



FOAM FIGHTS FIRE

Overview on PFC Legislation

Dr. Leonhardt; October 2017

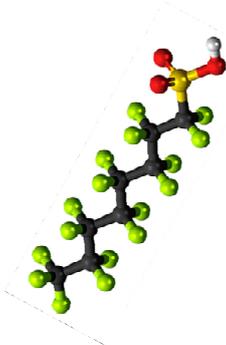


Agenda

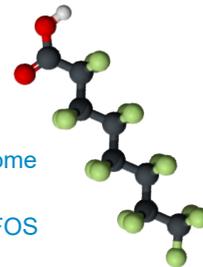
- PFOS and PFOA - basics
- PFOS
 - The history
 - Legislation status quo
- PFOA
 - The history
 - Legislation status quo
- Legislative Trends Europe
 - RMOA Process
 - The PMT-Model
 - ECHA's SVHC-List
 - ECHA's PACT-List
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- Fluorine containing vs fluorine free foams



PFOS and PFOA – some basics

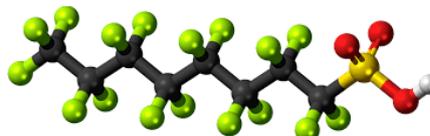


- ❑ 8-Carbon perfluorinated chain surfactant type molecules
- ❑ PFOS was intendedly used in foams (Fluoro-surfactant) PFOA was not
- ❑ Degradation of PFOS to PFOA is possible
- ❑ Both compounds are regulated in the EU and some other legislations (Australia, US, CAN, CH, ...)
- ❑ Actual C6-Technology does not use nor yield PFOS nor PFOA



PFOS – the regulatory history

- ❑ December 2003: UK introduced plans for restrictions on PFOS-containing products/chemicals
- ❑ 2005: The European Commission adopted the proposal to “severely restrict the use of PFOS and related substances”
- ❑ December 2006: the ban of PFOS and related is set in force by regulation 2006/122/EC (amendment to regulation 76/769/EC)
- ❑ August 2010: PFOS listed in POPs, adoption into EU-law drops threshold for PFOS from 50ppm to 10ppm



The legal situation – status quo

PFOS is regulated, all derogations timed out – any use of it above 10ppm in mixtures/articles is prohibited.

Coming next:

Several European national bodies (Swedish KEMI, German UBA, are planning to work on or are already working on revisiting the restrictions with the target to update them (=lowering the threshold limits, cutting exempts)

PFOA – the regulatory history

- December 2014 Germany and Norway launched initiative to regulate PFOA (originally proposing a threshold of 2ppb = 2µg/kg)
- February 2015 first draft of PFOA restriction went to 1st public hearing
- 2nd public hearing closed November 2015
- March 2016 Commission invited to 3rd hearing for clarification on issues
- PFOA Restriction entered into force July 13th, 2017
- Transition period runs out July 2020

The legal situation

The regulation affects

'68. Perfluorooctanoic acid (PFOA)

CAS No 335-67-1

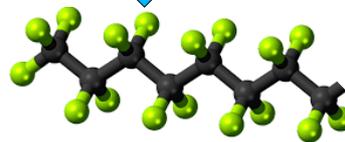
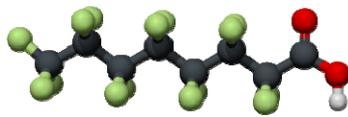
EC No 206-397-9

and its salts.

With "its salts" being:

Any related substance (including its salts and polymers) having a linear or branched perfluoroheptyl group with the formula C_7F_{15} - directly attached to another carbon atom, as one of the structural elements.

Any related substance (including its salts and polymers) having a linear or branched perfluorooctyl group with the formula C_8F_{17} - as one of the structural elements.



The legal situation

The regulation affects

1. Shall not be manufactured, or placed on the market as substances on their own from 4 July 2020.
2. Shall not, from 4 July 2020, be used in the production of, or placed on the market in:
 - (a) another substance, as a constituent;
 - (b) a mixture;
 - (c) an article,

in a concentration equal to or above 25 ppb of PFOA including its salts or 1 000 ppb of one or a combination of PFOA-related substances.

- ❑ 1 generally prohibits the manufacturing of any of the above described substances
- ❑ 2 sets the threshold limits to be 25ppb (parts per billion = 1µg/kg) for the pure substance or 1000ppb (=1ppm=1mg/kg) for the total of all present related substances in a product

The legal situation

The exempts

4. Points 1 and 2 shall not apply to any of the following:
- (e) concentrated fire-fighting foam mixtures that were placed on the market before 4 July 2020 and are to be used, or are used in the production of other fire-fighting foam mixtures.
5. Point 2(b) shall not apply to fire-fighting foam mixtures which were:
- (a) placed on the market before 4 July 2020; or
 - (b) produced in accordance with point 4(e), provided that, where they are used for training purposes, emissions to the environment are minimised and effluents collected are safely disposed of.
- 4e allows the continuous use of fire fighting foam concentrates which were placed on the market prior to July 4th, 2020 with no time limit!
 - 5 allows the continuous use of foam solutions provided a) the concentrate used to make it complies to 4e and where used for training the runoffs are collected and disposed of

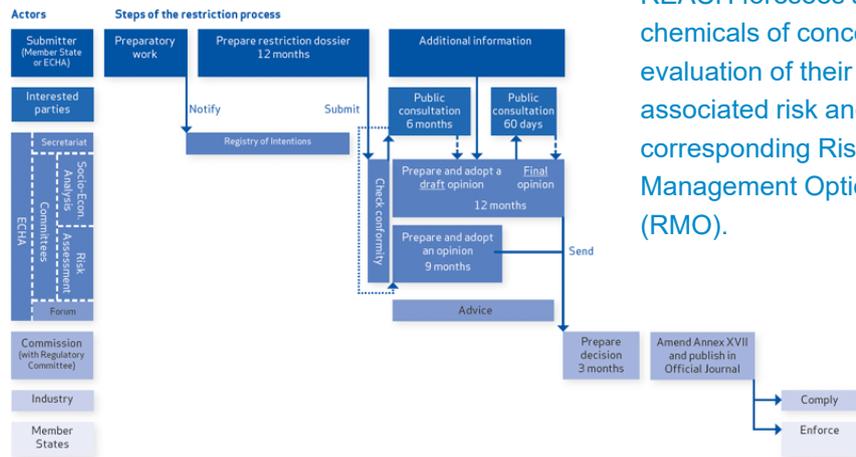
Legislative Trends - Europe

Other activities in Europe

- Perfluorohexane sulfonic (PFHxS) acid put on the REACH SVHC candidate list
- Perfluorohexanoic Acid (PFHxA) proposed for SVHC
- proposed by Norway for POP's list
- UBA launched app "PFC-Planet" which aims to inform about presence of poly- or perfluorinated organic chemistry in consumer products



The RMOA Process



REACH foresees a study of chemicals of concern for evaluation of their associated risk and corresponding Risk Management Options (RMO).

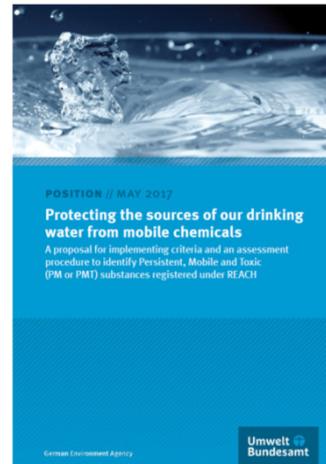
The RMOA Process

1. Preparatory work
2. Notify the intention to prepare a restriction dossier
3. Prepare the restriction dossier
4. Submit the restriction dossier
5. Check conformity
6. Public consultation on the restriction report
7. Advice from the Forum
8. Prepare and adopt the opinion of RAC
9. Prepare and agree on the draft opinion of SEAC
10. Public consultation on SEAC draft opinion
11. Prepare and adopt the opinion of SEAC
12. Send the opinions to the Commission
13. Prepare and adopt the restriction decision
14. Comply with restriction
15. Enforce the restriction

The PMT-Model

UBA published a position paper to bring in a new scheme for evaluation of substances under REACH extending the existing PBT-Model (persistent-bioaccumulative-toxic) according to their risk (concern)-level

New scheme called PMT-Model focusing on water transportation of substances:
PMT = Persistent – Mobile - Toxic

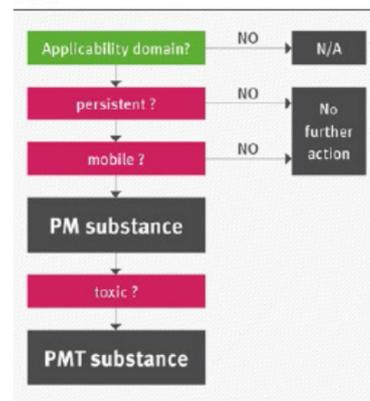


The PMT-Model

Questions asked:

- Does it fit to (current) applicability domain (organic and organometallic substances)?
→ no inorganic, biological or unknown substances
- Is it Persistent in aquatic environment?
- Is it mobile in the aquatic environment?
- Is it toxic?

Overview of the proposed assessment procedure to identify PM/PMT substances registered under REACH



Source: Umweltbundesamt Section IV 2.3 Chemicals

The PMT-Model

Persistence (P)

A substance fulfils the persistence criterion (P) in any of the following situations:

- a. the degradation half-life in marine water at environmentally relevant pH 6–8 and 12°C is higher than 60 days;
- b. the degradation half-life in fresh or estuarine water at environmentally relevant pH 6–8 and 12°C is higher than 40 days;
- c. the degradation half-life in marine sediment at environmentally relevant pH 6–8 and 12°C is higher than 180 days;
- d. the degradation half-life in fresh or estuarine water sediment at environmentally relevant pH 6–8 and 12°C is higher than 120 days;
- e. the degradation half-life in soil at environmentally relevant pH 6–8 and 12°C is higher than 120 days.

critical:

- Half life numbers in sea water extremely low – even for degradable surfactants
- Based on proposed half life numbers all PFAS will fall under the P-criterion

The PMT-Model

Mobility (M)

A persistent substance fulfils the mobility criterion (M) if:

- a. the water solubility is at environmental relevant pH 6–8 and 12 °C $\geq 150 \mu\text{g/L}$ and
- b. the $\log K_{oc}$ at environmental relevant pH 6–8 and 12 °C is ≤ 4.5 .

critical:

- Solubility criterion extremely low
- Reference value for soil to water-adsorption coefficient chosen very high
→ any substance showing a better solubility is affected

$\log K_{oc}$: soil-water partitioning coefficient for organic carbon indicates how mobile a contaminant is in solid due to wash-out-effects. The smaller the number, the higher is the concentration in water.

The PMT-Model

Toxicity (T)

A substance fulfils the toxicity criterion (T) in any of the following situations:

- the substance meets the criteria for classification as carcinogenic (category 1A or 1B), germ cell mutagenic (category 1A or 1B), or toxic for reproduction (category 1A, 1B or 2) according to Regulation EC No 1272/2008;
- there is other evidence of chronic toxicity, as identified by the substance meeting the criteria for classification: specific target organ toxicity after repeated exposure (STOT RE category 1 or 2) according to Regulation EC No 1272/2008;
- the substance meets the criteria for classification as "additional category for effects on or via lactation", according to Regulation EC No 1272/2008;
- the Derived-No-Adverse-Effect-Level (DNEL) is $\leq 9 \mu\text{g}/\text{kg}/\text{d}$ (oral, long term, general population);
- other information provided that its suitability and reliability can be reasonably demonstrated.¹

- Proposal is presently discussed at European level
- Revision of proposal will introduce the "v" (very) to PMT (matching PBT-system)
- Up for comments until December 2017

The legal situation - trends

ECHA's Public Activity Coordination Tool (PACT)-list:

Name	C-Chain	EC/list No.	CAS Number	Authority carrying out work	Activity being carried out by the authority	Latest update	Scope (Suspected hazard(s) or concern(s) considered)	Outcome. Reports the outcome of the latest recorded activity.
Perfluorobutanoic acid and its salts and precursors	4	-	-	Denmark	RMDA	15.08.2017	CMR, PBT	Under development
1,1,1,2,2,3,3,4,4,4-nonafluorobutanoic acid (PFBS)	4	206-203-7	375-73-5	Denmark	RMDA	01.04.2016	PBT	Under development
Undecafluorohexanoic acid	6	206-196-6	307-24-4	Germany	RMDA	11.03.2016	PBT	Under development
Perfluoronona-1-oic acid (2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptafluorononanoic acid and its sodium and ammonium salts	9	206-801-3	375-95-1	Sweden	RMDA	04.05.2015	CMR, PBT	Appropriate to initiate regulatory risk management action
Perfluoronona-1-oic acid (2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptafluorononanoic acid and its sodium and ammonium salts		206-801-3	21049-39-8	Sweden	RMDA	04.05.2015	CMR, PBT	Appropriate to initiate regulatory risk management action
2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptafluorononanoic acid and its ammonium and sodium salt		-	-	Germany	Hazard assessment	04.05.2015	PBT	Under development
Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts	10	206-400-3	335-76-2	Sweden	RMDA	11.12.2015	PBT	Appropriate to initiate regulatory risk management action
Decanoic acid, nonadecafluoro- and its salts		-	-	Germany	Hazard assessment	04.05.2015	PBT	Under development

The legal situation - trends

ECHA's current substances of very high concern-list (SVHC):

Name	C-Chain	Description	EC.no.	CAS no.	Intrinsic property(ies) referred to in Article 57	Date of inclusion
Perfluorohexane-1-sulphonic acid and its salts	6	PFHxS	-	-	vPvB (Article 57e)	07/07/2017
Ammonium pentadecafluorooctanoate (APFO)	8	PFOA	223-320-4	3825-26-1	PBT (Article 57 d)#Toxic for reproduction (Article 57c)	20/06/2013
Pentadecafluorooctanoic acid (PFOA)			206-397-9	335-67-1	PBT (Article 57 d)#Toxic for reproduction (Article 57c)	20/06/2013
Perfluorononan-1-oiic-acid and its sodium and ammonium salts	9	PFNA	-	-	Toxic for reproduction (Article 57c)#PBT (Article 57 d)	17/12/2015
Ammonium salts of perfluorononan-1-oiic-acid			-	4149-60-4	Toxic for reproduction (Article 57c)#PBT (Article 57 d)	17/12/2015
Perfluorononan-1-oiic-acid			206-801-3	375-95-1	Toxic for reproduction (Article 57c)#PBT (Article 57 d)	17/12/2015
Sodium salts of perfluorononan-1-oiic-acid			-	21049-39-	Toxic for reproduction (Article 57c)#PBT (Article 57 d)	17/12/2015
Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts	10	PFDA	-	-	Toxic for reproduction (Article 57c)#PBT (Article 57 d)	12/01/2017
Nonadecafluorodecanoic acid			206-400-3	335-76-2	Toxic for reproduction (Article 57c)#PBT (Article 57 d)	12/01/2017
Decanoic acid, nonadecafluoro-, sodium salt			-	3830-45-3	Toxic for reproduction (Article 57c)#PBT (Article 57 d)	12/01/2017
Ammonium nonadecafluorodecanoate			221-470-5	3108-42-7	Toxic for reproduction (Article 57c)#PBT (Article 57 d)	12/01/2017
Henicosfluoroundecanoic acid	11		218-165-4	2058-94-8	vPvB (Article 57 e)	19/12/2012
Tricosfluorododecanoic acid	12		206-203-2	307-55-1	vPvB (Article 57 e)	19/12/2012
Pentacosfluorotridecanoic acid	13		276-745-2	72629-94-8	vPvB (Article 57 e)	19/12/2012
Heptacosfluorotetradecanoic acid	14		206-803-4	376-06-7	vPvB (Article 57 e)	19/12/2012

International snapshots 2017

- ❑ April 2017: the Nordic Council (DK, FI, SW, NO) concluded that the “current level of knowledge on PFAS and the extent of concerns justify prompt action” on a global level regulating the substance group as opposed to individual case by case as is applied today.
- ❑ May 2017: US Department of Defense released updated “Quality Systems Manual for Environmental Laboratories” now also covering the analysis of PFASs
- ❑ August 2017: Alaska’s Department of Environmental Conservation released advise to “review inventory for AFFF manufactured prior to 2002 as these may likely contain PFAS”. Defining PFAS as per- and polyfluoroalkyl substances

International snapshots

- ❑ August 2017: The Heads of the Environmental Protection Agencies of Australia and New Zealand (HEPA) published their “PFAS National Environmental Management Plan” as a consultation draft serving “as the basis for feedback on experiences and views on the environmental regulation of PFAS”
- ❑ September 2017: US Naval Sea Systems Command released new specs for foams for use by all Departments and Agencies of the Department of Defense setting threshold limits for PFOA and PFOS to be 800ppb max
- ❑ The OECD is updating its „Lists of Perfluorooctane sulfonate (PFOS), Perfluoroalkyl sulfonates (PFASs), Perfluorooctanoic acid (PFOA), Perfluorocarboxylic Acid (PFCA), related Compounds and Chemicals that may degrade to PFCA“ which was last reviewed in 2007. The updated lists is planned for Q4 2017.

UBA’s PFC-Mission

Changes to classification and labelling

- ❑ 2014: C₉-PFCA: amongst others toxic to reproduction 1B
- ❑ 2016: C₁₀-PFCA: amongst others toxic to reproduction 1B

Substances of Very High Concern (SVHC)

- ❑ 2012: C₁₁₋₁₄-PFCAs very persistent and very bioaccumulative (vPvB)
→ proposed for REACH candidate list
- ❑ 2015: C₉-PFCAs persistent, bioaccumulative and toxic (PBT)
→ adopted on REACH candidate list
- ❑ 2016: C₁₀-PFCAs persistent, bioaccumulative and toxic (PBT)
→ proposed for REACH candidate list
- ❑ 2017: PFHxS (Perfluorhexane sulfonic acid) very persistent and very bioaccumulative (vPvB)
→ adopted on REACH candidate list

UBA's PFC-Mission

Next Step:

- ❑ October 2017 Proposal for Limitation of C₉-C₁₄-PFCAs according to REACH:
→ complete ban of manufacturing, use and import of C₉-C₁₄-PFCAs and their precursors within the EU

UBA's PFC-Mission

Driving Force - Concerns of UBA about PFCs*

- ❑ Persistent in the environment
- ❑ Broad distribution in surface waters and in groundwater
- ❑ Presence and accumulation in the food chain
- ❑ High mobility (long distance transportation along natural transportation paths into remote areas)
- ❑ Presence in human blood and mother milk, low elimination rates from humans
- ❑ Presence in potable water, air and food
- ❑ Toxicological profile (PFOS, PFOA, PFNA, PFDA –toxic to reproduction)



*translated from a presentation in German by Dr. Annegret Biegel-Engler (UBA) held in Essen, 2017

UBA's PFC-Mission

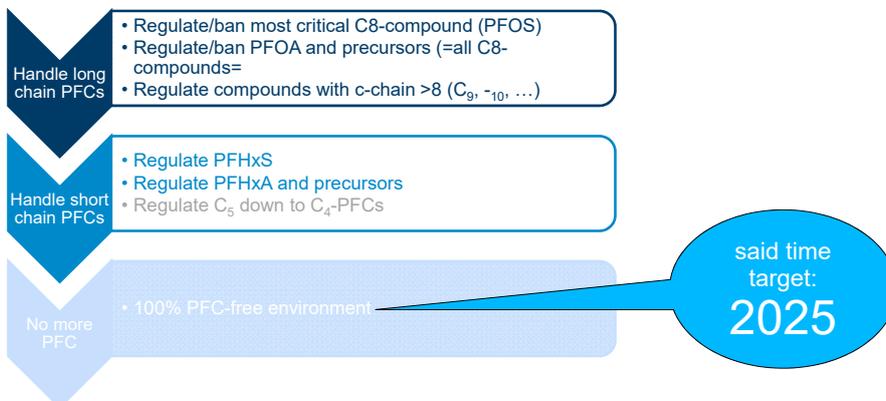
Driving Force – Governmental Work Order

- ❑ German Ministry for Health (BMG) tasked commission to develop recommendations for threshold limits for PFCs in potable water and food:
- ❑ Working group identified 13 PFCs to date as top priority,
- ❑ for 7 of them sufficient data are available to propose a threshold:

Lfd. Nr.	Name, Abkürzung (CAS Nr.)	TW _w [µg/l]	GOW* [µg/l]
1	Perfluorbutansäure, PFBA (375-22-4)	10	–
2	Perfluorpentansäure, PFPeA (2706-90-3)	–	3,0
3	Perfluorhexansäure, PFHxA (307-24-4)	6	–
4	Perfluorheptansäure, PFHpA (375-85-9)	–	0,3
5	Perfluoroktansäure, PFOA (335-67-1)	0,1	–
6	Perfluornonansäure, PFNA (375-95-1)	0,06	–
7	Perfluordekansäure, PFDA (335-76-2)	–	0,1
8	Perfluorbutansulfonsäure, PFBS (375-73-5)	6	–
9	Perfluorhexansulfonsäure, PFHxS (355-46-4)	0,1	–
10	Perfluorheptansulfonsäure, PFHpS (375-92-8)	–	0,3
11	Perfluoroktansulfonat, PFOS (1763-23-1)	0,1	–
12	H4-Polyfluoroktansulfonsäure, H4PFOS (27619-97-2)	–	0,1
13	Perfluoroktansulfonamid, PFOSA (754-91-6)	–	0,1

UBA's PFC-Mission

Where does this lead to?



*...didn't mention everything?
...questions left?*

...please ask

