Key Considerations when Transitioning to PFAS-free or Fluorine Free Foams(F3)

Mike Willson, 14th May 2025 – Sydney, Australia

Discussion Outline…

- **We rely on firefighting foams to be quick, reliable and effective - protecting lives** and critical assets in major fire incidents – *including yours!*
- **Most regulatory restrictions focus on legacy C8-PFAS.**
- **Check site fuels, listings, application rates** and delivery devices necessary with any F3 transition
- **Check existing fire protection systems are not unintentionally compromised** by F3 changes? …Or lives may be in danger?
- **A key considerations review** may help prevent unseen pitfalls during your transition journey…


Offshore installations use seawater


A large flammable liquid storage tank fire

Q: Are we risking lives by too hasty a transition?

Let's find out…

Do we need to transition now?...

Start by asking 4 key Qs:

- ***What do the regulations say?***
- ***Will it be as effective?***
- ***What is the benefit and likely cost?***
- ***...Why are we doing this?***

Because:

- **ONLY SA & QLD have practically banned the use of all PFAS-foams (incl. C6-foams).**
- **NSW bans use of C8-foams unless catastrophic fires.** Also ***"...prevents use of C8 or C6 foams for firefighter training/testing."*** **BUT recognises...**

"Current F3s do not have same level of efficacy"

ALL OTHER States/Territories comply with National Position Statement (2019) where long-chain PFAS (C8) foams are phased out under Stockholm Convention.

(...see next slide for more detail...)

Australian Regulatory Position

Outside NSW, SA & QLD, our National PFAS Position Statement (2019) applies:

"***Phasing out all legacy C8-PFAS foams*.**

Transitioning away from the use of chemicals that cause irreversible or long-term contamination *of Australia's environment* ***should be the ultimate goal*** *for all users of PFAS in Australia.*

Where short-chain [C6] PFAS are used *in aqueous film forming foam (AFFF), they should* ***only be used in emergency situations*** *and in accordance with all relevant regulations.*

Any releases should be fully contained, wastes managed *according to the PFAS National Environmental Management Plan (NEMP 3.0).*

Until effective and economically feasible non-PFAS alternatives are developed, *the ongoing sale and use of products and articles containing* ***short-chain PFAS may be necessary for uses for which no suitable and less hazardous alternatives are available***."

Other Regulatory Positions…

Stockholm Convention

- **Implements C8-PFAS ban as declared Persistent Organic Pollutants (POPs) – PFOS, PFOA, PFHxS** - categorized Persistent, Bioaccumulative and Toxic (PBT), …but ***C6-PFAS excluded***.
- ***All leading C8-PFAS foams ceased manufacture by end 2015*** *(outside China and perhaps Russia)*.
- Some global foam mfrs. have now ceased making C6-foams, focusing ONLY on PFAS-Free foams (F3s).

New Zealand

- **ALL PFAS foams (incl. PFOA & C6) are banned from use after 3Dec.2025**, …***unless*** specific **exemptions** granted by EPA NZ.

United Kingdom

- **Legacy C8-foams prohibited from use after 4 Jul.2025.** Residual traces 25ppb PFOA limit, with 1ppm residual PFOA related substances limit.
- **C6 foams permitted for emergency use on flammable liquids**, providing all foam use contained and collected - *as far as practically possible*.
    - **Under review**…*Expected to broadly follow EU restrictions and transition periods.*

EU Regulatory Position…

European Union

- **Legacy C8-PFAS foams banned from use since 2023.**
- **C6-PFAS foams to cease use** *at levels above 25ppb PFHxA* (under PFHxA legislation Sep.2024) for:
  - **Municipal fire brigades (*except response to SEVESO III sites*)** — **Apr. 2026**
  - **Firefighter training & testing** — **Apr. 2026**
  - **Civil Aviation** — **Oct. 2029**
- **ALL OTHER SECTORS are covered in C6-PFAS restriction legislation for firefighting foams, expected entry into force (EIF) end 2026**. More challenging sectors expect **extended transitions** to alternative PFAS-free foams (F3s) – *for Class B flammable liquid fires only*:
  - **Refineries & Chemical Plants (Seveso III sites)** — **10 years**
  - **Offshore installations** — **10 years**
  - **Shipping (existing vessels) & Navy ships builds** — **10 years** (new civil 5 years)
  - Launch facilities for Space industry — **10 years**
  - **Defence** — **5 years**
  - **General industry** — **5 years**
  - **Portable extinguishers** — **12 months (*AR-foam units 18 months*)**

EXTENSIONS recognise F3 challenges: ***lack of functionality - seawater, dry chemical, non-aspirated devices, wind, cold winters, space restrictions etc.***

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EU & USA Regulatory Positions…

EU cont'd…

- **UNIVERSAL C6-PFAS restriction legislation** expected end 2026-27 ***for ALL other consumer and industrial uses.***
- ***Includes extended transitions of 5 to 12 years after EIF for specific 'essential use' sectors***, including ***semi-conductors, energy, communications, medical etc.*** ***…PPE & clean fire suppressing (gaseous) agents estimated 12yrs transition.*** *…A few applications may be* ***'time-unlimited'***.

USA

- **PFAS foams widely restricted for training/testing and Municipal Brigade use, in most States.**
- ***Only 15 States have banned sale of PFAS foams (Incl. C6)*** *(Alaska,* ***California,*** *Colorado, Connecticut, Hawaii,* ***Illinois,*** *Maine, Maryland, Minnesota, New Hampshire, New Jersey,* ***New York****, Rhode Island, Vermont and Washington)*

PFAS Litigation focused on contaminated drinking water supplies by major PFAS mfrs/users.

US EPA focused on v. low ***drinking water restrictions:*** *4ppt for PFOA, PFOS, 10ppt for PFHxS, Gen-X*
…now seems 'on hold' under Trump Presidency!

- ***1ppt = 1 second in 32,000 years!***

Key Considerations when Transitioning to F3s…

1. **Review and understand local regulations** – *talk to Authority Having Jurisdiction (AHJ).*
2. **Is PFAS-free foam transition necessary – NOW?** *–a delay may allow improved F3 fire performances, viscosity reductions or flexibility to be developed, perhaps?*
3. **MAJOR design review** ***(+ significant $$ budget)*** **required *before* F3 transitions** - *include a full cost-benefit analysis with management 'sign-off' **before** embarking.*

ENSURE: Existing system protections are *NOT unintentionally compromised* by proposed F3 changes.

More Key Considerations…

4. **C6-foams mostly allowed for major fire emergencies to save lives and minimise escalation potential** - *especially where all foam use can be contained & collected for safe disposal – as far as practically possible.*
5. **Firefighter training and system testing** - *increasingly required using F3s.*
6. **Check all bunds don't leak!** – *around hazards, foam tanks, back-up foam stocks (avoids leakage or potential overflows).*
7. **Critically - Ensure firefighters are safe** – *check NO unexpected re-ignition risks ?*

ENSURE: Existing firefighter protections are also *NOT unintentionally compromised* by proposed changes.

Further Key Considerations…

8. **Transitioning to F3 is not a ‘drop-in’ replacement.**

9. **Adopt a total system engineering approach - robust plan with ‘check lists’** – *avoids pitfalls later.*

10. **Check existing and future fuels being used/stored on site with fire test data verifying effectiveness.**

11. **Ensure F3 choice is listed at specific application rates with delivery devices for your fuels** - include a safety factor for real-life fire conditions *(eg. listings under UL162, FM5130, EN1568-3&4, Lastfire, ISO 7203-1&3, IMO MSC.1-Circ1312 etc.)*

12. **Heptane test fuel is not a reliable substitute for gasoline on most F3s -** *four aromatics in gasoline prematurely attack most F3s (TriMethyl Benzene, Xylene, Toluene, Benzene), so increased application rates likely.*

14. **Accept design changes likely** – *eg. higher application rates, longer durations, larger pipework flows/pressures, extra/new aspirating nozzles, proportioner changes, larger foam storage, extra containment etc.*

Ensure your facility’s existing speed, effectiveness and reliability are maintained - to adequately protect lives.

Additional Key Considerations…

15. **Check your firewater uses drinking water, NOT seawater** – *F3s generally suffer premature collapse with seawater, bore-hole or silty water, hence 10 yr transitions expected in EU regulations.*

16. **Using Dry Chemical as complimentary agent?** *Most F3s attacked by Dry Chemical applications, reducing burnback effectiveness and potential premature re-ignition.*

17. **Check no harmful or persistent ingredients in F3?** *Avoid D4/D5 siloxanes as potentially bioaccumulative. Aquatic toxicity usually increases with F3 discharges, so containment remains best practice.*

18. **Verify proportioners accurately deliver/mix likely more viscous F3s, especially in winter** - *globules may form along bottom of pipe, making weak foam solution, potentially preventing effective fire control.*

19. **Store F3 correctly to avoid risk of premature gelling, separation or water absorption -** *potentially creating 'sludge' which could potentially reduce firefighting effectiveness.*

Ensure your facility's existing speed, effectiveness and reliability are maintained - to adequately protect lives.

Extra Key Considerations…

20. **Arrange equivalent alternative fire cover during F3 transitions** – *IF site shut-down factor in production losses.*

21. **Ask AHJ what PFAS residue level is 'clean enough'?** *Conduct TOP Assay lab test to verify below limits.*

22. **F3 behaves differently and less forgiving than C6-AFFFs -review application methods:**
    - ***correct aspiration***
    - ***gentle delivery***
    - ***cover holes and premature breakdown to maintain integral foam blanket.***

23. **Firefighters may need to avoid walking in F3 blankets for their safety,** *as risk of sudden re-ignition increases – especially on gasoline.*

24. **Ensure adequate firefighter re-training , system operation instructions so skills and techniques become 'best practice'.** *Research by US FAA, DoD and NFPA provide guidance…*

Ensure F3 application as effective and reliable as possible, minimising risk of re-ignition – keeping people safe.

US Firefighter's Guidance on F3 Delivery

25. Application Summary:

- **AVOID plunging F3 foams into fuel.**
- **Select narrow angle spray for optimum reach and 6-8:1 aspiration.**
- **Expansions of 3-4:1 often require 50% higher application rates.**
- **Expect typically 2 passes with the F3 stream** (C6-AFFF usually single pass) **to completely extinguish within sweep area.**
- **Slow nozzle sweeps** (waist height & parallel to ground) **across entire width of leading flame edge,** moving back into the spill**.**
- **Allow thicker foam blanket build up, achieves more reliable extinguishment.**

Conclusions

Following these guidelines should:

- **Avoid common pitfalls**
- **Help achieve a successful F3 transition**

ENSURE key objectives achieved:

1. F3 changes are NOT *unintentionally compromising* existing system design.

2. F3s are applied *effectively, gently and reliably*, minimising risk of re-ignition

Result = *Adequately protected lives*.

...Any Qs?