Transition achieved

New milspec foams provide superior performance with reduced environmental risk, writes Tom Cortina.

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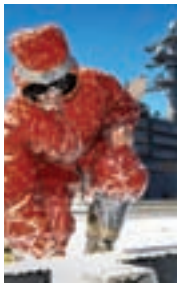

Sailors observe the AFFF system flow in the hangar bay of USS Makin Island during an AFFF operating system test. Photo: Mass Communication Specialist 3rd Class Nick Cerilli, US Navy.

Over the past few months new AFFF agents from multiple manufacturers containing only short-chain fluorotelomer-based surfactants have passed the US military specification (Mil-F-24385F), one of the world's most challenging foam standards, and have been listed on the US military's qualified products database.

Short-chain fluorotelomer-based surfactants that contain six carbons or less (C6) are approved for use by environmental authorities worldwide as alternatives to longer-chain fluorosurfactants (C8 and above) because they are much lower in toxicity and do not bioaccumulate based on current regulatory criteria.

While these new military specification (milspec) listings are an extremely positive development that validates our predictions that the transition to short-chains would be smooth, they are not at all surprising.

The use of short-chain (C6) fluorosurfactants in fire-fighting foams is not new. They have been a key component of some fluorotelomer-based AFFF agents since the 1970s. In fact, milspec AFFF agents containing greater than 95% short-chain fluorosurfactants that have been on the market for more than 30 years are the primary foam agents used for the last decade by US, Australian and some European armed services. As such there was never any real doubt that foams containing only short-chain fluorosurfactants could meet the most difficult fire protection challenges.

Milspec is one of the most rigorous and respected standards for fire-fighting foams in the world. It is more difficult to meet than other standards such as EN and UL, and there are many foam products that meet the requirements of those standards but do not meet the requirements of the milspec. Unlike the ICAO foam standards that are based on the results of a single fire test, the milspec requires foam to pass multiple fire tests using both fresh and salt water. Included in those fire tests is the requirement to pass one of the tests at half strength to account for potential problems with the operation of proportioning equipment in the field. No other foam standard includes this rigorous half-strength requirement. A more complete list of milspec requirements is presented here:

- Fire performance on 2.6m^2 and 4.6m^2 unleaded gasoline pool fires using both fresh and salt water
- As part of the fire performance testing foam agents must extinguish the 2.6m^2 fire at half-strength and at five times strength
- Foam quality, film formation and sealibility tests
- Dry chemical compatibility
- Compatibility after aging with all other QPD-listed products and prior QPD products still in use in significant quantities determined by multiple qualification tests and mixtures including 2.6m^2 fires using both fresh and salt water
- Conformance to chemical and physical tests, including refractive index and fluorine content
- Corrosivity on multiple alloys (pH, total halides, general and localised corrosion)
- Environmental impact as determined by biodegradability factors, specifically, chemical oxygen demand, biological oxygen demand, and aquatic toxicity

An important component of the milspec that needs to be stressed is the requirement that all listed foams must be compatible for use in the same equipment at the same time. Along with performance, this compatibility requirement is one of the key issues that led the Federal Aviation Administration to require in 2006 that all airports in the US must use milspec AFFF agents for aircraft rescue and fire fighting. Compatibility with the other concentrates allows mutual aid and re-supply from many sources in times of emergency or competitive bids, ensures performance, prevents foam mixing and storage issues and avoids potential equipment problems.

In recent years some airports in Europe and Australia have begun using fluorine-free foams for ARFF based on their having passed the ICAO standard. The airport firefighters using these foams and the passengers flying into these airports should be aware that fluorine-free foams are not currently able to pass the milspec and would not be allowed for use in US airports. In addition the ICAO standard does not include the secondary critical requirements of the milspec such as compatibility. Fluorine-free foams currently on the market are not only incompatible with AFFFs, but also with other fluorine-free agents.

Recent testing by the Naval Research Labs presented at an American Chemical Society Conference in San Diego showed AFFF agents extinguishing gasoline fires in less than half the time it took fluorine-free foams to extinguish the same fires. NRL includes the development of aqueous film-forming foam under their greatest accomplishments – 90 Years of Innovation – as 'one of the most far-reaching benefits to worldwide aviation safety.'

There is currently a misconception that foams containing only short-chain fluorosurfactants require significantly more fluorosurfactant to achieve the same level of performance as a previous formulation with some long-chain content.

This misconception appears to be based on public statements from one manufacturer that it required 40% more fluorosurfactant to reformulate some of their products. It is our understanding that most of the new short-chain AFFF agents that have passed the milspec have a fluorine content of around 1%. This is well within the historical range for fluorotelomer-based AFFF agents on the QPD and significantly lower than the PFOS-based products that were on the list prior to 2002.

Although each foam formulation is unique and the exact amount of fluorosurfactant needed to achieve a specific performance level will vary with each formulation depending on the skill of the formulator, there is nothing inherent in the use of short-chain fluorosurfactants that would require significantly more to be used to achieve the required performance level.

Concluding, the environmental impact of fire-fighting foams has been drastically reduced over the last decade with the elimination of PFOS foams, an increased focus on minimising foam discharges, and the transition to short-chain C6 fluorotelomer-based surfactants. The recent listing on the milspec QPD of multiple new AFFF agents containing only short-chain fluorosurfactants is an important sign that this transition has been successfully achieved. This will ensure that safe and effective AFFF agents that meet all environmental requirements will continue to be available well into the future.

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So everyone will make it home safely tonight.

Today's C6 AFFF agents:

- Are most effective to fight flammable liquid fires.
- Provide superior extinguishment and burnback performance.
- Have reduced environmental impacts.
- Have a low toxicity and bioaccumulation profile.
- Contain short-chain (C6) fluorosurfactants that are approved by global regulatory agencies.

FFFC Fire Fighting Foam Coalition
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