Many were surprised the promised 3rd draft consultation by Queensland's Department of Environment and Heritage Protection never materialised, when the Minister unexpectedly announced implementation of its final Policy on 8th July 2016.

Was this a carefully considered, well thought through result of debate and consultation to inform the best position, or was it more idealogical, or perhaps a knee-jerk reaction to Senate inquiries for Oakey/Williamtown? Is it a blinkered and over-precautionary isolated response to foam's environmental impacts, or does it blaze a trail we should all be following? It's a complex issue finding the right answers, so we are covering it in two parts with this part 1 article now and part 2 following in the next issue.

Credit must be given to Queensland (QLD) for taking positive action on a long overdue ban on the use of 3M Lightwater™ branded foam concentrates which contain and breakdown to PFOS, probably the most extensive fluorochemical contaminant, now requiring disposal by incineration in QLD. PFOS is a Persistent (P), Bioaccumulative (B) and Toxic (T) substance with proven long range transport issues, the only fluorochemical listed by the Stockholm Convention as a POP (Persistent Organic Pollutant) in 2009. Australia's Government has still not ratified this amendment, although we are assured it is working hard to achieve this soon. Outside QLD PFOS-based foams can still be used and disposed of through Waste Water Treatment Plants (WWTP) anywhere else in Australia, and most of the world. The European Union (EU) passed 2006 legislation to ban PFOS use in 2011 with disposal by incineration, followed by Canada in 2013. Singapore and New Zealand also ban its importation.

QLD has made a bold decision, lumping all firefighting fluorochemicals into an effective ban, requiring incineration alongside PFOS. Only Fluorine Free Foams (F3) are effectively allowed without full containment and disposal to WWTP in QLD. This goes far beyond any other jurisdiction in the world. Does it make sense? Is it supported by scientific research? Does it deliver least environmental impacts from foam's use?

F3 agents are typically ten times more toxic than fluorinated AFFFs, are often slower, risk flashbacks and often require typically 3 times more agent than AFFFs for a given size fire. Clearly the situation is not as "black and white" as QLD's Government, and others, would have you believe.

PFOS and PFOA deserve restriction

Undoubtedly PFOS is a significant contaminant from the ElectroChemical Fluorination(ECF) process and should be regulated. It's likely to be carcinogenic, transfers to unborn foetuses,

is found in mother's milk, and animals from polar bears to penguins. Manufacturing ceased in 2002-3… except in China, which is apparently under review.

PFOA, the other emerging contaminant of concern is predominantly used as a polymerisation aid for fluoropolymers (not fluorotelomers) used in a wide variety of industrial and consumer products including cookware and textile treatments. PFOA is also a breakdown product and impurity from the ECF process and is facing restrictions. PFOA can also breakdown from longer-chain fluorotelomer precursors and is an unintended manufacturing by-product of this manufacturing process at low ppm levels. PFOS and PFOA are both classified as long-chain ≥C8 fluorochemicals, major contributors to emerging contaminants of concern.

PFOA exhibits Persistence, Bioaccumulation and Toxicity, mobility and potentially harmful human effects. Under review for POP listing by Stockholm Convention, PFOA is still widely used today in most countries, including Asia. Transitional change is needed.

The US EPA 2006 PFOA stewardship program, encouraged transition to more benign alternatives, including C6 fluorotelomer surfactant based products, with 2 key objectives:

- 95% PFOA removal from products & facilities by 2010, which was achieved.
- working towards elimination of PFOA from those facilities & products by 2015.

The US EPA's latest 2014 report shows major progress towards this virtual elimination of PFOA.

Increasing development of short-chain C6 agents resulted, stimulating this transition away from PFOA precursors. The European CHemicals Agency (ECHA) rejected proposed 2ppb restriction levels for PFOA. Latest draft REACH legislation recommends 25ppb for PFOA and 1,000ppb for total precursors, endorsing C6 fluorosurfactant usage (1part per billion equates to 3 seconds in 100 years).

C6 has no PFOA or PFOS ingredients, cannot degrade to PFOA or PFOS, just a few ppb PFOA as an unavoidable by-product of manufacture, exempted in the latest REACH draft PFOA regulations.

C6 fluorosurfactants are accepted for use by US EPA, European Chemicals Agency, REACH, UK Environment Agency and NICNAS (National Industrial Chemicals Notification and Assessment Scheme) in Australia. Although Persistent, it is considered neither Bioaccumulative, nor Toxic, nor harmful to human health.

C6 also benefits from being fast, reliable, efficient and effective – necessary when saving lives.

What constitutes environmental responsibility?

How do we responsibly futureproof ourselves against fires, without using C8 Fluorochemcials?

We need effective and reliable alternatives going forward, which allow us to train and provide effective, efficient fire control.

Its not easy to answer, when ALL foams pollute our environment, as do the breakdown products from fires. It requires balancing pollution created by fire, against pollution caused by firefighting, while recognising speed and performance can minimize environmental impacts… Every second counts to save a life. Is QLD's policy the most environmentally responsible approach? Has it considered other options to deliver minimised adverse impacts?

We have 3 main options:

- Let it burn
- Use Fluorine Free Foams (F3) – as QLD advocates
- Choose short-chain C6 fluorosurfactant-based foams

A risk-based approach is needed, to identify the best option for each specific site.

Calculations for "Letting it burn" on a 61m diameter crude oil storage tank for example could consume up to $500,000 worth of fuel/hour, producing between 17.5 – 262 tonnes of noxious smoke!

Structural fires do not require Class B foam use, but may produce fluorochemicals in firewater runoff as breakdown products of the fire e.g.. from carpets, upholstery, clothing and other diverse domestic and commercial uses. Shouldn't these fluorochemicals also now be collected in QLD – for incineration?

Health risks from fire

Fires generate a wide-range of skin contact and inhalation hazards likely to cause increased cancer risks. Smoke, breakdown products, and firewater run-off can all produce Volatile Organic Compounds(VOCs), Hydrogen cyanide, sulphur and nitrous oxides and Polycyclic Aromatic Hydrocarbons (PAHs) – some are known carcinogens like Benzo(a)pyrene, and hazardous to humans.

2015's Australian firefighter study showed 79% of fires attended by career, paid part-time and volunteer firefighters were structural, vehicle or bush fires, which do not require the use of Class B foams, but increases incidence of cancer.

Fast extinction, reduces exposures and risks to firefighters, casualties and local communities, plus minimising escalation and damage. Quick control also reduces necessary

volumes of foam and water resources, while reducing firewater runoff volumes, creating less problem for containment and disposal, reducing risks of overflow and pollution into the environment.

Most do not appreciate that 95% of fluorochemical usage is in commercial and residential products, like stain repellent carpets, upholstery, garments, paper products, food packaging and firefighter tunics, which probably ends up in structural and vehicle firewater runoff, whether F3, C6 or only water is used to put out these fires!

Queensland Fire and Emergency Services research has shown that fire breakdown product toxins can enter skin under and through PPE, and off-gassing during incidents, BA changes, clean ups, and transfers back to station. These exposures are contributing to increased cancer risks. Recommendations include showering and changing into clean clothes on the fire-ground, while placing PPE in sealed containers before regular laundering, to help reduce health risks. Maybe letting it burn, is not usually the best environmental approach.

Fluorine Free Foam (F3) option?

Is this QLD F3 focus a better idea, despite concentrating on foam agent impacts to the environment, while largely excluding many other important environmental considerations. Is this the right answer? Some say its too simplistic and blinkered a response to a far more complicated problem, is probably over-precautionary, and isn't the right answer for many fire situations.

F3 agents benefit from being 100% bioadegradable without persistent ingredients. They are also advantageous for dispersive applications where no containment is possible, and for non-emergency training. However, they struggle with critical factors including:

- Provide no fuel repelling capability – which is why fluorinated foams were developed originally!
- Deliver poor vapour sealing
- Provide slower control and extinction, with sudden, unpredictable flare ups and flashovers, that can result in greater escalation risks and re-involvement.
- More damage is likely to result, particularly from larger events.
- The ever-present increased life safety risks, increased firewater runoff, and typically 10 times higher aquatic toxicity than AFFFs.

Stay tuned for Part 2 where we explain these F3 failings, discuss other important omissions in QLD's foam policy, show recent extensive comparative research between short-chain C6

fluorosurfactant-based AFFFs and F3 alternatives. We examine key foam user considerations while contrasting both fire and environmental performance alternatives of these options. It helps foam users navigate this minefield providing additional considerations to aid decision-making for their sites in future… its worth a read!

For more information, email willsonconsulting26@yahoo.com.au