



# fire fighting foam update

## C6 FOAMS

Q3:2017



**Dear customer,**

**Over the last 15+ years, the Fire Fighting Foam Industry has been working to understand how environmental pollution arising from the use of non-C6 fluorinated AFFF concentrates can be removed.**

As from February this year, the US EPA and the European Chemical Agency (ECHA) have approved fire fighting foams manufactured with fluorosurfactants using a maximum carbon chain of C6:

- > In the USA, C6 technology has now been approved by the EPA and the military as the way forward for AFFFs.
- > In the EU, ECHA has now exempted C6 technology and allowed C6 AFFFs to be sold within the EU.
- > In return, fluorotelomer manufacturers are being required to improve the quality of C6 fluorosurfactants by reducing the amount of impurities to:
  - > less than 25ppb for PFOA
  - > less than 1000ppb for a combination of PFOA-related substances.

We are pleased to announce that our range of Aberdeen Foam AFFF-C6 concentrates already meet this regulation - and contain considerably fewer than the maximum quantities allowable under this regulation - three years before it comes into force!

The articles included in this newsletter will provide you with further information on these important issues, but should you have any questions do please send an email to [david@firefightingfoam.com](mailto:david@firefightingfoam.com)

Kind regards

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## INTRODUCTION

Nearly 15 years after the end of production of PFOS-based AFFF agents, there is continued discussion within the fire protection industry on the environmental impact and efficacy of fire fighting foams. The discussion of environmental impact is usually focused on foams that contain fluorochemicals, while the discussion of efficacy is usually focused on foams that do not contain fluorochemicals. The Fire Fighting Foam Coalition (FFFC) has produced this fact sheet to provide you with accurate, up-to-date information about these issues.

## KEY FACTS

- > All modern AFFF agents contain fluorotelomer-based fluorosurfactants.
- > Fluorotelomer-based AFFF agents are the most effective foams currently available to fight flammable liquid fires in military, industrial, aviation, and municipal applications. They provide rapid extinguishment, burnback resistance, and protection against vapor release.
- > Fire test results presented at international fire protection conferences in 2011, 2013 and 2016 all show that AFFF agents are significantly more effective at extinguishing flammable liquid fires than fluorine-free foams.
- > Fluorotelomer-based foams do not contain or break down into PFOS (perfluorooctane sulfonate) or homologues of PFOS such as PFHxS (perfluorohexane sulfonate).
- > Fluorotelomer-based foams are not made with PFOA (perfluorooctanoic acid) or any PFOA-based products, but may contain trace quantities as an unintended byproduct of the surfactant manufacturing process.
- > The short-chain (C6) fluorosurfactants that have been the predominant fluorochemicals used in fluorotelomer-based AFFF for the last 25 years are low in toxicity and not considered to be bioaccumulative based on current regulatory criteria.
- > Foam manufacturers have transitioned or are in the process of transitioning to the use of only short-chain (C6) fluorosurfactants in their fluorinated foam products.
- > Proposed regulations on long-chain ( $\geq$  C8) perfluorinated chemicals (PFAS) in Canada, the European Union, and the United States allow for the use of short-chain (C6) fluorochemicals as alternatives to long-chains in foam and other applications. These regulations do not restrict the use of existing stocks of fluorotelomer-based foams.

- > Foam and fluorochemical manufacturers are promoting the use of best practices in order to minimize emissions of fire fighting foams to the environment. Best practices include the containment and treatment of foam discharges and the use of non-fluorinated fluids and methods for training and the testing of foam equipment.

## ENVIRONMENTAL IMPACT

The environmental impact of AFFF-type fluorosurfactants has been extensively studied and a large body of data is available in the peer-reviewed scientific literature. The bulk of this data continues to show that short-chain (C6) AFFF fluorosurfactants and their likely breakdown products are low in toxicity and not considered to be bioaccumulative or biopersistent according to current regulatory criteria.

Groundwater monitoring studies have shown the predominant breakdown product of the short-chain (C6) fluorosurfactants contained in fluorotelomer-based AFFF to be 6:2 fluorotelomer sulfonate (6:2 FTS) [6:2 being the ratio of carbon atoms to fluorine atoms]<sup>1</sup>. A broad range of existing data on 6:2 FTS indicate that it is not similar to PFOS in either its physical or ecotoxicological properties<sup>2,3,4,5</sup>. Recent studies on AFFF fluorosurfactants likely to break down to 6:2 FTS show it to be generally low in acute, sub-chronic, and aquatic toxicity, and neither a genetic nor developmental toxicant. Both the AFFF fluorosurfactant and 6:2 FTS were significantly lower than PFOS when tested in biopersistence screening studies that provide a relative measure of biouptake and clearance<sup>6</sup>.

Aerobic biodegradation studies of 6:2 FTS in activated sludge have been conducted to better understand its environmental fate<sup>7</sup>. These studies show that the rate of 6:2 FTS biotransformation was relatively slow and the yield of all stable transformation products was 19 times lower than 6:2 fluorotelomer alcohol (6:2 FTOH) in aerobic soil. In particular, it was shown that 6:2 FTS is not likely to be a major source of perfluorocarboxylic acids or polyfluorinated acids in wastewater treatment plants. Importantly neither 6:2 FTOH nor PFHpA (perfluoroheptanoic acid) were seen in this study.

PFHxA (perfluorohexanoic acid) is a possible breakdown product and contaminant that may be found in trace quantities in fluorotelomer-based AFFF. Extensive data on PFHxA presented in 2006 and 2007 gave a very favorable initial toxicology (hazard) profile<sup>8,9,10,11</sup>. Testing was done on four major toxicology end points: sub-chronic toxicity in rats, reproductive toxicity in rats, developmental toxicity in rats, and genetic toxicity.

Results show that PFHxA was neither a selective reproductive nor a selective developmental toxicant. In addition it was clearly shown to be neither genotoxic nor mutagenic. In 2011 results were published from a 24-month combined chronic toxicity and carcinogenicity study, which demonstrated that under the conditions of this study PFHxA is not carcinogenic in rats and its chronic toxicity was low<sup>12</sup>.

In 2014 an independent report was published that assessed several short-chain (C6) fluorinated chemicals with regard to the criteria used to define persistent organic pollutantants (POPs)<sup>13</sup>. The report assessed these chemicals based on the four criteria that must be met to be considered a POP under the Stockholm Convention: persistence, bioaccumulation, potential for long-range transport, and adverse effects (toxicity and ecotoxicity). It concludes that none of the chemicals meets the criteria to be considered a POP, and at most they only meet one of the four criterion. The report also concluded that the three short-chain (C6) fluotelomer intermediates and PFHxA “are rapidly metabolized and eliminated from mammalian systems.

None of these materials appear top bioaccumulate of biomagnify based on laboratory data and avaiilable field moniotoring data, and none show severe toxicity of the types that would warrant designation as POP.”<sup>13</sup>

## CONCLUSIONS, FEBRUARY 2017

- > Fluorotelomer-based AFFF agents are the most effective agents currently available to fight class B, flammable liquid fires.
- > They do not contain or breakdown into PFOS and are not likely to be a significant source of long-chain perfluorochemicals.
- > They do contain fluorosurfactants that are persistent, but are not generally considered to be environmental toxins.
- > AFFF and fluorochemical manufacturers are in position to meet the requirements of upcoming regulations with short-chain (C6) fluorosurfactants that provide the same fire protection characteristics with reduced environmental impacts.

*The above is an edited version of a document published by the FFFC on the 14th February 2017.*

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- <sup>12</sup> Assessment of POP Criteria for Specific Short-Chain Perfluorinated Alkyl Substances, Environ International Report, January 2014, Update published in December 2014
- <sup>13</sup> An extensive compilation of peer-reviewed and other relevant available data can be found at the following link:  
<https://fluorocouncil.com/resources/search/>

## INTRODUCTION

A large majority of EU member states have backed a draft Regulation setting out a proposed restriction on the manufacture and marketing of perfluorooctanoic acid (PFOA).

The restriction, which also covers PFOA's salts and related substances, will come into force three years after the Regulation is published.

However, discussing the proposal at the 7 December REACH Committee meeting, a majority of member states rejected France's proposal to shorten the transition period to 30 months.

The restriction would apply to the use of PFOA, its salts and related substances in the production of or marketing in another substance as a constituent, a mixture, or an article at concentrations above 25 parts per billion (ppb) of PFOA, including its salts; or 1,000ppb of one, or a combination of, PFOA-related substances.

The original proposal from Germany and Norway suggested a 2ppb limit for PFOA. However, Echa's committees for risk assessment (Rac) and socio-economic analysis (Seac) proposed the higher limits that made it into the proposed Regulation. At the time, NGOs accused the committees of "rubber stamping" industry proposals.

## REACH COMMITTEE MEETING

At the recent REACH Committee meeting, member states agreed the proposed restriction should apply to latex printing inks and equipment for making semiconductors five years after the date of the Regulation's entry into force.

They also agreed a six-year transition period for its application to:

- > textiles for the protection of workers from risks to their health and safety
- > membranes intended for use in medical textiles, filtration in water treatment, production processes and effluent treatment

Medical devices other than implantable medical devices will have a 15-year transition period.

## EXEMPTIONS

Some uses are exempted - these include:

- > perfluorooctane sulfonic acid and its derivatives
- > byproducts formed during the manufacture of C6 fluorochemicals
- > photographic coatings applied to films, papers and printing plates
- > photolithographic processes for semi-conductors
- > **firefighting foams placed on the market before the three-year transition period after entry into force of this Regulation.**

*The above is an edited version of an article by Luke Buxton, Europe Desk Editor of [www.chemicalwatch.com](http://www.chemicalwatch.com). The original article can be found online at <https://chemicalwatch.com/51663/pfoa-restriction-gets-green-light-from-reach-committee>*



**ABERDEEN FOAM MEETS EC REGULATIONS THREE YEARS EARLY!**

**A new EU Regulation EC 2017/1000 was published on June 13 2017 regarding perfluorooctanoic acid (PFOA), its salts and PFOA-related substances.**

The regulation requires that by 4th July 2020, fire fighting foam concentrates are not allowed to include a concentration greater or equal to:

- > **25 parts per billion** (ppb) of PFOA or its salts
- > **1000ppb** of one or a combination of PFOA-related substances

Our range of Aberdeen Foam AFFF-C6 concentrates already meet this regulation - and contain considerably fewer than the maximum quantities allowable under this regulation - three years before it comes into force!

Component	Amount allowable under EU regulation EC 2017/100	Amount contained in a typical Aberdeen Foam AFFF-C6 concentrate
> PFOA or its salts	≤25ppb	<b>0.015ppb</b>
> PFOA-related substances	≤1000ppb	<b>0.54ppb</b>

1 part per billion = 0.0000001%, meaning that Aberdeen Foam concentrates contain 0.000000015% PFOA or its salts and 0.000000054% PFOA-related substances.



**ABERDEEN FOAM MEETS REACH & EC REGULATIONS THREE YEARS BEFORE THE DEADLINE OF 2020!**



## 1956

The American company **3M** start making **Scotchgard**, a water repellent chemical manufactured using fluorosurfactants.

The natural breakdown of the fluorosurfactants used in Scotchgard produces **Perfluorooctanesulfonic acid** - also known as **PFOS**. PFOS is harmful to human health.

3M also manufacture **Aqueous Film-Forming Fire Fighting Foams** (AFFFs) using the same fluorosurfactants used in Scotchgard.

## 2005

**3M withdraws from the manufacture and sale of AFFFs.**

## 2008

**The use of PFOS is banned across Europe.**

## 2010

Global concerns are raised about PFOS and **perfluorooctanoic acid (PFOA)**, a chemical closely related to PFOS. PFOA can also be created by the breakdown of fluorosurfactants with a carbon chain length of C8 or greater.

In the USA, the Environmental Protection Agency (EPA) establish what is known as the **2010/15 PFOA Stewardship Programme**. The purpose of this programme is to eliminate the manufacture of any fluorosurfactant which has the possibility to breakdown into PFOA or PFOS, ie fluorosurfactants with a carbon chain length of C8 or more. The deadline for this is set for the end of **2015**.

In the fire fighting foam industry, this means that all AFFF manufacturers are required to **reformulate their foam concentrates using C6 fluorosurfactants by the end of 2015.**

## 2015

In a report following on from the 2010/15 PFOA Stewardship Programme, the EPA report states they are **“not conducting [an environmental] assessment of AFFFs because they are now made with C6-based fluorosurfactants.”**

Countries including Norway, Germany and Queensland, Australia lobby to go further and seek **a ban on any chemical that can breakdown to PFOS or PFOA.**

## 2017

In June, the EU publish a new regulation EC 2017/1000 which states that by 4th July 2020, fire fighting foam concentrates are not allowed to include a concentration greater than or equal to:

- > **25 parts per billion (ppb)** of PFOA or its salts
- > **1000ppb** of one or a combination of PFOA-related substances

**As outlined previously, our range of Aberdeen Foam AFFF-C6 concentrates already meet this regulation - and contain considerably fewer than the maximum quantities allowable - three years before it comes into force!**

For further information, please go to <http://www.firefightingfoam.com/knowledge-base/c6-technology/>

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[www.firefightingfoam.com](http://www.firefightingfoam.com)  
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