD. For the DoD to comply with environmental regulations and maintain long-term sustainability, alternatives to fluorinated surfactant foams with adequate firefighting performance are urgently needed. The DoD is working aggressively to address the national PFAS issue in a cohesive, consistent manner while coordinating and communicating with external stakeholders. We are making substantial progress toward understanding the Department's use of AFFF and researching fluorine-free alternatives to AFFF. This project on investigation of TRL 3-4 fluorine free foams works to further those goals in research and development. The objective of this project is to take the fluorine free foams while they are still in the development stage, and test them in lab-scale fires to determine if they should be developed further to take to the MIL-SPEC scale.

Technology Description

Many small companies and universities develop potential fluorine-free foams, but may not have the resources to take every sample to the scale needed (5 gallons or more) for MIL-SPEC testing. Smaller lab-scale fires will help to minimize cost while allowing down-selection and optimization of promising formulations. Formulations will be tested first against a 19 cm pan fire. This set up consists of a borosilicate cylinder with 1 cm layer of heptane on a 9 cm layer of water. We will then add simulated burnback time testing with a 3.2 cm pan fire in the center — as this will have the same ratio as the 1 ft pan to the 6 ft pan used in the traditional burnback test. We will follow as closely to the MIL-SPEC burnback as possible, by placing the 3.2 cm pan with burning fuel in the center of the 19 cm pan within 60 seconds of extinguishment of the original fire. If the formulations do not perform similarly to C6 AFFF in the laboratory 19 cm pan fire, then follow-on experiments using Compressed Air Foam (CAF) and Ultra-High Pressure (UHP) will be performed, before moving on to the MIL-SPEC pan fires. If these formulations do not perform under standard conditions CAF and UHP will be explored on a laboratory-scale under various injection pressures and flow rates. Published work has shown that the performance of some siloxane based foams scale up to the MIL-SPEC pan fires, though previous work has shown this is not always the case with fluorine-free foams.

Benefits

New FF_FSAs are urgently needed, but development is expensive, and MIL-SPEC testing is also expensive. By having a smaller scale fire and burnback test to determine if a FF_FSA is worth taking to the next step in the development process, the development of fluorine-free foams can be accelerated.