Fighting fires with foam – minimising the risks

Facility owners and managers have become increasingly aware about the dangers and ramifications associated with using the wrong fluorochemicals, which can have a significant impact on the environment and possibly human health. The most common question that is emerging is – should I use fluorinated foams such as Aqueous Film Forming Foams (AFFF), Film Forming FluoroProtein (FFFP), FluoroProtein (FP) or Fluorine Free (F3).

Why are foams a hot topic?

There are a number of regions where per-and poly-fluoroalkyl substances (PFAS) and other fluorochemicals have been discharged in Australia without containment and have spilled into rivers and lakes. These areas have been found to contain high levels of these chemicals in soils, surface water, ground water, waste water, animals and fish.

The social and economic costs to Australia and the rest of the world is making facility owners and managers re-think the use of PFAS in fire fighting foams. The associated costs include degradation of drinking water and soil, financial impacts on the agriculture and aquaculture industries, costs associated with the clean-up and waste management and legal cost to end users as well as health ramifications.

Understanding foams and managing them

AFFF has been the most effective way to contain and control Class B fires (flammable gas/liquid fires). These foams are mixed with water to provide a film/blanket over the flames, removing oxygen required to fuel the fire. They are man-made and contain fluorinated carbon chains called fluoro-surfactants. Some manufacturers offer F3 fight fighting foams as an alternative to AFFF.

More research is emerging with is linking fluorochemicals to environmental and possibly human health problems. All fire-fighting foams have an impact on the environment as they cause a reduction of oxygen in rivers and lakes, however fluorinated foams have been found to have a bio-accumulative effect on fish, animals and people. This means they can accumulate in the bodies of organisms and have been shown to be toxic to fish and other animals.

There are also ongoing investigations into the health effects these foams have on fire fighters as well. The mobility of foams is also currently being explored. Foams have the ability to travel long distances and can contaminate water supplies and ecosystems used by people and animals.

Fire brigades predominantly use various foams to fight fires. Foam can also be found in fixed fire suppression systems in industries such as petrochemical, oil and gas, defence and aviation.

Emerging trends – transitioning from PFAS to F3
Many industries are moving away from the use of AFFF and replacing them with F3 foams, which in some cases can result in new foam not being compatible with fire protection systems or equipment which reduces performance and can also impact insurance premiums.

Qualified fire safety consultants can assist with an efficient transition, ensuring the right balance is achieved between the environmental impact and fire-fighting performance. Once a viable F3 alternative has been selected the systems and equipment must be cleaned and all residual PFAS removed and disposed of in an approved manor. On occasion, modifications are required to ensure foam performance meets the right application rating.

A full system assessment should be undertaken prior to any work commencing to access the cost of modifications as well as the safe removal of contaminants in equipment, fire water supplies, storage tanks, valves and other components. In some cases, it may be more cost effective to replace all components rather than risk a PFAS rebound. When selecting the F3 foam, the Greenscreen certification rating should be taken into account to ensure the new foam is fully bio-degradable.

Removing foam toxicity
PFAS can only be disposed of by approved waste management companies. Incineration is the only successful way to achieve the total destruction of PFAS foam which can only be achieved with an extremely high temperature of 1100 degrees Celsius. PFAS can release other highly toxic gases into the atmosphere when incinerated at lower temperatures. Five tips are below to implement a transition from PFAS to F3:
• Engage a fire safety consultant to access systems and equipment;
• Evaluate the cost of removing contamination from the current system and equipment versus replacement;
• Confirm the adequate supply required for both foam and water;
• Choose a type B class fire risk polar solvent or hydrocarbon when selecting new foam;
• There is no one size fits all when transiting to a safer F3 method. Every situation needs to be assessed on its own merits.

Many foam manufacturers continue to spend millions of dollars on reducing the chemical chain from C8 to C6. C6 was thought to be a viable solution but have proven to be very mobile and harder to remove from ground water and soil. The best solution is to classify foams as persistent (does not break down) and non-persistent (fully biodegradable) rather than looking at the chemical chains. This classification method would remove the chance of precursors to Poly-FLUOROALKYL substances being masked in shorter chemical chains.

Protecting people and the environment
There has been an increasing number of PFAS related Australian contamination cases. All of the states and territories have now endorsed the PFAS National Environmental Management Plan Version 2.0 which is a guideline everyone should be following. Ultimately, we are seeking the very best fire foam solution that protects people, facilities and the environment. Fluorine free foam is the answer.