PFAS restriction

ACEA COMMENTS ON THE ANNEX XV DOSSIER OF THE UNIVERSAL PFAS RESTRICTION PROPOSAL

May 2023

First submission

ACEA - European Automobile Manufacturers' Association

WHO WE REPRESENT

ACEA MEMBERS

ABOUT ACEA

The European Automobile Manufacturers' Association is a professional association uniting 14 major mobility actors on the European market.

- 13.0 million Europeans work in the auto industry (directly and indirectly), accounting for 7% of all EU jobs
- 11.5% of EU manufacturing jobs – some 3.4 million – are in the automotive sector
- Motor vehicles are responsible for €374.6 billion of tax revenue for governments across key European markets
- The automobile industry generates a trade surplus of €79.5 billion for the European Union
- The turnover generated by the auto industry represents almost 8% of the EU's GDP
- Investing €58.8 billion in R&D per year, automotive is Europe's largest private contributor to innovation, accounting for 32% of the EU total

Today, ACEA would like to express its concern and share its comments on the proposal for a universal PFAS restriction, which dossier was published on February 7th, 2023, and revised on March 22nd.

EXECUTIVE SUMMARY

The PFAS REACH restriction is expected to have a major impact on the automotive industry. This document is the first response of ACEA to the public consultation and on the revised Annex XV dossier published on 22 March 2023. Please note that due to time constraints, this document may not include much technical information, but further submissions by ACEA will provide additional information during the course of the public consultation.

The automotive industry fully shares the desire to reduce the use of PFAS as much as possible. However, the current proposal is not in accordance with the industry's position on the issue.

The automotive industry is a major downstream user of many PFAS, including fluoropolymers, fluorinated gases, and short-chain PFAS. Fluoropolymers are used for several key technical components, such as gaskets, hoses, joints, O-rings, seals, cords, cables, or sleeves. The current proposal does not acknowledge any derogations for such uses, whereas alternatives are not readily available and do not share sufficient properties to be qualified.

In the context of this derogation, the automotive industry wishes to express its great concern if the implementation of the restriction were to continue as is and proposes an alternative implementation approach that integrates the technical and economic constraints on the one hand and preserves the objectives of electromobility on the other. Material assessment is a complex process and requires sufficient lead time for validation and introduction of alternatives. We therefore request:

- **Application of the PFAS ban should be in two phases for the automotive industry**:
  1. Only in vehicles type-approved after entry into force +X years (depending on application), in accordance with the rules of implementation of the regulations applicable to the automotive sector (Regulation (EU) 2018/858). This prevents the scrapping of already-registered vehicles, including millions of properly functioning used vehicles sold mainly by brand dealers and used vehicle dealers per year.
  2. An extension to all vehicle production after entry into force X+Y years (dates to be confirmed in updated submission).

- **Guarantee the maintenance and reparability of the vehicles** that will no longer be in production at the entry in force of the restriction (including lifetime serviceability of refrigerants). This would enable a more sustainable industry and be in accordance with the Green Deal.

- **Guarantee the maintenance and reparability of machinery producing vehicles** and automotive parts in industrial settings during their long lifetime under high industrial standards and regulations.

- And for the items below:

  - **Fluoropolymers (including fluoroelastomers):** we request their removal from the scope of the restriction. Concerning the manufacturing phase, the risks of PFAS emissions to the environment can be controlled with alternative Risk Management Options. Concerning the use phase, they are considered non-toxic, non-bioaccumulative, non-mobile and as such, are classed as polymers of low concern. Concerning the end-of-life phase, incineration of fluoropolymers does not contribute to environmental PFAS emissions and is a safe method of disposal.

- **Lubricants**: we request more time to analyze the impacts, specifically the PFPE lubricants (stable, not classified as hazardous and as bio-accumulative, lifetime lubricant), as automotive uses should be considered as falling under the "harsh conditions" derogation.

- **Batteries**: we request derogations and respective transition times until the battery industry has identified and implemented alternative non-PFAS solutions.

- **Fuel cells**: we request that PTFE and PFSA (fluoropolymers) are removed from the scope of the proposed restriction to enable the hydrogen economy to develop and secure the EU's decarbonization policy.

- **Hard chrome plating**: we request a derogation of 13.5 years to not conflict with EU POP and other parts under EU REACH.

- **PTFE membrane**: see fluoropolymers.

- **Refrigerants**:

    - We request a transition period of 7 years for new passenger vehicle types and 17 years for new registrations. For heavy-duty vehicles, this transition period should be 10 years for new types and 22 for new registrations.
    - Additionally, vehicles with internal combustion engines (ICE) and belt-driven compressors should receive an unlimited derogation as there is no viable alternative.
    - European production for export should receive an unlimited derogation as alternatives are not suitable for all markets.
    - Servicing of existing fleet must be untouched and remain possible without any time limit receiving an unlimited derogation.

ACEA acknowledges the necessity of regulating PFAS, but the current restriction proposal is too broad and too impacting to be relevant. Fluoropolymers (including fluoroelastomers) should be out of scope of this restriction, and the "repair as produced" principle should be respected for all existing vehicles.

INTRODUCTION AND CONTEXT

PFAS have been widely used in the industry due to their unique properties:

- Very high stability
- Resistance to high temperature and high pressure
- Electrical insulation
- Resistance to chemicals

Fluoropolymers and fluoroelastomers, both considered as PFAS and facing a ban according to the proposal, enable low friction between materials when used as coatings. This property is fundamental for the automotive industry.

F-gases are also widely used as refrigerant in the automotive industry; the main gas used in mobile air conditioning as of now is R-1234yf. More details will be available in the relevant part of this document. Heat pumps are also impacted by the potential ban on PFAS.

Please note that due to our position as downstream users, we are also highly impacted by the ban on several sub-uses such as:

- Lubricants
- Uses of fluoropolymers in batteries and fuel cell
- Uses of PFAS in electronics and semiconductors
- Textiles and fabric used in vehicles.

As we are not direct manufacturers of such articles and products, we will share relevant data we gathered on this topic, but the committees should refer to the relevant submissions from professional associations to have a clear global understanding of the issues.

In order to gather information more efficiently, ACEA dedicated subgroups to the following uses (non-exhaustive exemplary case studies):

- Fluoropolymers and elastomers
- Lubricants
- Batteries
- Fuel cells
- Electronics
- Mobile air conditioning and refrigeration
- Membrane materials
- Textiles (to be detailed in a later submission)
- Lacquers (to be detailed in a later submission)

For each of the sub-uses, ACEA drafted a short paper with the relevant information, which are available as annexes to this document.

GENERAL COMMENTS

1. Global impact on automotive parts

Despite a partial knowledge of the impacts, it is already established that the impact of the PFAS restriction for the automotive industry is considerable and unprecedented due to the number of applications concerned. The use of materials or components using PFAS corresponds to the automotive industry's need to respond to numerous challenges, including electromobility.

A non-exhaustive inventory of the fluoropolymers used in the automotive industry identified more than 250 parts composed entirely of fluoropolymers or fluoroelastomers. Most of them are joints, seals, tubes, O-rings, sleeves, gaskets, cords, and cables, present in many copies in the car. It is to be noted that half of the identified parts are located in the engine.

More technical parts, such as the membrane in the fuel cell or the bearing shafts of the air conditioner compressor are also composed to some degree of fluoropolymers (for instance here: PVDF and PTFE coatings respectively).

Automotive parts are widely impacted by this draft regulation as well as their production and transport vehicles on the market. Without machinery to build transport vehicles including maintenance of these machineries, the whole production of vehicles and the workforces are at risk. We expect similar use of fluoropolymers like seals and O-rings, lubricants etc. The machinery is used in industrial settings during their whole long-lasting lifetime without expectation of release of PFAS due to high industrial standards and regulations.

The draft restriction provides no derogation yet for transport vehicles placed on the market. In Germany, 5.6 million cars are sold second hand in 2022. Many consumers sell their car to the brand dealer when buying a new car (incl. cars from another brand). 74% of these cars are sold by brand dealers or used car dealers and proper functioning cars are placed on the market, that – without a derogation under the PFAS restriction – are ready to be dismantled/recycled.

2. Maturity of alternatives

The maturity of alternative solutions to the use of PFAS is currently poorly understood within the automotive industry. The wide variety of applications concerned, and the numerous properties conferred by the presence of PFAS in these applications suggest that to achieve the same properties, this substitution could affect the very design of these applications making their validation and implementation much more complex.

The design itself of the vehicle is questioned by some alternatives; the replacement of R1234yf by other gases would need to redesign the entirety of the mobile air conditioning system, and with it the entirety of the vehicle.

Finding alternatives themselves requires assessing a number of parameters for the candidate materials. Such an assessment is a complex process as vehicles are highly complexes products with several thousands of parts, and equally dozens of different operating conditions. This assessment involves physical testing of products for durability, temperature, humidity, crash etc. This testing requires time and can result in high costs (several millions of Euros per substance). A systematic assessment of all possible alternatives per restricted PFAS in order to conclude on the essentiality of a derogation is therefore an unrealistic expectation on industry.

Generally, such assessments must be targeted to specific uses of the substance. In this case, this is an issue as stated by the Annex XV dossier, the uses of PFAS in the industry are still lacking in information. Suitable alternatives must be available in:

a. sufficient quantity.
b. acceptable quality.
c. with the same performance and functionality (fulfil the OEM specific requirements, which may vary from OEM to OEM).
d. with consistency over a defined contractual duration.
e. with a competitive price compared to original material.

Application of the essential use definition should also not lead to substitution with less safe, sustainable, or durable materials. Such substitutions may force trade-offs in terms of the long-term reliability, safety, emissions performance or otherwise compromise the long-term sustainability of our products. This is particularly true with the PFAS substitution; we fully understand that the persistency of PFAS is the main concern of the authorities, yet this persistency is why the PFAS are such widely used. Any transition to a PFAS-free solution will most likely use persistent substances with similar properties. In the long term, industries and the whole society will then face a dilemma:

- Substitute PFAS to PFAS free, non-persistent substances and materials; this would mean less durable and sustainable articles, in contradiction with the overall strategy developed by EU.
- Substitute PFAS to PFAS free, persistent substances and materials; this would most likely enable the industry to achieve sustainable and durable products and articles, but the persistency issue of substances will remain.

Such a dilemma seems not to be acknowledged by the authorities in their assessment.

In the case of transitioning from one PFAS solution to a PFAS free new solution, homologation would require changing all the documentation. A ban of PFAS in the first place is suitable only in newly approved vehicles in accordance with the rules of implementation of the regulations applicable to the automotive sector.

3. Maintenance and sustainability

The draft regulatory text foresees a general restriction of PFAS applicable around 2026/2027 with the possibility to benefit from short term and long-term exemptions for certain applications.

To date, according to this draft text, very few automotive applications would benefit from a derogation, which would mean that the vast majority of automotive applications would have to be redeveloped, validated, and implemented on all vehicles in production after entry in force of this proposed restriction.
In addition, the maintenance of vehicles whose production would have ceased in 2026/2027 could no longer be ensured with spare parts – including fluids – according to their current definition or for example with the current air conditioning fluid (R1234yf).

Maintenance and repair are an important factor of the long lifecycle of a vehicle. As demonstrated in past consultations, it is economically and technically not feasible to phase out the substances in Legacy Spare Parts. This problem was initially raised and resolved during the discussion and implementation of the EU End of Life Vehicles (ELV) Directive (2000/53/EC) and the exemption for these spare parts under the ELV Directive was confirmed by Member States and the EU Commission ("repair-as-produced principle"). This decision ensures that transport vehicles can be serviced, repaired, and maintained in such a manner as to not be detrimental to their function, safety and reliability without any limitation of any type or category of component parts.

Without a derogation for any type of spare parts, the supply of spare parts will be severely compromised, and the service, repair and maintenance of vehicles will not be possible, which is in strong contradiction to the overall strategic goals of the circular economy. This argumentation is widely accepted within authorities and has been used e.g. in the phthalate-restriction REACH Annex XVII Entry 51.
As such, ACEA supports a derogation to promote the "repaired as produced" policy, which would also increase the sustainability of the existing vehicles fleet.

The development of applications that are crucial to the deployment of electromobility could itself be called into question (e.g., no derogation for Li-ion batteries - short-term derogation for fuel cell membranes - etc.). At the earliest possible entry in force, in 2025/2026, about 18%[1] of the market is expected to be full electric vehicles, with the remaining fleet still using ICE

[1] LMC Automotive

technology at some level. Phasing out PFAS, especially fluoropolymers, is not possible if the transition to a full electric vehicle fleet is to be achieved by 2035.

4. Traceability of PFAS in the supply chain

Due to the absence of regulations imposing the traceability of PFAS and despite the traceability process implemented by the automotive industry for many years it is not possible to have an exhaustive vision of the use of PFAS in the products and processes of the automotive supply chain. To be more exhaustive, the automotive industry is using mainly IMDS and GADSL as a tracking tool for substances present within automotive parts.

As per early 2021, around 48.028 companies were active in the IMDS database in Europe, and more than 200.000 globally. The material datasheets amount to 88 million, with about 13.500 reported substances concerning 2500 concurrent users. Despite the powerful tracking tools the automotive industry uses, PFAS as family encompass too many substances to be tracked effectively. Since 2000, around €16 billion have been invested by the automotive industry to implement IMDS, maintain and optimize the system and train the supply chain.

Chart 1: Companies registered in IMDS

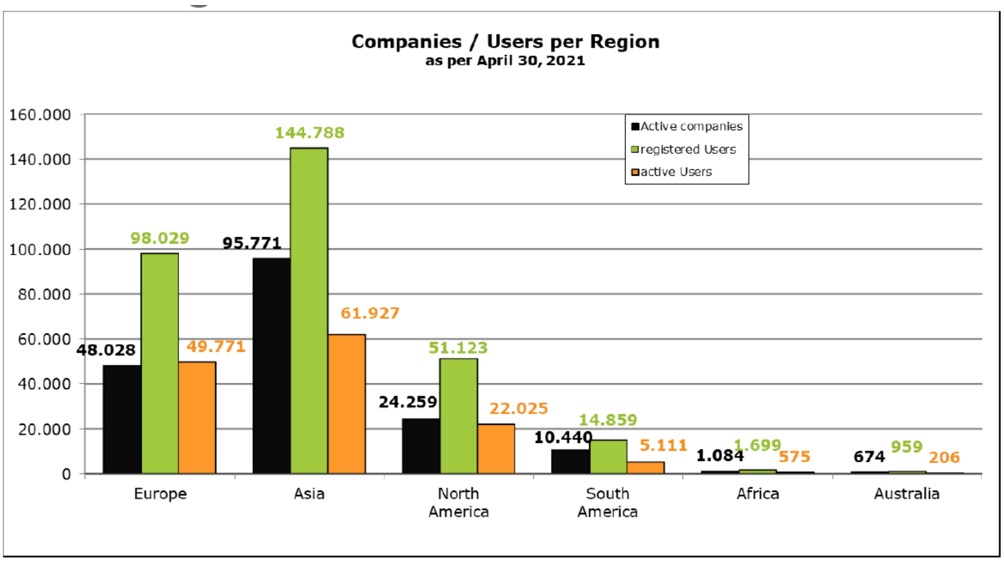


Chart 2: Distribution of registered companies and users of IMDS

One of the major challenges faced is the data quality which is highly susceptible to engineering and regulation changes. Given as an annex, ACEA has commissioned a study to identify short chain PFAS in its supply chain for a selection of automotive parts. If few short chain PFAS were identified, additional fluoropolymers were identified as being used by the supply chain. Given the time schedule, it is highly unlikely that the automotive industry will be able to manage the global PFAS restriction in its current proposal. The identification of PFAS is still ongoing and will most likely take many years for the whole supply chain to provide relevant information.

As such the **time schedule of 18 months for the ban to be effective after the entry in force is too short** and most industrials will not be able to comply. This is considering the automotive industry, which already have tracking tools and powerful database to identify substances. Many suppliers and other industrial sectors do not have access to such tools; hence a longer time schedule should be considered for this proposal.

Concerning the concentration limit presented in the Annex XV dossier, the lack of testing standards for fluorinated substances as well as the absence of a legal duty from the international supply chain to communicate PFAS content in parts and material make the limits to be unapplicable in the current state. In the current situation, it is only possible to investigate the presence of about 40 PFAS, compared to the thousands of substances involved in the restriction dossier.

ANNEXES

FLUOROPOLYMERS (INCL. FLUOROELASTOMERS)

EXECUTIVE SUMMARY

Fluoropolymers and fluoroelastomers are vital engineering materials that improve CO2e performance of our vehicles and enhance durability of our components.

Removing these materials from our portfolio will result in poorer performing products with reduced longevity, increasing the costs to our customers.

These materials are non-hazardous and do not have concerns during the use and end-of-life phases.

We request that fluoropolymers and fluoroelastomers are removed from the scope of the Restriction.

Alternative risk management options, controlling emissions during the manufacturing phase, should be implemented as an alternative to a restriction on fluoropolymers and fluoroelastomers.

INTRODUCTION

ACEA members fully support the need to restrict hazardous per and polyfluoroalkyl substances (PFAS).

The current restriction proposal, published on 7 February 2023 will restrict more than 10,000 substances, with vastly differing hazard properties.

Fluoropolymers and fluoroelastomers are considered non-toxic, non-bioaccumulative, non-mobile and as such, are classed as polymers of low concern. By including these polymers in the scope of the restriction, we put at risk our progress towards a new era of electric propulsion, where these materials are essential in battery and fuel cell technologies and hamper research into these essential technologies.

This report looks exclusively at the impact of removing fluoropolymers and fluoroelastomers from the automotive toolkit. The impact of this restriction proposal on batteries and fuel cells will be covered in subsequent annexes.

		Risks	Information on remediation
Safety of fluoropolymers during lifecycle	Manufacturing Phase	Use of Fluorinated Polymerization aids (FPA) & its emissions thereof	Substitution of FPA with Non-FPA: Industry has developed NFPA technology for PTFE, FKM, PVDF and PFA
			Implementation of abatement technologies to control emissions
	Use Phase	No risk identified	Fluoropolymers satisfy OECD Polymers of Low Concern criteria
	End-of life phase	Degradation into small PFAS molecules	Fluoropolymers do not degrade – Danish EPA
		Incomplete incineration	1. RIVM, Gore studies on incineration prove complete decomposition of fluoropolymers 2. GFL's incineration project in collaboration with KIT and other stakeholders
		Leachate from landfills	Fluoropolymers are inert, non-toxic and do not leach

Figure 1: Lifecycle risks for fluoropolymers

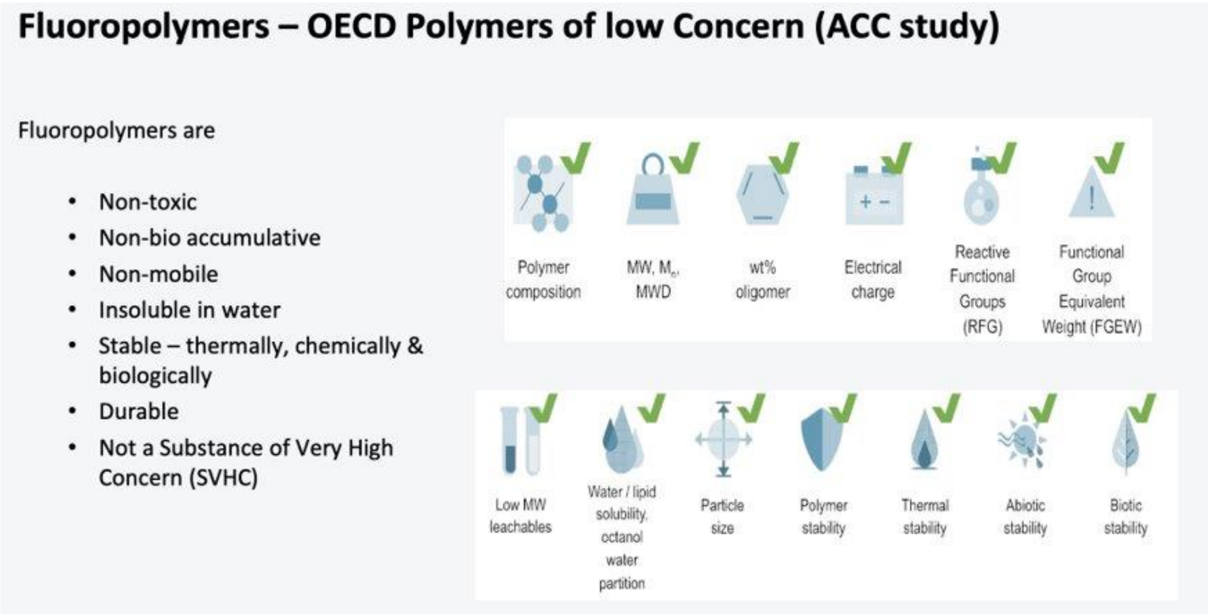


Figure 2: Criteria for polymers of low concern according to OECD

AUTOMOTIVE USES

Data from the automotive industry's International Material Data System (IMDS), taken in Q1, 2022, shows the breakdown of reported PFAS in the automotive Industry.

- Nearly 8 million automotive parts contain PFAS substances under the scope of the proposed Restriction.
- Over 5 million of these parts contain fluoropolymers and fluoroelastomers.
- The biggest reported PFAS is PFTE fluoropolymer, which is used in nearly 4 million automotive parts.
- PTFE counts for nearly 50% of the total reported PFAS in automotive parts and more than 70% of fluoropolymer uses.

- Fluoropolymer uses impact hundreds of automotive applications, which will need to be evaluated.

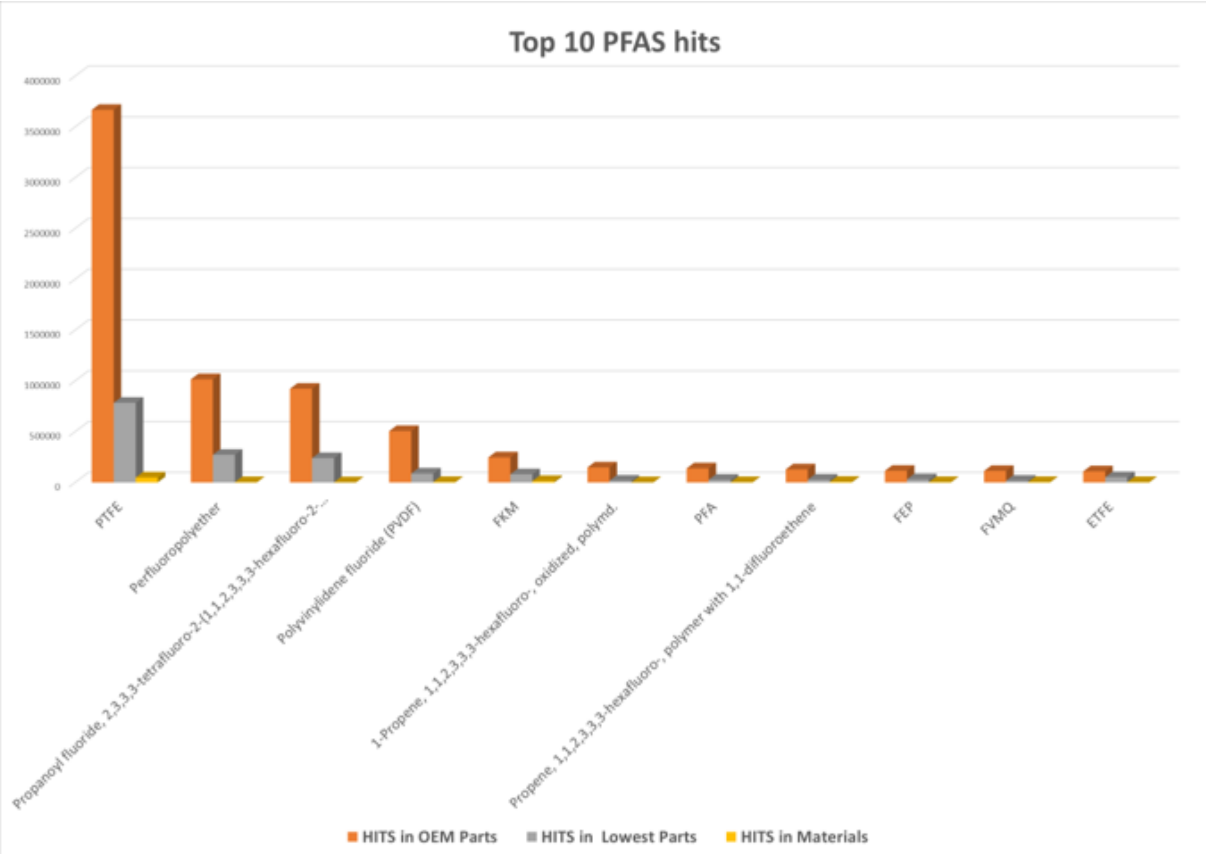


Figure 3 : Most used PFAS in automotive parts (IMDS data, early 2022)

Basic Substance	HITS in OEM Parts	HITS in Lowest Parts	HITS in Materials
PTFE	3,666,462	782,915	48,039
Perfluoropolyether	1,014,278	270,894	1,751
Propanoyl fluoride, 2,3,3,3-tetrafluoro-2-(1,1,2,3,3,3-hexafluoro-2-(heptafluoropropoxy)propoxy)-, polymer with trifluoro(trifluoromethyl)oxirane, reaction products with 3-(ethenyldimethylsilyl)-N-methylbenzenamine	921,287	238,496	399
Polyvinylidene fluoride (PVDF)	504,622	85,965	2,827
FKM	245,649	79,400	12,153
1-Propene, 1,1,2,3,3,3-hexafluoro-, oxidized, polymd.	147,178	16,788	626
PFA	137,702	25,136	1,577
Propene, 1,1,2,3,3,3-hexafluoro-, polymer with 1,1-difluoroethene	127,864	26,551	5,320
FEP	114,460	29,989	2,491
FVMQ	112,543	16,526	3,226

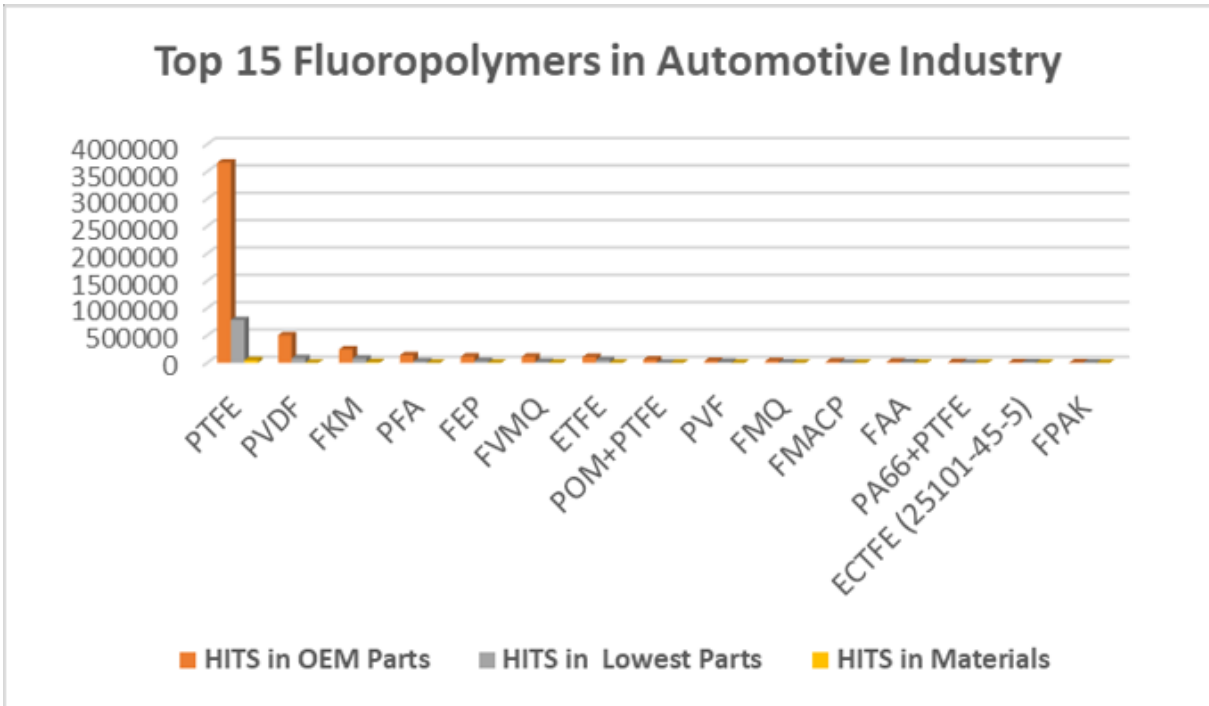


Figure 4: Top used fluoropolymers in the automotive industry (IMDS data, early 2022)

Basic Substance	HITS in OEM Parts	HITS in Lowest Parts	HITS in Materials
PTFE	3,666,462	782,915	48,039
PVDF	504,622	85,965	2,827
FKM	245,649	79,400	12,153
PFA	137,702	25,136	1,577
FEP	114,460	29,989	2,491
FVMQ	112,543	16,526	3,226
ETFE	107,944	51,078	2,120
POM+PTFE	60,450	2,796	221
PVF	32,970	16,218	270
FMQ	31,892	6,792	568
FMACP	22,866	2,958	349
FAA	20,489	10,172	1,381
PA66+PTFE	10,921	910	81
ECTFE (25101-45-5)	10,244	9,304	61
FPAK	8,501	4,942	608

Non-exhaustive list of applications

System Description			
48 Volt Power Cabling	Exhaust Manifold	Interior NVH Pads	Rear Suspension Knuckle Assembly
AC Compressor	Exterior Usability Appearance and Protection	Internal and External Noise Synthesis	Rear Suspension Links/Arms Upper & Lower
AC Inverter	External Communications & Connectivity	Jack and Emergency Tools	Rear Wheel Arch Liners and Baffles
AC Lines, Receiver Drier and Accumulator	Fasteners	Keyless Vehicle	Rear Wheel Steering Actuation
Accessory Drive (FEAD, READ)	First Row Door Window Lift Assy	Lighting - Ambient Instrument Panel (IP) & Consoles	Restraint Electronics
Acoustic Control Components	Fixed Roof Glazing	Load Compartment Floor Trim	Road Wheel and Tyre Assembly
Active Anti-Roll	Floor Console Armrest/Lid	Load Compartment Fuse Box / Passive	Roof Bars and Roof Rack
Air Cleaner	Floor Console Main Moulding	Load Compartment Side Trim	Seat Belts
Air Distribution Duct Components	Forward Looking Camera (IPMA)	Load Compartment Transverse Trim	Seat console
Air Suspension	Forward Looking Radar	Low Pressure Ducts	Seats
Alarm Horns and Sirens	Front Bumper Skin, Foams and mounted Grilles	Low Voltage Power Electronics	Second Row Door, Qtr & Rear Closure Window Lift Assy
Applied Decorative Trim - (IP)	Front Door BIW	Main Floor Trim	Side Door Latches and Exterior Handles
Applied Decorative Trim - Floor Console	Front Door Exterior Frame Finisher	Module - Auto or Powershift Trans as Shipped	Side Doors Hinges and Checks
Applied Decorative Trim - Side Doors	Front Door Interior Frame Finisher	Module - Body Part Assembly	Spare Wheel and Tyre Assembly
Applied Parts - (IP)	Front Door Trim Panel	Module - Cockpit complete	Speakers
Applied Parts - Floor Console	Front Drive Unit	Module - Cooling Pack	Special Protective Structures
Automatic / Automated Manual Selector Assembly	Front End Module Carrier	Noise Insulation, Hood and Engine Bay	Stability Control Systems
Auxiliary Water Pump	Front Fenders	NS Powertrain Mounting System	Starter Motor
Badging	Front Floor	Oil Filter, Level Indicator and Cooler	Static Sealing and Structural Adhesive
Battery 48V Super Capacitor and Ancillaries	Front Foundation Brakes	Onboard Charger	Steering Column
Battery Cables	Front Propshaft	Overhead Console	Steering Wheel
Battery, Heat Shield & Battery Management System	Front Side Door Dynamic Weatherstrip	Parcel Shelf / Blinds	Sun Visors
Belt Driven Integrated Starter Generator (BISG)	Front Side Door Glass	Passenger Entertainment Displays	Sunroof Assembly
Body Control Module	Front Springs and Dampers	Pedals	Supplemental Front Lamps
Body Dash and Cowl	Front Stabilizer (Anti-Roll) Bar	Pillar Trim Lower	Supplemental Rear Lamps
Body Side	Front Structure	Pillar Trim Upper	Supplementary Heat Source
Booster, Master Cylinder and Reservoir Assembly	Front Sub-Frame Complete	Power Amplifier	Surround Cameras
Brake Pipes and Hoses	Front Suspension Knuckle Assembly	Power Outlet & Lighter	Suspension Controls
Cabin Rear Trim	Front Suspension Links / Arms Upper and Lower	Power Side Door Mechanism	Switch gear
Cargo Retention	Front User Interface Display	Power Transfer Unit	Towing and Recovery Attachments
Center Stack	Front Wheel Arch Liners and Baffles	Powertrain and Auxiliary Control Modules	Towing Electrical
Charge Port Bowl and Flap	Fuel Cell	Powertrain Control Modules: Mounting Hardware	Traction Battery
CHMSL (Center High Mount Stop Light)	Fuel Distribution	Powertrain Control: Sensors and Actuators	Traffic Horns (Electric)
Cladding, Body and Wheel Arch	Fuel Evaporative Control	Radiator	Transmission Dress Items (Auto)
Climate Sensors	Fuel Filler (Refueling)	Radiator Grill (non-bumper mounted)	Transmission Dress Items (Manual)
Closure Panel or Knee Bolster - (IP)	Fuel Filler and Flap	Radio Frequency Key	Transmission Oil Cooler
Clutch Actuation Assembly	Fuel Tank Assembly	Rear AC Control Module	Transmission Oil Cooler Pipes
Column Cowl	Gear Shift Module (GSM)	Rear Bumper Skin and Foams	Turbocharger or Supercharger
Consumer Electronics Interface Module	Generator/Alternator	Rear Closure BIW Panel	Under Engine Closures, Rock Shields and Engine Bay Air Guides
Convertible Top Assembly	Grille Opening Panel/Front Sheet Metal	Rear Closure Dynamic Weatherstrip	Underfloor Closures
Cooling Fan and Shrouds	Headlamp Cluster	Rear Closure Exterior Handle and Actuation	Upper Exterior and Roof Finish
Cross-Car Beam (IP)	Headliner Assembly	Rear Closure Finishers	Vacuum Distibution Components
Curtain Airbag System	Heat Insulation and NVH Shields - Engine Bay & Underfloor	Rear Closure Hinges	Windscreen & Tailgate Washer System
Cylinder Block	High Pressure Ducts	Rear Closure Interior Trim Panel	Wiper Assembly Front
DCDC Converter	High Voltage Fuse Box	Rear Closure Latches	Wiper Assembly Rear
Dressed Engine Exterior Covers	High Voltage Power Cabling	Rear Closure Support & Checks	Wiring harnesses
Driver Airbag and Cover	Hood BIW Panel	Rear Combination Lamp	
Driver Information Module (Instrument Cluster)	Hood Hinges	Rear Door BIW	
EDS Components & Fasteners	Hood Latch & Actuation	Rear Door Exterior Frame Finisher	
Electric Vehicle Supply Equipment (EVSE)	Hood Support and Struts	Rear Door or Rear Quarter Trim Panel	
Electric Water Pump	Hose Set - Coolant (includes Expansion Tank)	Rear Drive Unit	
Emission Control Components	HVAC Auxiliary Unit	Rear Floor	
Emissions Additive Storage, Supply and Conditioning	HVAC Main Unit	Rear Foundation Brakes	
Engine Bay Fuse Box / Passive	Infotainment Antennas and Cables	Rear Propshaft	
Engine Compartment Trim / E-Box	Infotainment Head Unit	Rear Side Door Dynamic Weatherstrip	
Engine Cooling	Infotainment Remote Control and Headphones	Rear Side Door Glass	

Engine Covers	Inner Handles	Rear Spoiler	
Engine Ventilation	Instrument Panel Main Molding	Rear Springs and Dampers	
EW Powertrain Mounting System	Interior Lighting	Rear Stabilizer (Anti-Roll) Bar	
Exhaust Gas Recirculation	Interior Mirror	Rear Sub-Frame Complete	

The current Restriction proposal would require the majority of fluoropolymer uses to be substituted 18 months after Entry into Force.

This timescale is woefully insufficient to allow a safe transition to alternative materials.

- Alternative polymers may require additional additives to approach the performance requirements of fluoropolymers and fluoroelastomers.
- Alternatives do not currently meet the same level of performance as fluoropolymers.
- It is anticipated that the durability of components will be reduced, reducing service life, increasing servicing intervals and increasing cost of ownership for consumers.

If fluoropolymers and fluoroelastomers remain in scope, a transition period of 12 years after entry into force is not sufficient for the automotive industry, and we would request a lifetime derogation for fluoropolymers and fluoroelastomers.

EMISSION CONTROL MEASURES – MANUFACTURING PHASE

The European fluoropolymer industry is committed to responsible manufacturing. The industry has made tremendous progress on the issue of emissions potentially generated during the production of these materials, and on the exposure of its workers and neighbouring communities.

Producers are working closely with their respective national competent authorities to establish and implement the technical actions that may be required to guarantee an adequate control of the risks derived from the manufacture and use of fluoropolymers and fluoroelastomers and remove such risks wherever possible. We consider the fluoropolymer industry as one of the best controlled industries from an environmental standpoint.

Producers are continuously improving and/or developing best available techniques in the manufacturing processes and management of environmental emissions related to fluoropolymers and their productions.

Fluoropolymer producers are continuing to investigate and develop R&D programs for the advancement of technologies allowing for a transition away from using PFAS-based polymerization aids during fluoropolymer production.

Given the variety of fluoropolymer types, grades, and manufacturing processes, a single solution will not be applicable to all fluoropolymers manufactured and placed on the market.

Certain fluoropolymers will require the continuous use of fluorinated polymerization aids until alternative technologies are developed and implemented.

Several fluoropolymers have always been manufactured without requiring the use of processing aids.

The manufacturing phase has the greatest risk for PFAS uses, as PFAS monomers and processing aids are required for fluoropolymer and fluoroelastomers production.

Non-PFAS processing aids are becoming available, according to manufacturers, but final polymer properties can be adversely impacted.

According to polymer manufacturers, the risks of PFAS emissions to the environment can be controlled with alternative Risk Management Options.

- E.g., requirements for effluent treatment and emission limits

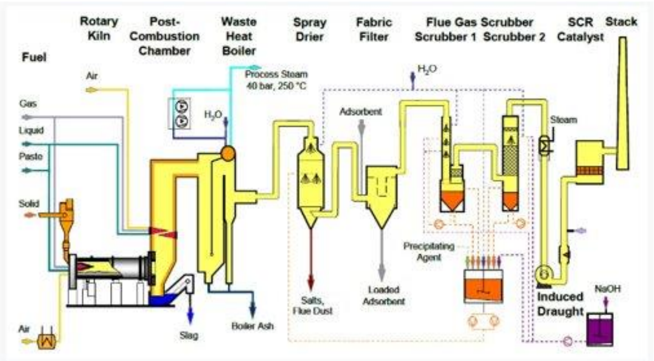
EMISSION CONTROL MEASURES – USE PHASE

Fluoropolymers used in the automotive industry satisfy the OECD classification of "Polymers of Low Concern" which require no emission control measures during the use phase.

Please refer to the publication "A critical review of the application of polymer of low concern regulatory criteria to fluoropolymers II: Fluoroplastics and fluoroelastomers - Korzeniowski - 2023 - Integrated Environmental Assessment and Management - Wiley Online Library".

EMISSION CONTROL MEASURES – END OF LIFE PHASE (INCINERATION)

A peer reviewed study[2], looking at the incineration of fluoropolymers was published in Chemosphere.



- PTFE was incinerated at typical incineration temperatures of 870°C (for 4 secs) and 1020°C (for 2.7 secs) to determine if any PFAS products were generated during the incineration process.

- The study determined that incineration of PTFE during normal incineration conditions did not produce any PFAS emissions.

Incineration of fluoropolymers does not contribute to environmental PFAS emissions and is a safe method of disposal.

[2] Krasimir Aleksandrov, Hans-Joachim Gehrmann, Manuela Hauser, Hartmut Mätzing, Daniel Pigeon, Dieter Stapf, Manuela Wexler,Waste incineration of Polytetrafluoroethylene (PTFE) to evaluate potential formation of per- and Poly-Fluorinated Alkyl Substances (PFAS) in flue gas, Chemosphere, Volume 226, 2019, Pages 898-906, ISSN 0045-6535,

EMISSION CONTROL MEASURES – END OF LIFE PHASE (LANDFILL)

A series of tests at the Charles River Labs in the Netherlands were performed to investigate if the persistence of PTFE implies future degradation, release, or transformation into a continuous source of substances of concern.

Studies to Address Potential Partitioning to Water – Studies showed that PTFE is insoluble in water and is not biodegradable.

Studies to Address Potential Partitioning to Soil – The molecular weight of PTFE is above 500,000 Daltons and although the soil adsorption and phototransformation studies are not yet finished, it can reasonably be expected, based on the high molecular weight, that no partitioning to soil is anticipated.

Studies to Address Potential Partitioning to Air - The vapor pressure was determined to be very low less than 1 x 10-10 mm Hg at 20°C. No decomposition or chemical reaction was observed at less than 150°C. No observable weight loss below 549°C, however at 549°C a 5% weight loss was observed. This data supports the lack of inhalation exposure potential at environmentally relevant temperatures.

Conclusions from the Charles River Laboratory and ALS study:

These results support the stability of PTFE and lack of transformation to other PFAS, such as perfluoroalkyl acids. PTFE will not partition to air, water, or soil. Potential inhalation, oral or dermal exposure to PTFE for biota or the environment is unlikely based on this data.

Additional studies are also being conducted by fluoropolymer producers and results will be made available in due course.

LUBRICANTS

EXECUTIVE SUMMARY

- PFPE main use is in lubricants. This substance is:
  - Not classified as hazardous
  - Not classified as bio-accumulative
  - Stable
- Low friction properties
- Durable/retain functionality (keeps product long lasting)
- Insoluble in water
- Are used only in cases no other lubricant can effort the functionalities.

We acknowledge the proposed derogation on lubricants in harsh conditions, but ACEA needs more time to analyse the impacts.

INTRODUCTION

Automotive industry fully supports the proposal to minimize the release and dispersal of PFAS through water and biota and as part of the CSS. We understand that substances that pose uncontrollable risks due to their properties should be regulated. However, the broad regulation of the entire group of PFAS substances seems not to be appropriate.

According to the restriction proposal all PFAS substances are classified as very persistent themselves or in the environment, bio-accumulative and toxic but that doesn't apply to all of them, not all can be defined as hazardous for environment. In case of PFPE lubricants, it seems that the negative effects mentioned within the current restriction proposal are not appropriate.

Therefore, we as automotive industry understand the derogation on lubricants used in harsh conditions in the restriction proposal. Yet, we fear that this derogation may not be sufficient as:

- There is no definition of harsh conditions, therefore we can only assume that all our uses of PFPE lubricants are included in this derogation.
- PFPE is a used as lifetime lubricants, and as such a transition no PFPE-free lubricants may lead to lack of sustainability in our vehicles.
- Existing vehicles will not be repairable after the 12 years derogation, which cause an issue as PFPE is a lifetime lubricant.

Lubricants and greases with above mentioned capabilities, depending on their use, are essential for automotive industry since they are taking on variable functionalities in different parts and in different locations of the vehicle, e.g. low friction, heat/temperature resistance, durability, chemical stability, long lasting functionality. These functionalities of the PFAS are in many cases simultaneously needed and no alternative lubricant can take over all this in once. As the PFAS with those functionalities are relatively expensive they are only used in very specific cases, e.g. in harsh conditions where no other alternatives can be used (high temperature differences, a product/part cannot be replaced easily and in case several of above-mentioned functionalities must be fulfilled simultaneously).

Substitution of PFAS based lubricants would require a lot of testing and time for a complex article like a vehicle with such a complex supply chain.

In addition, non-PFAS based lubricants would relate to higher costs for the customer due to increasing of maintenance services (regreasing/relubrication). Furthermore, according to the restriction proposal many parts must be scrapped respectively replaced (even they are fully functional) which is contradictory to the goals of the Green Deal and Circular Economy.

AUTOMOTIVE USES

PFPE is used in case of extreme conditions, e.g. extreme temperature differences, maximum durability, possibly in some production plants, Sunroofs to minimize friction, bearings, inside engines etc.

Impacts to our industry:

High Pressure Ducts / Hoses And Reservoirs / Console Unit / Restraining Devices – Diagnostic / Rear Shock Absorbers / Housing And Seals / Internal Hydraulic Or Mechanical Controls And Pumps / Power Take-Off / Turbocharger / Supercharger / Exhaust Gas Recirculation / Mufflers / Sensors / Signal Conditioning Devices / Stabilizer Bar / Strut / Front Suspension Members / Emission Control - Distributor Mechanisms / Jack And Jack Handle / Differential Assembly / Housing / End Couplings And Yokes / Parking Brake Controls (Cable) / Spare Wheel Frame Mounting / Coolant Pump And Flow Control / Hinges & Check Side Doors / Electric Horns / Rear Suspension Members / External Controls – Hydraulic / Driver-Operated External Controls - Floor Shift / Overhead Console | Main molding & lid / Manual Control Unit / Compressor / Driver-Operated External Controls / Front Shock Absorbers / Power Closure Mechanisms / Suspension Leveling Power Source / Steering Column and Shaft / Wheels / Cab Suspension Leveling Mechanism / Multiple Function Controls / FEM Carrier Subframe / Floor Console Switches / Receiver / Tubes And Hoses / Automatic Control Unit / Master Cylinder / In-Vehicle Entertainment System / Cab Tilting Mechanisms / Engines / Seats / Traction Battery / Door components / Transmission / Bearing / O-Rings / Actuator / Clutch / Air conditioner / Window / Steering Column / Mirror / Display Moduls.

Main applications/functions

PFPE (grease); Engine mechanical parts, Transmission - bearing (PFPE, grease) low friction, heat resistance, chemical fuel stability, durability; Engine sub - Throttle sensor (PFPE, grease) low friction, heat resistance, chemical fuel stability, durability

Critical criteria / properties of the substance in these applications

- Lubricants are used to minimize friction and thus minimize energy losses. The lubricants must withstand extreme conditions and meet the following requirements:
    - Non-toxic and non-flammable
    - Resistance to decomposition, to high and low temperatures, to aggressive media, to high mechanical loads, to grime, UV, extreme weather conditions
    - Ensure lubrication over the entire life – reduces the cost due to less replacement and repair of the product.
    - Increasing the number of mating cycles and extending the service life

No alternative can take over all the functionalities at the same time.

What performance criteria are required, external specifications, legal requirements etc?

Functionality of the parts should be guaranteed for almost a lifetime of the vehicle without having to be constantly/steadily maintained and increasing the repairing costs of the vehicle for the customer.

Why was this substance chosen for this function – e.g. cost benefit ratio, engineering considerations:

- While conventional mineral oil-based lubricants/greases perform well for many applications, synthetic PFPE lubricant/greases offer significant advantages. They are stable over long periods of time with low oxidation degradation or evaporation. They can withstand harsh conditions such as high voltage, corrosiveness, or chemical interactions. They can be used over a wide temperature range and are fire resistant. In high-temperature applications, synthetic PFPE lubricants thins out less than comparable mineral oil, providing better protection by forming a thicker oil film between surfaces.

- They can also be used in environments with exposure to chemical or solvent splashes and even for plastic and rubber lubrication. Especially in terms of maintenance costs, frequent re-lubrication, break down losses and machine downtime fluorinated lubricants play an important role and are vastly superior towards to non-fluorinated lubricants. In addition, fluorinated lubricants offer better protection against wear and corrosion. PFPE lubricants are in general more expensive than conventional mineral oil-based lubricants but combine a lot of properties in one substance.

EMISSION CONTROL MEASURES

Measures taken to ensure safe handling and environmental release:

- Automated systems
- Personal protective equipment

ANALYSIS OF ALTERNATIVES

Identify where commercially available alternatives do not exist and estimate time for them to be available in a production environment.

Currently no substances are available taking over the whole bundle/package of functionalities of PFPE in lubricants.

Cost impacts of alternative

It is not possible to estimate any costs for alternatives as no alternatives are available on the market to substitute PFPE in lubricants in our products which takes over all the functionalities mentioned prior. Therefore no cost comparison is possible.

Impacts to the end user (consumer) and end of life / disposal (if applicable)

It might lead to higher costs for consumers/vehicle owners as parts that usually outwear the whole lifetime of a vehicle must be changed during the lifetime of the vehicle, e.g. engines to move an outer mirror or seats etc. Further use cases are still under evaluation.

SOCIO ECONOMIC IMPACTS

Impact on consumers

- Reduced durability.
- Increase in service parts.
- Increased service intervals and service costs.

Impacts to other EU initiatives and regulations

- Increase in current CO2e performance.
- Impacts net zero CO2 strategies.

MOBILE AIR CONDITIONING

EXECUTIVE SUMMARY

ACEA's key aspects on proposed PFAS refrigerant ban:

- The proposed transition period for refrigerants in the Annex XV Restriction Report is much too short.
  It should differentiate between new vehicle types and new registrations (existing types) and between passenger cars and trucks. A feasible timeframe could be:

Time after EiF [years]	New vehicle types	New registrations
Passenger cars	7	17
Heavy-duty vehicles	10	22

- Vehicles with ICE and belt driven compressors should receive an unlimited derogation as there is no viable alternative.
- European production for export should receive an unlimited derogation as alternatives are not suitable for all markets.
- Servicing of existing fleet must be untouched and remain possible without any time limit receiving an unlimited derogation.

DETAILED SUBMISSION

On March 22nd, 2023, ECHA disclosed the draft Annex XV Restriction Report (Version nr. 2) Proposal for a restriction of Per- and polyfluoroalkyl substances (PFAS). The report addresses the PFAS ban with restriction scenarios which had been worked out to limit potential environmental and health impact of relevant substances.

The vast majority of mobile air conditioning systems use R1234yf or R134a – both considered as PFAS – as refrigerants for heat transfer in compression refrigeration cycles. These systems enable cooling of air or fluid in cars, trucks and buses. They are required for customer comfort and safety by cooling/heating the passenger cabin and providing climate conditions for driver to keep low thermal stress and high concentration on the traffic. These systems also dehumidify the air which reduces window fogging in cooler temperatures. For trucks, air conditioning systems are in operation during mandatory resting periods (drivers are sleeping in the cabin).

Furthermore, these systems are essential for keeping traction batteries at the required temperature. Indeed, every traction battery needs proper cooling and heating for safe and durable operations, quick charging, efficient storage and providing electric power supply on customer demand.

The Annex XV draft proposes the ban of MAC current refrigerants

- with a very short lead time of 1,5 years after EiF; except ICE driven vehicles with belt driven compressors with a lead time of 6,5 years after EiF.

- for placing on the EU-market; and for production in the EU for export purposes.
- for service and repair of cars already on the road.

We recognize the dossier submitters' intention of a widespread ban of PFAS including refrigerants – possibly based on the idea that alternatives were promptly available for mobile air conditioning systems. This is not the case.

Potential non-PFAS-refrigerants might be R744 (CO2), R290 (Propane) or R152a (Difluoroethane). These refrigerants have different properties, Tab 1.

Property	R1234yf	R744	R290	R152a
Chemical formula	C3H2F4	C02		C2H4F2
Chemical name	Tetrafluorpropene	Carbon dioxide	propane	Diflourethane
Complies with Kigali Amendment to the Montreal protocol	yes	yes	yes	no
Boiling point (at ambient pressure)	-29,5°C	-78,7°C	-42°C	-24,0°C
Evaporation pressure at 0°C	2,16 bar	33,85 bar	4,7 bar	2,64 bar
critical temperature	94,7°C	31°C	96,7°C	113,26°C
Critical pressure	33,82 bar	73,75 bar	42,5 bar	44,9 bar
Maximum pressure in the MAC system	Up to 32bar	Up to 130bar	39 bar	30 bar
GWP IPCC AR4/AR6	4/0,5	1/1	3/0,02	124/164
classification	A2L (Mildly flammable)	A1 (non flammable)	A3 (Extremely flammable)	A2 (flammable)
Safety system for		limitation CO2-concentration in passenger compartment	limitation risk of ignition	limitation risk of ignition

These specific properties are different to R1234yf and require significant different air conditioning systems. With this said, it is impossible to run an R1234yf system with R744, R290 or R152a – for thermodynamic or for safety reasons. All systems have to be designed and developed individually depending on their refrigerant. System layout has to be according to ISO13043 and SAE J639.

<u>R744 MAC systems</u>

R744 (CO2) is a non-flammable gas with a GWP of 1. No toxic decomposition products. As R744 has quite low boiling temperature, this is very beneficial for heat pump use. Due to the low critical temperature of R744 the MAC system works at significantly higher pressure than R1234yf: Up to 130 bar instead of 32 bar. This demands new design and development for every component with respect to the high pressure in the MAC system. Depending on ambient conditions R744 state is at subcritical or supercritical conditions which causes a more complex control-algorithm. In an R744 system the low critical temperature means no phase change occurs at high temperature in the gas cooler. This makes an R744 MAC system less efficient at high ambient temperatures above the critical temperature of 31°C (3)(4).

CO2-concentration mitigation strategies (safety concept) are mandatory to limit CO2-concentration in the passenger compartment in case of leakage in the cabin due to component damage. Moreover, trucks drivers need to sleep in their cabin, while the air conditioning system is running after being plugged in at a parking lot facility. Strategies are known and would be implemented in these vehicles.

R290 MAC System

Up to now there are no technical standards available for a common safe R290 system design. These have to be developed, evaluated and accepted throughout industry and relevant stakeholders. For safety reasons R290 should not be used with combustion engine and mechanical driven compressors. Therefore, a secondary loop system is needed to decouple R290 from the passenger compartment. Secondary loop systems would have significant impact on MAC system design – for passenger cabin cooling as well as for traction system thermal management in electrified vehicles. Because of the R290 flammability, the refrigerant charge shall be as low as possible and R290 containing components must not be placed inside the cabin.

R152a MAC System

R152a is flammable and requires a secondary coolant loop on the low temperature side. Industry standard SAE J639 describes and defines requirements for Safety and Design Standards for Motor Vehicle Refrigerant Vapor Compression Systems. The dossier's submitters name R152a as potential substitute to R134a and R1234yf. But R152a is listed in the Kigali amendment (to the Montreal Protocol) as a refrigerant to be phased down. Additionally, the latest IPCC AR6 report discusses the GWP at 164 - which is above EU MAC directive limit of 150. Therefore, we believe that R152a is not a sustainable future solution, and it should not be considered as a viable alternative.

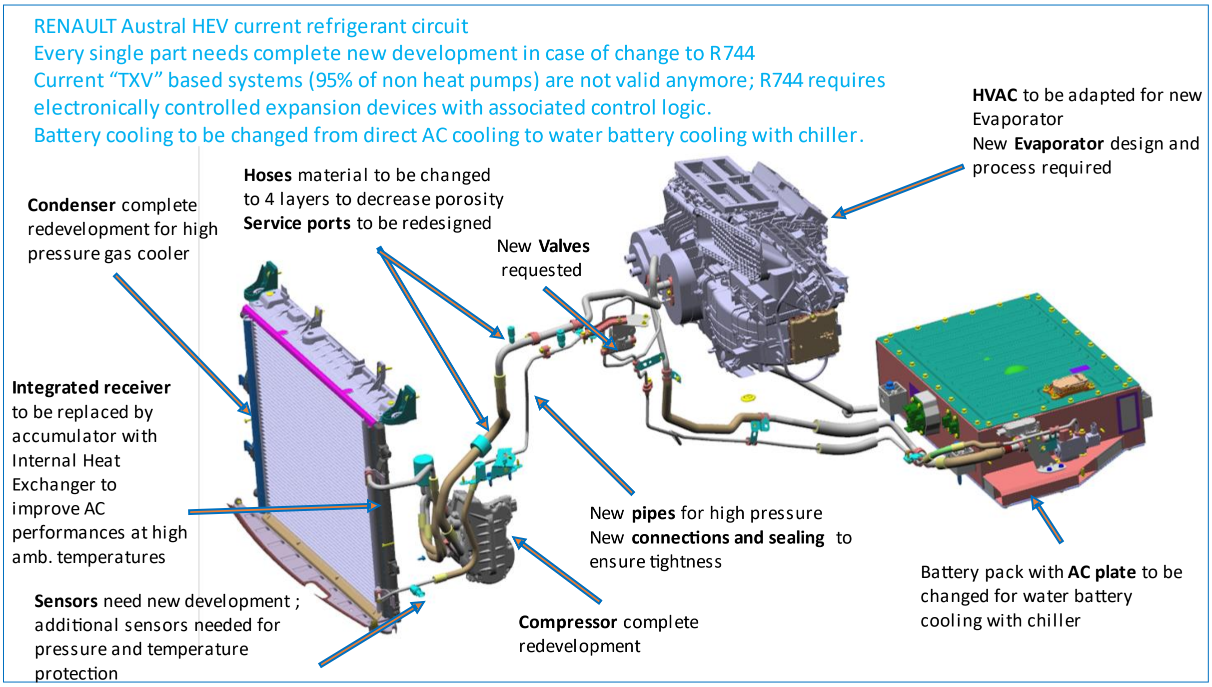
Additional considerations

Moreover, suggested alternatives have no chance for being global solutions while Japan and US have recently switched to R1234yf. Actually, cooling performances of suggested alternatives are not sufficient for warmer areas than EU countries. Our industry is global and needs global solutions. Cooling performance and efficiency comparison has been made on a system bench showing both lower cooling capacity and lower efficiency of R744 under high ambient conditions (3)(4).

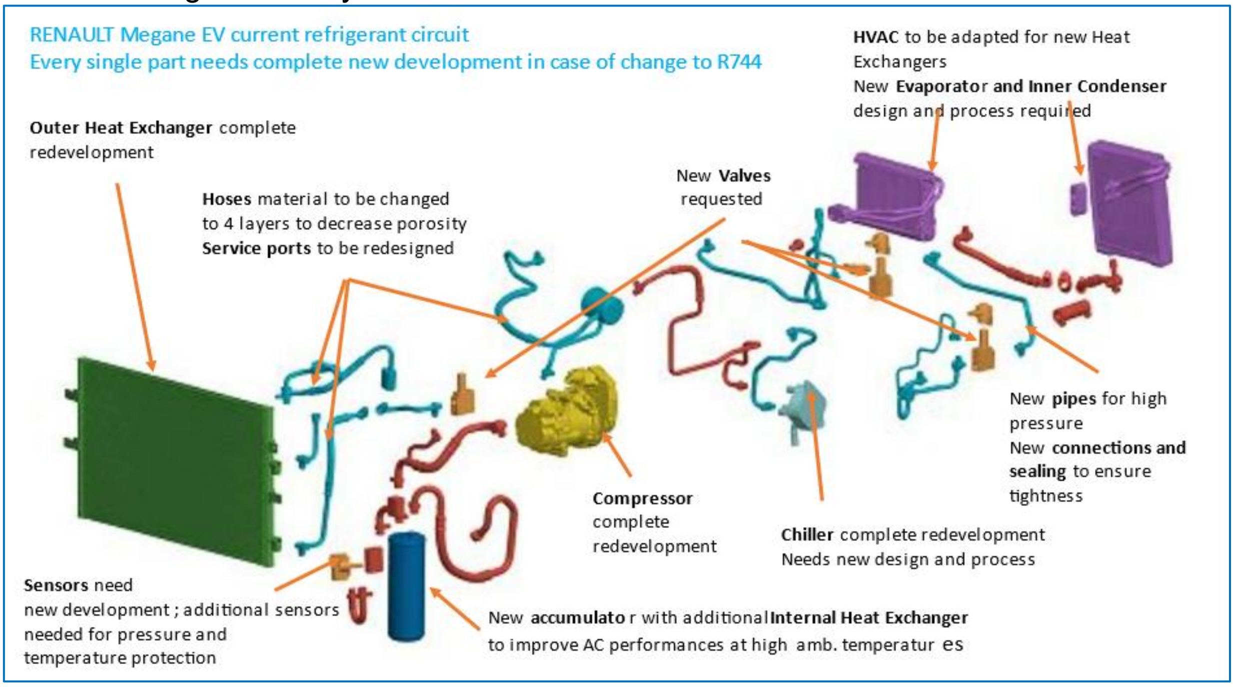
Different to home appliance refrigerators which are "stand alone products" the refrigerant systems of cars and trucks are highly integrated systems – especially in electrified vehicles.

As examples:

- Renault Austral HEV layout: MAC for hybrid electric vehicle.



- Renault Megane EV layout: MAC for full electric vehicle.



The design, development, and vehicle integration of new Air conditioning systems with new refrigerants needs to be done together and with deep interaction with the development process for new cars, buses or trucks. The available space and the interfaces with additional systems are defined early during the development phase. This work takes several years. Once this space is allocated only minor changes would be possible e.g., geometry of pipes, wiring harness modifications, small component changes. Additionally, the production plants and aftersales services will require rework as well as investment in hardware and training. Therefore, any transition towards alternative refrigerants as R744 or R290 needs appropriate lead time for vehicle manufacturers.

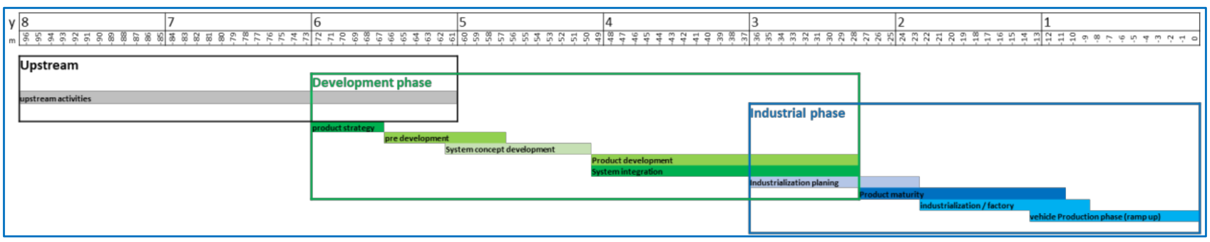
There are several challenges and steps during development process, durations in 1. to 5. refer to passenger cars:

1. Upstream activities:
    a. Supplier engagement for potential solutions
    b. Simulation tools
    c. Qualification of test and analysis facilities
    d. Permissions for handling and company workflows
    ➔ Ca. 36 months initial activities.
2. Design and develop the new systems:
    a. AirCo-System: Requirements, topologies, components, control algorithms
    b. Safety system: Requirements, topologies, components, control algorithms.
    ➔ Ca. 17 months Predevelopment and system concept design.
    ➔ Ca. 22 months Product development
3. Integrate the new systems in a vehicle:
    a. Functional: thermal, mechanical, NVH
    b. Geometrical: package for all components
    c. Electrical: electric and electronic integration in ECUs

    All with respect to safety requirements.
    ➔ Ca. 22 months System integration
4. ensure maturity:
    a. Components: long term maturity [incl. initial build up of test capacities]
    b. Functions: proof for all environment and use conditions.
    ➔ Ca. 17 months Product maturity
5. Industrialization on large scale production:
    a. Components: production at suppliers on all new production lines with new technologies
    b. Systems/vehicles: montage with new requirements and processes within existing production lines, refrigerant supply and charge process
    ➔ ca. 14 months industrialization

➔ due to impact on safety and energy consumption: Everything ready until type approval of a new vehicle (ca. 10 months before SOP).

➔ Above mentioned workflows can overlap, the first model (incl. upstream) needs eight years, all further models take six years – see graphic below.



The development process for heavy-duty trucks is indeed similar to the one for passenger cars. Same steps but differences as well. A heavy-duty truck is a workplace and a living place at the same time. The variety of user functions are greater than for passenger cars. There are also a wide range of applications to be developed, long haulage, city distribution, construction, mining etc.

Many of them are facing heavy loads and very rough road conditions in their daily work. High durability is a keyword that defines and affects the duration of the steps in the development process. Development and verification take longer time, so does the total process.

➔ The first model (incl. upstream) needs eleven years, all further models take nine years.

For a transition of vehicles already in production the specific production intervals shall be considered. Production time of typical passenger car platforms is more than ten years (e.g., BMW F01-F13 from 2008 until 2018; e.g., BMW F20-F32 from 2011 until 2021). Trucks have slightly longer intervals 12 years – in specific applications even more are relevant.

With respect to the deep integration of MAC systems explained above, this workstream must be considered from process start. Models which are close to production or already in production cannot be redesigned for new systems.

Based on 2021 data (1) there are 11.6 million new vehicles registered in the EU, 3.6 million vehicles imported into the EU and 12.1 million vehicles produced in 194 automobile factories in the EU.

This huge numbers of production and import emphasize the impact of a MAC system change on mobile air conditioning market. Considering the whole automotive industry – besides the vehicle manufacturers – we expect significant effort in educating engineering specialists, enabling testing infrastructure and capacities as well as supplier's engineering capacity and production ramp up to meet transition requirements.

For aftersales services all relevant workshops/service points need new service machines and tools as well as employee training. This timing has not been evaluated by now but it would happen in parallel with industrialization.

The last MAC refrigerant transition in the EU was one decade ago and realized in a two-step process with adequate lead time:

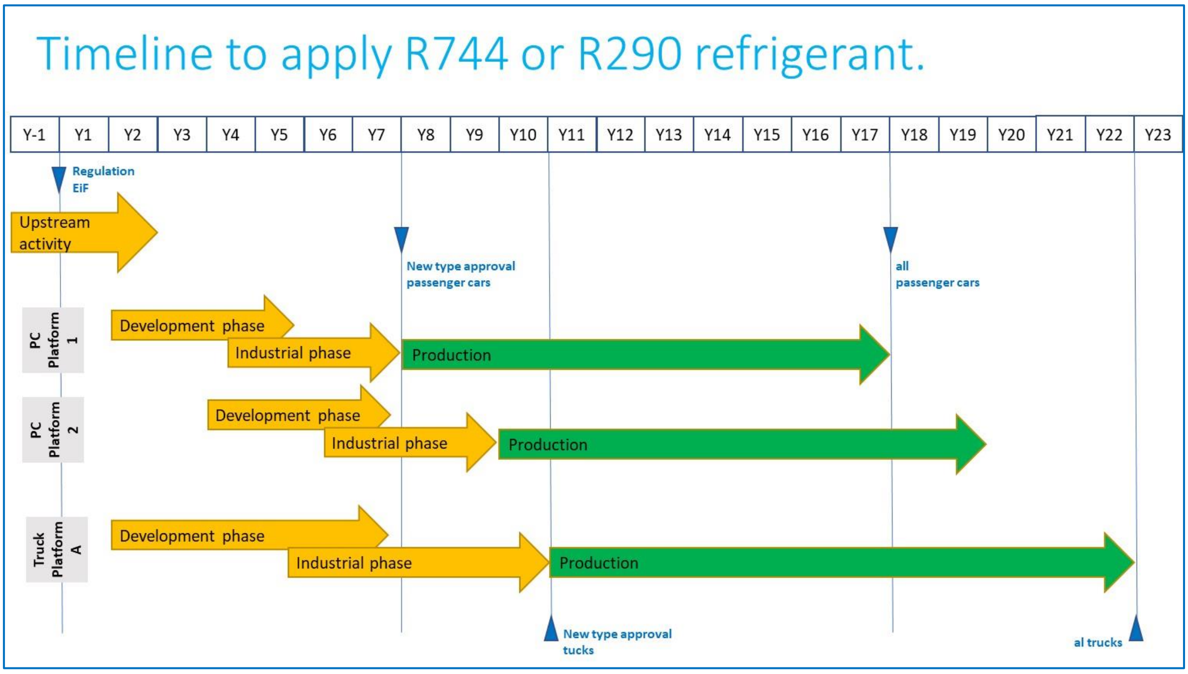
- MAC directive 2006/40/EC was approved in March 2006,
    - it bans high-GWP-refrigerants:
        - for new type approved cars from 2011 (delayed to 2013 due to refrigerant availability),
        - for all cars to be registered or sold from 2017.
    - it relates to M1/N1 vehicles only.
    - it does not affect export vehicles from EU production.

➔ Almost seven years from approval with a four-year transition phase.

This timeline was met by using R1234yf instead of R134a which is a nearly drop-in-solution. At that time, MAC systems were much simpler as most cars were driven by internal combustion engines. Electrified cars were very few.

With explanations above for development and industrialization of new MAC-systems and our experience from implementing 2006/40/EC we clearly see the need of adequate transition phases. Taking into account that upstream work starts earlier than a new regulation would get into force, any transition from state-of-the-art refrigerant R1234yf to new refrigerants can be available at the very earliest from 7 years after EiF for the first new passenger vehicle platforms or new vehicle types. Considering a production interval per platform of 10 years and the fact that a running change is not possible in all cases, the transformation for all newly produced passenger cars shall be another 10 years longer until 17 years after EiF.

A transition for trucks has to consider longer periods, new truck platforms or new types could only be equipped with new refrigerant systems from 10 years after EiF, all newly produced trucks shall be another 12 years longer until 22 years after EiF. (see graphic below)



This time is mandatory for all industry partners and companies to manage the transition in all sectors from PFAS-refrigerant-MAC to a non-PFAS-refrigerant-MAC.

The use of R744 MAC systems has benefits at heat pump mode but disadvantages at high temperature use in terms of energy consumption (3). Vehicles with internal combustion engines and belt driven compressors use refrigerant systems only for cabin cooling. Heating energy is provided “for free” by combustion engine coolant, MAC heat pump mode is not implemented. As pure cabin cooling with R744 causes higher energy consumption from combustion engines compared to R1234yf we see the risk that the amount of avoided R1234yf leakage to the atmosphere might bring lower benefit than the increased CO2-emissions for running R744 systems in ICE vehicles. A major and unsolved challenge is the design of open type compressor shaft-seals for mass production. There is no technical solution on long term view and there might be no belt driven R744 compressor available also in longer future. We propose not to ban R1234yf from combustion engine vehicles with belt driven compressors as the most balanced environmental option.

In addition to restriction on placing products on the EU market, the draft proposal also bans production of all R1234yf-containing MAC systems in any EU manufacturing plants for export market. Contrary to what is stated on the annex draft – it is not possible to fill systems with R1234yf after vehicle is exported. Any vehicle must fulfill conformity of production when leaving the manufacturing plant. And electric vehicles need operational refrigerant system-based battery cooling to allow vehicle use for transport. Per 2021 there are 5.7 million vehicles exported per year from the EU to markets all over the world (47% of EU vehicle production). As MAC systems with new refrigerants are more expensive than systems running with R1234yf any vehicle produced in the EU for export would have a competitive disadvantage on worldwide market compared to vehicles produced outside the EU. This would support shifting production capacities outside of the EU with impact on employment. Overall, there are 3.5 million jobs on direct and indirect manufacturing (2019). (1)

Finally, vehicle manufacturers must legally be able to service any vehicles placed in the market during their lifetime, including refrigerant refill. As the proposal also restricts the servicing of vehicles which were originally placed on the market with R134a or R1234yf A/C systems. It's unclear if this is without derogation or after a 12-year derogation. In either case, because the systems cannot use any proposed alternative, repairing these vehicles would require replacement of the entire system. The expense for this repair would be enormous. In most cases it's not even possible as most of these vehicles have ICE powertrains and R290 and R744 are not suitable alternatives for vehicles with these powertrains. Therefore, repair of vehicles with R134a and R1234yf systems should be exempt from restrictions for an unlimited time.

SUBMISSION SUMMARY

ACEA analyzed the impact and consequences of the draft Annex XV restriction report. Based on all data shared before, a ban of R1234yf would cause a transition towards new alternative refrigerants with huge impact on mobile air conditioning systems:

- tough technical requirements.
- a wide variety of solutions to be developed for different types of drivetrains (ICE, HEV, PHEV, BEV) and vehicle types (cars, buses, trucks).
- a complex industry transition (not only for car manufacturers).

If R1234yf should be banned, ACEA proposes:

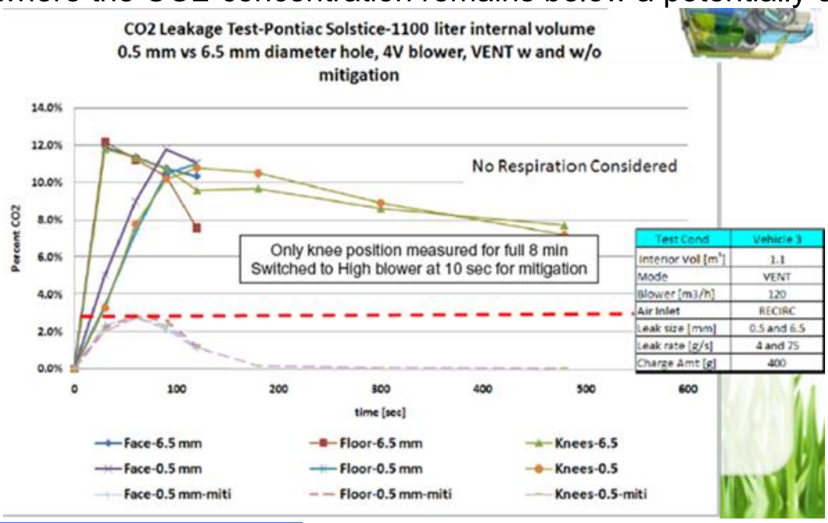
- to receive enough time to potentially develop a global solution.
- to ban PFAS refrigerants not earlier than 7 years after EiF for new passenger cars vehicle types and not earlier than 10 years after EiF for new truck vehicle types placed on the market in the EU.
- to ban PFAS refrigerants not earlier than 17 years after EiF for all newly produced passenger cars and not earlier than 22 years after EiF for all newly produces trucks placed on the market in the EU.

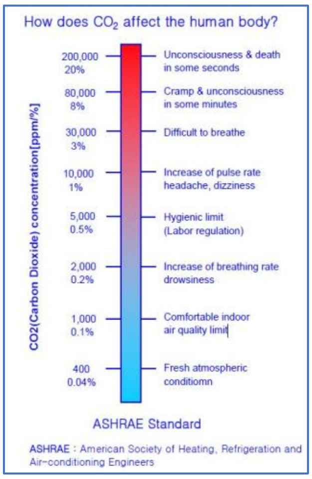
- to allow unlimited derogation for vehicles with combustion engines and belt driven compressors.
- to allow unlimited production of vehicles with PFAS refrigerants in the EU for export purpose.
- to allow unlimited service of any refrigerant for vehicles placed on EU market during their lifetime.

APPENDIX

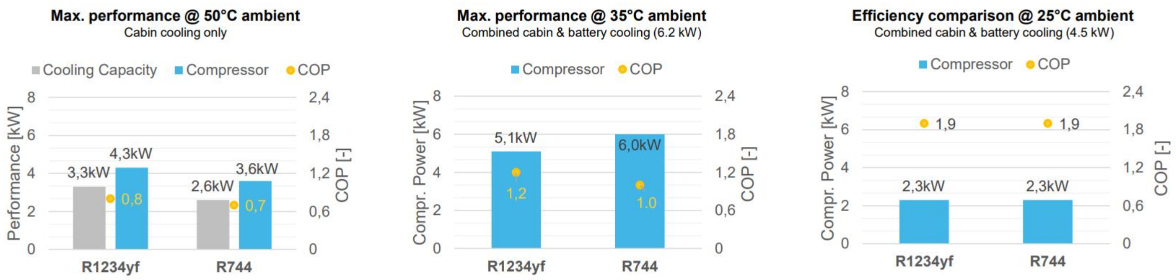
(1) ACEA Pocket Guide 2022/2023 – The Automobile Industry.
https://www.acea.auto/files/ACEA_Pocket_Guide_2022-2023.pdf

(2) Cabin CO2-concentration at leakage.
A test made in a car (Pontiac Solstice), shows concentration level above 10%, in case of a leakage in the AC circuit without mitigation measures. The graph also shows the concentration level with mitigation measures implemented where the CO2-concentration remains below a potentially critical level.





(3) Efficiency and performance of different refrigerant MAC systems



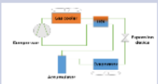
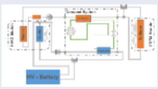
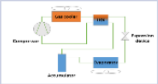
- Ambient temperatures up to 25°C → Cooling performances and efficiencies similar between R1234yf and R744
- 25°C < T < 35°C → Cooling performance similar but drawback of R744 compressor power (=drawback in COP)
- <35C → Cooling and efficiency drawback of R744

Note: 50°C ambient means at vehicle Front End Module. This case is not rare, because at idle, around Front-End Module, air temperature is usually 15°C above ambient.

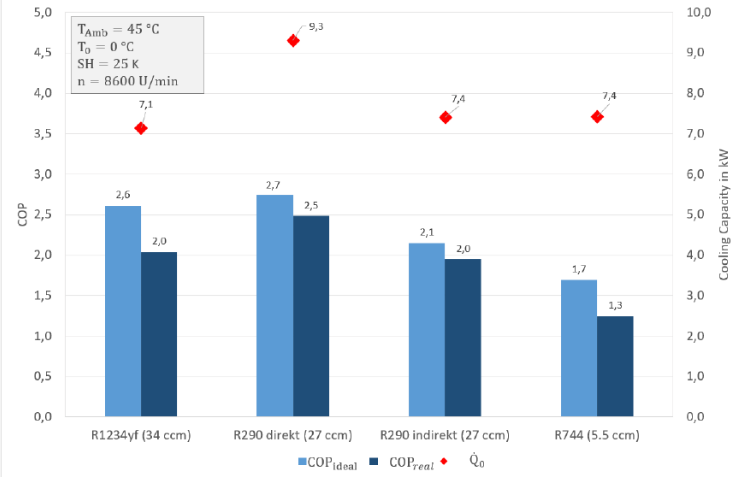
(4) Simulation comparison of BEV cooling and heating with different refrigerants

OBRIST ENGINEERING

Options for Future BEV A/C&HP Natural Refrigerant System Variants

System		Advantages	Disadvantages
R290 direct		• Excellent Ref. for +/- temp • Best thermodynamic properties • Best system efficiency	• Flamability issue • R290 components within passenger compartment • No SNAP approval
R290 indirect		• Low Ref. charge • Good thermodynamic properties • Additional Parts / longer BOM	• Flamability • 150gram vs. 500gram rule • No SNAP approval • Thermal/Dynamic losses – indirect losses • BOM / coolant side complexity
R744 direct		• HP COPs very good • SNAP OK • In automotive mass production since 2016 • Established in stationary applications	• Charge amount determination AC/HP/BC • Trained Staff required • Hot ambient > 35°C low COP

Simulation Results AC-Max 45°C ambient R1234yf vs. R290 vs. R744



at hot ambient R744 has significant COP disadvantages

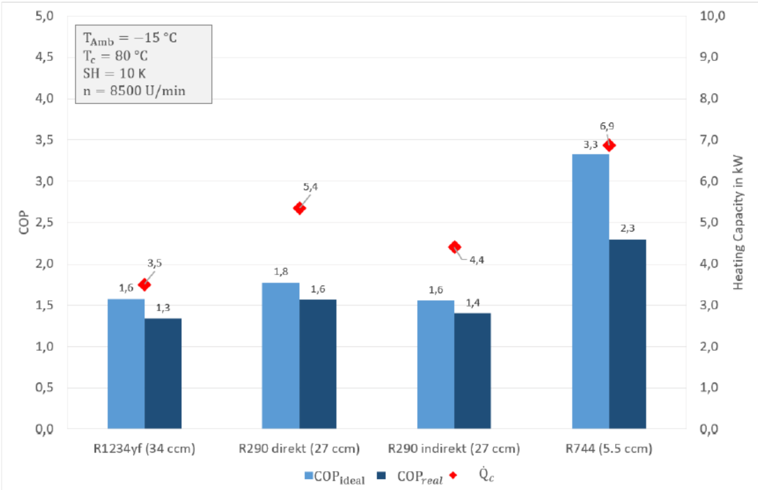
Cooling power > 7kW can be reached

R290 direct with best COP and max. cooling power

R290 indirect with same COP than R1234yf direct.

R744 in hot ambient (e.g. Dubai) requires add-on measures for COP improvements (e.g. Ejector, flash-gas, etc.)

Simulation Results HP-Max at minus 15°C ambient R1234yf vs. R290 vs. R744



R744 reaches best COP and highest peak heating power

R290 direct has better COP and significant max. heating power

NOTE: below minus 15degC ambient temperature R1234yf is operated below 1 bar abs. on suction side. Many OEM limit usage of R1234yf at low temperatures

BATTERIES

EXECUTIVE SUMMARY

- The PFAS REACH restriction proposal will have a major impact on the battery industry as well as on the automotive industry using these batteries for the transformation towards emission-free vehicles.
- For specific applications where PFAS are used in batteries, ACEA is requesting derogations and additional transition times to provide sufficient time for the battery industry to identify and implement alternative non-PFAS solutions.
- Batteries are a main enabler for the transition towards low-emission mobility, decarbonized energy generation and digitalization.
- Batteries also power a wide range of components in the car.
- This document details what types of PFAS are used in batteries and why, whether there are non-PFAS alternatives available, what are the tonnages of PFAS consumed and emitted, the socio-economic impact assessment of the proposed PFAS restriction for the battery value chain and finally proposes best practices that the battery industry and legislators could implement to further minimize emissions.

INTRODUCTION

The scope of this document as feedback to the ECHA consultation includes the following types of high performance, advanced rechargeable and lithium batteries:

• Lithium-ion rechargeable batteries (also known as Li-ion batteries)

• Lithium (Li) primary batteries (also known as primary Lithium batteries)

• Nickel–based rechargeable batteries (Ni-Mh)

• Lithium metal rechargeable batteries

• Solid-state batteries and other battery technologies currently under research

The only type of rechargeable battery which does not use PFAS is lead-acid batteries for batteries in 12V SLI use and specific 24V use. But the ban of use of Lead in batteries is being discussed under ELV directive (2000/53) with review expected by 2025 (according to directive 2023/544) for exemption on 12V and 24V batteries still in force, and Lead is also recommended to authorization under REACH. However, lead acid batteries have a low energy density. Lead-acid batteries cannot be used as suitable alternative for technologies presented above.

ACEA could update this document with additional information during the public consultation.

This document is based on the common work written by RECHARGE (“Application for derogations from PFAS REACH restriction for specific uses in batteries”, April 2023).

AUTOMOTIVE BATTERIES USES

PFAS are used in key components for all high performance and lithium battery technologies.

- Binder material for electrodes
- Electrolytes
- Valves, gaskets, washers
- Coatings of separators: ceramic and adhesive
- Edge coatings for electrodes

The reason of use is the combination of properties of chemical resistance and tolerance to a high range of working temperatures.

FUNCTIONAL USES

PFAS used in binder material for electrodes:

- PVDF is used as binder of the cathode of Li-ion rechargeable batteries & solid-state batteries, In a quantity around 2 to 3%. It holds the active material particle together with the composite electrode and with the current collector.
- PTFE can also be used in place of PVDF as a binder.

PFAS can be used in electrolytes :

- For the next generation of Li-ion rechargeable batteries. allowing a 20% longer life battery (short chain PFAS)
- As a binder in the solid electrolyte of solid-state batteries (PVDF, PTFE)

PFAS are used in valves, gaskets, washers (PTFE, FEP, PFA, VDF, HFP, FKM)

PFAS are used in separator coatings for adhesion of surface layer and protection of the anode from oxidation (PVDF)

PFAS are used for safety issues in Edge coatings of electrodes (PVDF/Ceramic)

EMISSION CONTROL MEASURES

The information about emissions have already been provided by RECHARGE in the second call for evidence submitted in October 2021.

Updated information will be included in subsequent submissions.

ANALYSIS OF ALTERNATIVES

PFAS used as binder (based on fluoropolymers) in electrodes:

- Fluoropolymers are classified as polymers of low concern. There are more appropriate options available for fluoropolymers manufacturing processes, we therefore request that fluoropolymers are removed from this scope of this restriction.

PFAS can be used in electrolytes:

- The next generation of Li-ion rechargeable batteries will use PFAS in liquid electrolyte for a 20% longer life battery.
    - Currently, there are no alternatives available today.
    - For new solid-state electrolytes, no alternative available today.
    - A minimum transition period of at least 13,5 years is needed.
    - This exemption shall be reviewed and assessed by the Commission no later than 10 years after Entry into Force, to understand if alternatives are available.

PFAS are used in valves, gaskets, washers:

- No alternative available today. An exclusion from the scope of the PFAS restriction proposal is requested.

PFAS are used in separator coatings: ceramic and adhesive:

- No alternative available today. An exclusion from the scope of the PFAS restriction proposal is requested.

FUEL CELLS

EXECUTIVE SUMMARY

The hydrogen economy is:

1. a key contributor to EU policies towards decarbonisation (Green Deal, Fitfor55 Package, REPower EU Plan …)
2. in danger because of the PFAS (more specifically, perfluorosulfonic acid [PFSA]) restriction proposal:
    - the proposed derogation applies only for proton-exchange membranes (PEM) in fuel cells (FC)
        - PFSA is used in FC elsewhere than PEMs are not derogated → needed, no alternatives ready yet.
        - PFSA is used in PEMs elsewhere than FC are not derogated → needed for electrolyser, no alternatives ready yet.
        - PFSA is also used on FC system auxiliaries (humidifiers, H2 sensor) → needed for the whole system.
    - a clear definition of "PEM" is missing (PEM is multi layered, all layers need to be covered by the derogation)
    - PTFE and PFSA needs to be excluded from the scope of the proposal as polymer of low concern.
    - PFSA are also key to batteries which are necessary for fuel cell applications è no derogation for batteries means no hydrogen economy.

PTFE and PFSA should be excluded from the scope of the proposed restriction to enable the hydrogen economy to develop and secure the decarbonization EU policy.

INTRODUCTION

- ACEA members fully support the need to restrict hazardous per and polyfluoroalkyl substances (PFAS).
- The current restriction proposal, published on 7th February 2023 will restrict more than 10,000 substances, with vastly differing hazard properties.
- PFAS are key technologies enablers.
- Which for some of them (Fluoropolymers) are of low concern according to OECD.
- PFAS is a large, complex, and diverse family of manufactured chemicals that includes a broad range of substances with different physical, chemical, and toxicological properties and uses consequently, a "One fits all" solution is not judged reasonable.
- Other RMO targeting emissions during the production phase is more appropriate as use phase and recycling phase are not a concern.

Failing at enabling the use of PFSA and PTFE in hydrogen and fuel cell technologies risks to stop the hydrogen economy developments without delivering the desired human health and environmental benefits.

AUTOMOTIVE USES

Data from the automotive industry's International Material Data System (IMDS), taken in Q1, 2022, shows the breakdown of reported PFAS in the automotive Industry.

- Nearly 8 million automotive parts contain PFAS substances under the scope of the proposed Restriction.
- Over 5 million of these parts contain fluoropolymers and fluoroelastomers.
- The biggest reported PFAS is PFTE fluoropolymer, which is used in nearly 4 million automotive parts.
- PTFE counts for nearly 50% of the total reported PFAS in automotive parts and more than 70% of fluoropolymer uses.

Fluoropolymer uses impact 100's of automotive applications, which will need to be evaluated.

- Fuel Cell and related technologies (electrolysers) are some of the critical ones.

PFAS are used in PEM fuel cells, but not only. Other components of Fuel Cell stacks are making use of PFAS and need to be removed from the proposed scope. Electrolysers are equally concerned.

FUNCTIONAL USES

PFAS used in a Fuel Cell PEM are mainly:

- PFSA ionomer represents the state-of-the-art polymer used in both the membrane and catalyst layer to facilitate the transport of protons, thanks to their outstanding chemical and thermal properties.
- PTFE is added to the PEM fuel cell electrode to improve the mechanical strength and to help in removing the product water formed on the cathode.
- PFAS are also used on FS system auxiliaries like in humidifier (membrane used to humidify air inlet, by using humidified air outlet) or H2 sensor (membrane of the component)
- For all those applications, no alternative is foreseen to be able to substitute today or in the near future these highly specialised materials, central to the functioning of the hydrogen value chain.
- A rushed PFAS ban without granting any exemption for applications in the hydrogen sector would push the fuel cell technology back to approximately TRL 2 in terms of power density and durability.
- Those technologies are as unviable without fluoropolymer-based components as PEM fuel cells and they are as essential for the EU's decarbonisation goals as PEM fuel cells.

Durability, chemical resistance, and heat resistance are 3 of the most important reasons why PFAS are key to the Hydrogen economy.

	Fluoropolymer characteristics									
	Durable		Inert		Functional			Stable		
Commercial application	Mechanical strength	Low particulation	Resistance to chemicals	Nontoxic, biocompatible, biological degradation resistant	Flexibility	Friction resistance	Low dielectric constant	Low leachables	Resistance to photolysis, oxidation, hydrolysis	Stability
Aerospace	X	—	X	—	X	X	X	—	X	X
Automotive industry	X	—	X	—	X	X	X	—	X	x
Medical devices	X	X		X	X	X	—	X	X	X
Pharmaceutical manufacture	X	X	X	X	X	—	—	X	—	X
Consumer outdoor apparel	X	—		X	X	—	—	X	—	—
Technical clothing (military, firefighters, first responders, medical personnel)	X	—	X	X	X	X	—	X	X	X
Consumer electronics	X	—	X	—	X	X	X	—	X	X
Wireless communications	X	—	X	—	X	X	X	—	X	X
Satellite navigation systems	X	—	X	—	X	X	X	—	X	X
Semiconductor industry	—	X	X	—	—	—	X	X	—	—
Building construction	X	—	—	X	X	—	X	—	X	X
Energy production and storage	X	X	—	—	—	—	X	X	X	X
Food and beverage production	X	X	X	X	X	X	—	X	X	—
Food protection and packaging	X	X	X	X	X	—	—	X		—
Drinking water filtration	—	X	X	X	—	—	—	X	X	—
Environmental protection	—	X	X	X	—	—	—	X	X	X

Figure 5: Fluoropolymer functionality and commercial applications (From "Integrated Environmental Assessment and Management — Volume 14, Number 3—pp. 319")

EMISSION CONTROL MEASURES

These are produced and used in a highly controlled industrial environment, where their emissions are negligible. Moreover, their reusability and recyclability are actively investigated.

Emissions at production are limited by making use of the best available technologies. All the producers are committed to limit those to the limit of what is possible.

During the use phase articles containing those PFAS, or for the production of which, PFAS were used, are sealed and/or not accessible to the customer/user.

Recycling issue can be controlled by incineration as it is already well documented in the scientific literature.

Regarding fuel cells, at end-of-life stage, the stack itself will be dismantled to recover Platinum contained in the electrodes. The cells will be then incinerated to recycle the platinum group metals (PGMs), while the ionomers will be fully destroyed with hydrogen fluoride (HF) emissions.

Following ELV regulation, and established recycling flow, vehicles with their Fuel Cell stacks will reach authorized treatment facilities at the end of their life for proper treatment limiting the risk to the environment virtually to zero.

ANALYSIS OF ALTERNATIVES

Laboratory scale development ongoing (more than 12 years to commercialization for the whole system).

Overview current alternatives on research level identified to substitute PFAS components in fuel cell and water electrolysis cell:

Component to replace	Supplier 1	Supplier 2	Supplier 3	Supplier 4	Supplier 5	Supplier 6
Ionomer (PFSA)	No	**yes**	**yes**	**yes**	no	**yes**
PEM (PTFE and PFSA)	No	**yes**	**yes**	**yes**	**yes**	**yes**
R/F (PTFE)	**Yes**	no	no	no	no	no
GDL/MPL (PTFE)	No	no	no	no	no	no

GDL: Gas Diffusion Layer
MPL: Micro Porous Layer
R/F: reinforcement

More time will be needed for finalization of the formulation, validation of properties, specifications, upscaling of the production, etc.

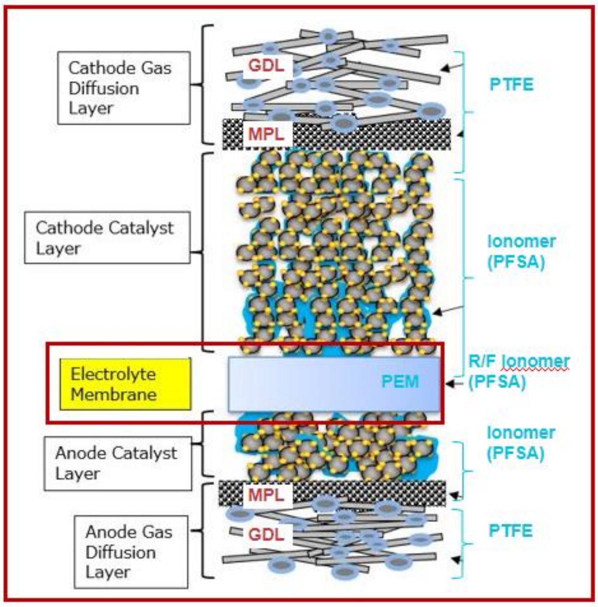
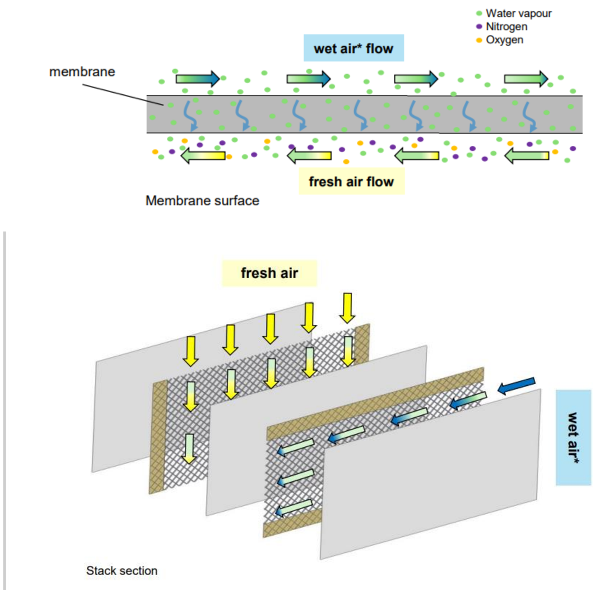


Figure 6: Illustration of the different layers in a fuel cell

Alternatives are far from confirmed and would need more time until possible commercialization and even more to meet customer specifications.

Similar conclusion for alternatives for PEM FC auxiliaries (humidifier, H2 sensor):

- 2 technologies are existing for humidifier: Hollow fibers and flat membrane.
- Hollow fibers could be with PFAS free, but they do not meet the automotive specifications (integration: higher volume and durability: freezing issue)
- Actually, no alternative flat sheets are commercially available yet but in development for 2030 (hydrocarbon-based material)



SOCIO ECONOMIC IMPACTS

A PFAS ban as proposed today would affect severely the EU industry as well as the ambitious policy towards decarbonization and lead to:

- a loss of a significant jobs growth potential in European industry,
- strategic autonomy of key value chains such as that of electrolysers and fuel cells,
- objectives of the REPowerEU to be missed,
- underdeveloped electrolyser and fuel cell capacity
- delocalisation of larger electrolysers and fuel cells facilities and hydrogen production plants outside Europe.

The proposed PFAS restriction will generate severe negative impact on the hydrogen economy, delaying its establishment, losing qualified jobs due to delocalization, increasing energy dependency, all resulting in missing decarbonization objectives.

ELECTRONICS

AUTOMOTIVE USES - OVERVIEW

- Cables and cable harnesses for multiple applications (see next page)
- Printed Circuit Boards (PCB): PTFE cores in high-frequency application for radios and radars (ADAS)
- Brackets: e-coat
- Fluoroalkyl Acrylate (FAA) coating in touch panels
- PFAS in liquid crystals cells of LCD modules (displays)
- Perfluoroalkoxy resin in wire of EM-modules
- PTFE in aluminium electrolyte capacitor encapsulation
- PTFE in film capacitors

Small electronic components:

- PTFE epoxy adhesive in microcontrollers/ICs.
- PTFE adhesive in SMI electronic components.
- Topcoat of double layer capacitors.
- PTFE tube in coils.
- PTFE as insulator in SMD connectors.
- PTFE as Teflon Tube in Diodes.
- ETFE, FEP, PTFE protect tube and protection of lead-wire in Thermistors.
- PTFE film in switches.

Application	Material	Automotive need	Why FLPOL / required properties	Potential alternatives	Market Driver	Standards
NOx and other gas Sensors/ Katalysator/ Sensor	PTFE	Euro 6 and Euro 7 NOx emission reduction - Sensor is placed direct at Exhausting/Motor System	Combination of temperature, mechanical stress, and media resistance	There are no direct substitutes for FLPOL.	Meeting Euro exhausting norms, reduce emissions, Motor management	Similar to: ISO 6722-1; ISO 19642
SCR heating cables for the Adblue feed lines	ETFE/FEP/MFA/PFA	Euro 6 and Euro 7 NOx emission reduction Direct need for heating cables is to avoid freezing of the AdBlue system	Combination of temperature and media resistance, e.g. to AdBlue	There are no direct substitutes for FLPOL.	Meeting Euro exhausting norms, reduce emissions, Motor management	Similar to: ISO 6722-1; ISO 19642
BVA (Brake wear indicator)	FEP/PFA/PTFE	Safety system - to warn the user of a vehicle that the brake pad needs replacement	A high temperature resistance is required	There are no direct substitutes for FLPOL.	Safety System, proactive maintenance	Similar to: ISO 6722-1; ISO 19642
Transmission, cable in ATF	ETFE/ FEP	Cable in gearbox, often immersed in hot, aggressive transmission fluid	Combination of temperature and media resistance, e.g. to ATF hot oil	There are no direct substitutes for FLPOL.	Provide function over a long time, less maintenance	Similar to: ISO 6722-1; ISO 19642
Fuel Tank Sensor/ Pump	ETFE	Cable for fuel level Sensor, and for pump to transport fuel to motor	A high fuel/media resistance is required	There is only one material, Polyamide.	Provide function over a long time, less maintenance	Similar to: ISO 6722-1; ISO 19642
Windscreen Washer heating	MFA/PFA	Direct need for heating cables is to avoid freezing of the washer system	Combination of temperature, mechanical stress and media resistance, e.g. to alcohol and hot water	There are no direct substitutes for FLPOL.	Provide function over a long time, less maintenance	Similar to: ISO 6722-1; ISO 19642

AUTOMOTIVE USES - SEMICONDUCTORS[3]

Frontend (wafer production process):

- Extensively used in photolithography process chemicals such as photoresist, gases for etching and cleaning, solvents, refrigerants
- Extensively used in Production equipment such as valves, seals, and coating of tubing

Backend (assembly/Packaging): sporadic use in housing, adhesives, and lead-frames or substrates

FUNCTIONAL USES

Automotive component	Function
Printed Circuit Boards (PCB): PTFE cores in high-frequency application for radios and radars (ADAS)	excellent stability of dielectric constant over temperature
Brackets: e-coat	Not yet identified
Fluoroalkyl Acrylate (FAA) coating in touch panels	Not yet identified
PFAS in liquid crystals cells of LCD modules (displays)	Very low water solubility/vapor pressure Dipole moment due to fluorine function leads to crystal-like orientation
Perfluoroalkoxy resin in wire of EM-modules	Not yet identified
PTFE in aluminium electrolytic capacitor encapsulation	Protection, chemical stability, low permeability
PTFE in film capacitors	Not yet identified

[3] Source: ZVEI

Automotive component	Automotive need	Electronic Component	Material	Function
		Epoxy adhesive in microcontrollers/ICs,	PTFE	
		Adhesive in SMI electronic components	PTFE	
	Heat and vibration resistant electronic components	Topcoat of SMD double layer capacitors	PTFE, PFPE	Heat resistance, chemical stability, durability
EV/HEV Battery Management System	Suppression of electromagnetic interference	PTFE tube in coils of common mode chokes	PTFE, TFM	
Antenna and Telematic Modules	To transmit high frequency signals	SMD coaxial RF connectors	PTFE	Dielectric, determines signal transmission characteritics
		Teflon tube in Diodes	PTFE	Heat resistance, chemical stability, durability, low friction
Engine	To measure the temperature of fuel, oil and water	Protecting tube and lead-wire protection film in Thermistors	ETFE, FEP, PTFE	Heat resistance and temperature cycle resistance (-50 to 150°C is a minimum requirement) in combincation with chemical/fuel stability, low permeability, durability.
		PTFE film in SMD switches	PTFE	Low friction, durability, water/oil resistance

Figure 7: Function of PFAS material

EMISSION CONTROL MEASURES

According to chapter E.2.11.3 and Figure 8, for electronics and semiconductors “significant emissions will occur during waste phase”.

But this does not apply to electronics used in the automotive/ transport sector. See Figure 9

“Despite the large tonnage of PFAS used in the transportation sector, emissions account for less than 1% of PFAS use. This low fraction can be explained by the assumed very low emissions from fluoropolymer use.”

All in all, emissions to the environment can be estimated as low because polymers of low concern (PLC) are mainly used.

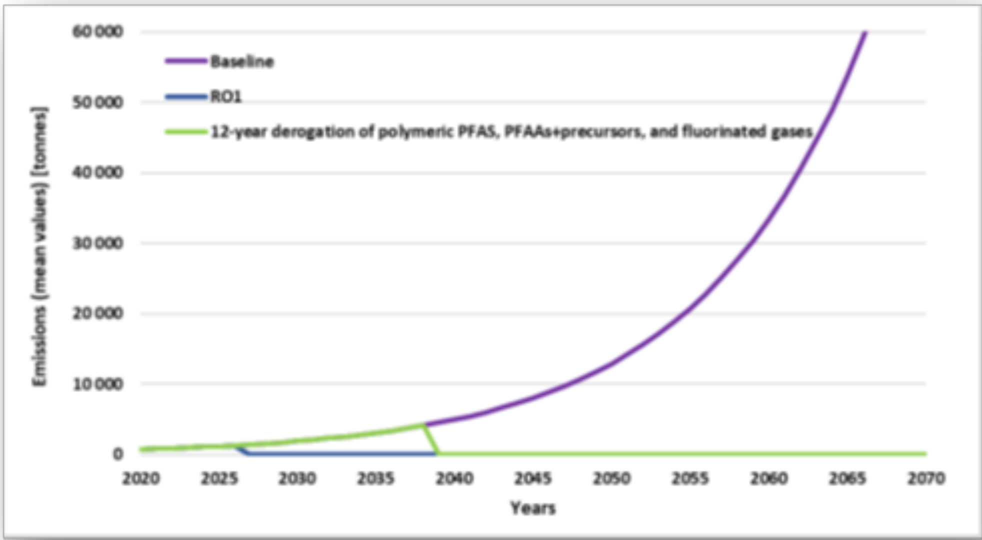


Figure 8: Expected PFAS use and emissions in EEA under the baseline in the electronics and semiconductor sector (mean values) [tonnes].

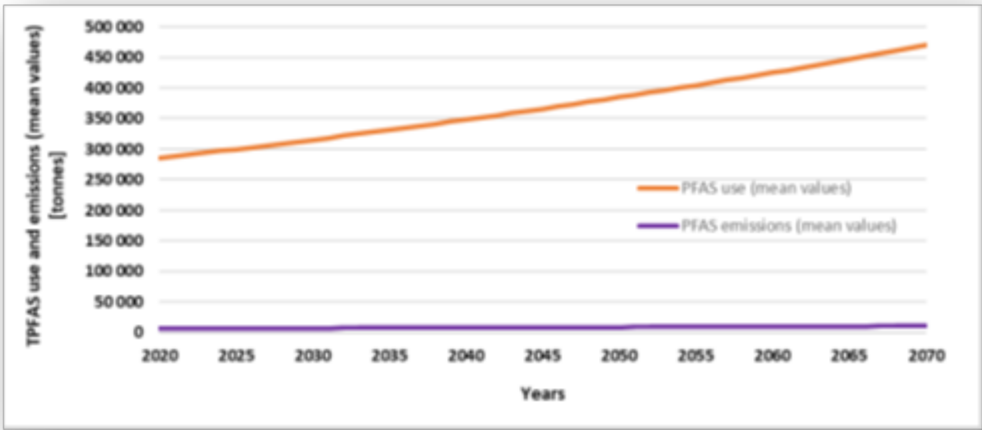


Figure 9: Expected PFAS use and emissions in EEA under the baseline in the transport sector (mean values) [tonnes]

ANALYSIS OF ALTERNATIVES

For cables for fuel level Sensor, and for pumps, **Polyamide** would be an alternative to ETFE.

Polyamide is available as an alternative insulator for SMD connectors containing PTFE.

Generally, there are overlaps between the main applications Electronics and Transport. So, would there are alternatives for fluoropolymers existing, alternatives for automotive electronic parts might be feasible. Until now, there is no alternative for PTFE identified.

For cables and for electronic components, at this time, there are no suitable alternatives with the same level of lifetime performance.

Main applications	**Sub-uses (non-exhaustive) of thoroughly investigated PFAS main applications**								
Medical devices	Implantable medical devices	Wound treatment products	Tubes and catheters	Metered Dose Inhalers (MDIs), e.g. as coating and propellant	Cleaning and heat transfer: engineered fluids	Sterilization gases	Diagnostic laboratory testing	Rigid gas permeable (RGP) contact lenses and ophthalmic lenses	Packaging of medical devices
Transport	Body-, hull- and fuselage construction	Sealing applications	Combustion engine systems	Electrical engineering and information technology	Safety equipment (incl. fire prevention and protection)	Hydraulic fluids	HVACR*-systems	Coating and finishings	
Electronics and semiconductors	Wires and cables	Coating, solvents and cleaning	Electronic components	Heat transfer fluids	Advanced semiconductor packaging	Photolithography			
Energy sector	Photovoltaic cells	Wind energy	Coal based power plant	Nuclear power plant	Proton exchange membrane (PEM) fuel cells	Electrolysis technologies (not PEM)	(Lithium-ion) batteries		
Construction products	Roofing	Bridge bearings	Sealings and adhesives	Processing aids and polymer processing aids	Coatings, paints, varnishes and impregnation	Coatings for wind turbine blades and solar cells			
Lubricants	Low viscosity lubricants	Solid/dry-film lubrication	Release-agents	Greases					
Petroleum and mining	Drilling fluids	Well stimulation chemicals	Anti-foaming agents	Water and gas tracers	Metal salts recovery	Lining of piping, seals, sensors, cables, etc.			

Figure 10 : non-exhaustive sub-uses of PFAS

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PTFE MEMBRANE

EXECUTIVE SUMMARY

- Fluoropolymers should be completely taken out of scope.
- PFAS monomers and processing aids should only be restricted, after performing appropriate risk analysis.
- Restricted PFAS (monomers/processing aids) need a derogation for minimum 13.5 years - Review needed after 5 years, if meanwhile alternatives exist and are industrialized.
- General exemption of all series and spare parts required (repair as produced).
- Circularity: Derogation for remanufacturing needed.
- PTFE membranes → currently no alternatives exist.
- Strict Recycling with a minimum quote of 95% of vehicles including its components according to ELV Directive 2000/53/EC.
- Best available and safe technology of PTFE production shall be assured by polymer manufacturers.

AUTOMOTIVE USES

The PFAS restriction proposal affects all vehicle types. All internal combustion engine (ICE) vehicles and electric vehicles (EV) are affected, later to a greater extent (PFAS weight percentage).

Regarding the PTFE membrane, these assemblies of the vehicles are affected:

Radar sensor, key receiver, key transceiver, door handle sensor, engine control unit, fuel cell control unit, transmission control unit, power control unit, aftertreatment control unit, body control unit, battery management system / controller, energy control units, voltage stabilization system, anti-theft system, instrument clusters, multi-function display, airbag control unit, crash satellites, speed indicator, transmission actuator, gearbox actuator, clutch control actuator, NOx sensor, pressure sensor, temperature sensor, mass air flow sensor, fuel delivery controller, electrical throttle control actuator, fuel supply unit, electrical water pump, belt starter generator, Inverter, Converter, Control Module, 48V / high voltage power electronics, 48V / high voltage battery controller, high voltage drive trains, high voltage battery junction box, etc.

FUNCTIONAL USES

More details of the main applications / functions of the membrane:

- Polytetrafluoroethylene (PTFE) is used to provide a thin, high-strength micro-porous membrane that has a unique combination of high airflow whilst also exhibiting high liquid entry pressure. Since PTFE has a high melting point and is chemically inert (i.e., stable), it provides unique performance at a broad range of temperatures and harsh chemical environments.

- Automotive Powertrain Vents use the micro-porous structure and hydrophobicity (i.e., water repellent nature) of PTFE as this allows gases to pass through the membrane while keeping out solid and liquid contamination. Furthermore, this serves as a structure for oleophobic treatment enabling repellence of low surface tension fluids commonly used in automotive applications. The PTFE provides high temperature resistance, chemical resistance, water protection (both submersion and high-pressure spray; with the following Ingress Protection (IP) ratings - IPx7, 8, 4, 6k, 9k), and dust protection (IP6x). This functionality allows passenger vehicles to safely operate in harsh weather conditions, un-improved roads/environments, etc. Additionally, the PTFE tape structure uniquely holds higher loading of aerogel compared to alternatives, leading to better blocking of heat, which better protects end users from burns.

- The use of PFAS ensures product functionality over long lifetime (up to 30 years). The long-term performance is based on the PTFE membrane characteristics in combination with oleophobic performance. While normal operating conditions are from -40°C to +125°C even more extreme conditions can be required. For example, -60°C for applications used in extremely cold climates; and up to > +150°C (peak) in energy sector (e.g., in hot engines). In these challenging conditions other membrane materials with same airflow performance could not survive. The overall combination of high airflow and high-water entry pressure (WEP) is unique to other materials.

What are the critical criteria / properties of the membrane in these applications?

- Chemically inert and hydrophobic, and therefore is not affected by chemicals or water that can cause other materials to lose their mechanical properties at high temperatures.
- Mechanical strength and flexibility, keeping the material cut- and scrape resistant even at high temperatures.
- A highly porous structure that allows electrical signals to travel at nearly the speed of light - with minimal loss or distortion at smaller dimensions and lower weight.
- Inherent flame-retardant material and meets the flame and smoke toxicity specifications without added flame retardants.
- Flexible at low as well as at high temperatures.
- UV resistance.

Why were this membrane / Fluoropolymer / PTFE chosen for this function e.g., cost benefit ratio, engineering considerations?

The technically most reliable solution in terms of the required properties / performance criteria, which is also required due to the higher severity. During the membrane change because of the PFOA ban a few years ago, alternative technical solutions with regards to design and materials were examined at OEM, Tier 1, Tier 2, Tier 3 and Tier 4 level.

The current PTFE membrane solution based on polymers of low concerns delivers sufficient performance, but less performance than compared to the previous membranes, which had PFOA contamination or PFOA degradation products inside. The current related PTFE membrane still has enough, however does no longer have the same level of robustness and resistance against the functional and safety relevant requirements while still maintaining the standards required.

There is a high potential risk that alternative materials to replace PTFE membranes will not be able to fulfil functional and safety relevant requirements.

Moreover, our investigation together with suppliers via the supply chain shows that the current state of Non-Fluorinated Polymer Processing Aid (or non-PFAS) technology cannot produce all the necessary grades of fine powder PTFE. While we are aware of multiple companies working on non-fluorinated processing aid technology, we do not yet see a clear path to a technically feasible solution that can produce most of the grades of fine powder PTFE required for high performance applications. In addition, we also have remaining questions regarding whether the current state of non-fluorinated processing aid technology can produce PTFE resin which compliant with other regulatory requirements related to fluorinated residuals.

We know from the investigations at that time that alternative solutions and materials are not yet available on the market. Elements like working temperature in combination with desirable surface tension cannot be provided by alternatives known today.

Polymer	CAS number	Critical surface tension in mJ/m2	Contact angle with water, in degrees
Acrylonitrile butadiene styrene (ABS)	9003-56-9	38,50	80.9
Epoxies	-	44,50	76.3
Fluorinated ethylene propylene (FEP)	25067-11-2	19,10	108.5
Hexatriacontane	630-06-8	20,60	108.5
Nylon 6 (polycaprolactum, aramid 6)	25038-54-4	43,90	62.6
Nylon 6,6	32131-17-2	42,20	68.3
Nylon 7,7	-	43,00	70
Nylon 8,8	-	34,00	86
Nylon 9,9	-	34,00	86
Nylon 10,10	-	32,00	94
Nylon 11	25587-80-8	35,60	82
Nylon 12	24937-16-4	37,10	72.4
Paraffin	8002-74-2	24,80	108.9
Polybutadiene	9003-17-2	29,30	96
Poly n-butyl methacrylate (PnBMA)	25608-33-7	29,80	91
Poly t-butyl methacrylate (PtBMA)	25189-00-9	18,10	108.1
Polycarbonate (PC)	24936-68-3	44,00	82
Polychlorotrifluoroethylene (PCTFE)	9002-83-9	30,80	99.3
Polydimethylsiloxane (PDMS)	9016-00-6	20,10	107.2
Polyethylene (PE)	9002-88-4	31,60	96
Polyethylene oxide (PEO, PEG, polyethylene glycol)	25322-68-3	43,00	63
Polyethylene terephthalate (PET)	25038-59-9	39,00	72.5
Poly(hexafluoropropylene)	-	16,90	112
Polyisobutylene (PIB, butyl rubber)	9003-27-4	27,00	112.1
Polymethyl methacrylate (PMMA, acrylic, plexiglas)	9011-14-7	37,50	70.9
Polyoxymethylene (POM, polyacetal, polymethylene oxide)	24969-26-4	37,00	76.8
Polyphenylene sulfide (PPS)	26125-40-6	38,00	80.3
Polypropylene (PP)	(a)	30,50	102.1
Polystyrene (PS)	9003-53-6	34,00	87.4
Polysulfone (PSU)	25135-51-7	42,10	70.5
Polytetrafluoroethylene (PTFE)	9002-84-0	19,40	109.2
Polytrifluoroethylene	24980-67-4	26,50	92
Polyvinyl acetate (PVA)	9003-20-7	35,30	60.6
Polyvinyl alcohol (PVOH)	25213-24-5	37,00	51
Polyvinyl chloride (PVC)	9002-86-2	37,90	85.6
Polyvinyl fluoride (PVF)	24981-14-4	32,70	84.5
Polyvinylidene chloride (PVDC, Saran)	9002-85-1	40,20	80
Polyvinylidene fluoride (PVDF)	24937-79-9	31,60	89

Figure 11: critical surface tension and contact angle with water for a selection of polymers.

Polymer Name	Working Temp Min Value (°C)	Working Temp Max Value (°C)
ABS - Acrylonitrile Butadiene Styrene	-60	89
ETFE - Ethylene Tetrafluoroethylene	-100	155
EVA - Ethylene Vinyl Acetate	-60	70
FEP - Fluorinated Ethylene Propylene	-150	205
HDPE - High Density Polyethylene	-70	120
HIPS - High Impact Polystyrene	-40	80
LCP - Liquid Crystal Polymer	-200	240
LDPE - Low Density Polyethylene	-70	100
PA 66 - Polyamide 6-6	-80	140
PAI - Polyamide-Imide	-196	280
PBT - Polybutylene Terephthalate	-40	140
PEEK - Polyetheretherketone	-65	260
PESU - Polyethersulfone	175	180
PET - Polyethylene Terephthalate	-40	140
PP (Polypropylene) Copolymer	-20	130
PSU - Polysulfone	-100	180
PTFE - Polytetrafluoroethylene	-200	290
PVC, Plasticized	-40	80
PVDF - Polyvinylidene Fluoride	-40	150
UHMWPE - Ultra High Molecular Weight Polyethylene	-30	130

Figure 12 : Working temperature of several polymers.

EMISSION CONTROL MEASURES

The following is more applicable for manufacturers and downstream users of a substance, rather than by OEMs and Tier1 (& Tier2).

If the substance is used in our manufacturing facility, what measures do we take to ensure safe handling and environmental release?

Most automotive companies use fluoropolymers in its final state. Means the production of fluoropolymers was done upstream in the supply chain. In the use phase / end of life phase of fluoropolymers, they remain chemically stable, non-toxic, not water-soluble and not mobile. Safe handling guides are available. Example are given in the following link:

https://fluoropolymers.plasticseurope.org/application/files/5116/3671/1909/Fluoropolymers_Safe_Hand_EN_2021.pdf.

During the production phase of fluoropolymers (done upstream in the automotive value chain), the Best Available Technique Approach shall be followed. That includes the management of emissions and replacement of PFAS-based process aids where possible. There are clear industry commitments in this regard. E.g., by the Fluoropolymer Group (The EU Industry Association of fluoropolymer manufacturers):

https://fluoropolymers.plasticseurope.org/application/files/4516/3367/9252/FPG_QA_RMOA_on_Fluoropolymers.pdf.

<u>One membrane manufacturer provided following statement on the emission control measures inside facilities:</u>

Our polymerization facility is equipped with state-of-the-art environmental controls* including: capture and recycling of monomers, a regenerative thermal oxidizer (RTO) with a caustic scrubber for air emissions and activated carbon adsorption beds to treat water effluent. The spent activated carbon beds are collected and thermally treated in a certified facility to regenerate the media. The facility continuously performs air monitoring with specialized maintenance restart leak testing, pursuant to a documented leak detection program. Wastewater samples are collected and analyzed daily and a bi-weekly report is sent to the central waste water treatment plant and to the local authorities. The fluoropolymer scrap materials are shipped for thermal destruction at a certified treatment facility. Strict procedures are followed throughout the manufacturing process to eliminate residual monomers from the fluoropolymer. These are industry standard practices and have been shown to result in monomer content of less than 0.01 ppm in the fluoropolymer (the limit of detection for test).

*As recommended in the EU BREF for polymer production:

https://eippcb.jrc.ec.europa.eu/reference/production-polymers.

<u>Are there additional measures that we could take, to support the overall objective of the restriction, with losing access to an important substance?</u>

Following input was shared by one of our PTFE membrane suppliers: Fluoropolymer manufacturing has a much greater potential to release non-polymeric PFAS to the environment than fluoropolymer processing. Using stringent environmental controls during manufacturing is essential to minimize emissions from manufacturing and as residuals in the finished polymers. Rigorous application of existing environmental regulations, strict adherence to Best Available Technique (BAT) and compliance with existing regulations and permitting is essential to minimizing environmental and health impacts of the fluoropolymers' early life cycle while retaining these products of high societal value. The residual levels of Polymerization Processing Aids (PPAs) in final resin could be regulated with control of downstream polymer processing and article production to eliminate emissions of the PPAs. There are clear industry commitments in this regard. E.g., by the Fluoropolymer Group (The EU Industry Association of fluoropolymer manufacturers)

https://fluoropolymers.plasticseurope.org/application/files/4516/3367/9252/FPG_QA_RMOA_on_Fluoropolymers.pdf

The "in life" stage of the fluoropolymer life cycle does not present the same health and environmental hazards of PFAS PAs and the low molecular weight, mobile, toxic and/or bio accumulative PFAS (such as PFOA or PFOS). The properties of some fluoropolymers like PTFE, ETFE, PFA and FEP are such that they do not display the environmental and toxicological profiles associated with these "PFAS of concern".

Indeed, these polymers are:

- chemically stable except under extremely harsh conditions, in no way representative of the environment or biota
- stable in the presence of microorganisms and biological fluids and tissues
- incapable of forming PFAA contaminants of concern in the environment or in the presence of biota, given their inherent stability
- negligibly soluble in water
- non-bioavailable
- non-bio accumulative
- non-toxic

The consequence is that there is no reason grounded in sound science for such fluoropolymers to be grouped with 'PFASs of concern' for regulatory purposes.

<u>If actors in our supply chain are proposing controls offering evidence of control in this area, we can re-iterate their proposals in support</u>

We support controls measures like BAT, BAT+ to be used wherever possible to reduce emission. We support those in the whole industry and believe production of high-performance materials like fluoropolymer can be achieved with very limited and controlled emissions. Regulations and directives are in place (IED, local emission permit, …) and can more effectively control emission than a restriction that would deny access to performance enabling safety, durability, and efficiency of vehicles.

ANALYSIS OF ALTERNATIVES

<u>Identify where commercially available alternatives do not exist and estimate time for them to be available in a production environment:</u>

We know from the investigations during the membrane change because of the PFOA ban a few years ago, that fluoropolymer-/PFAS-free solutions and materials are not available on the market.
The technical requirements could not be fully met by alternative materials, therefore no alternatives were offered by the supply chain and found during the market analysis.

Compare performance of alternatives to current substance

Due to the high severity, all requirements must be met. Other materials have failed and are therefore not suitable. Overall result: failed.

Identify cost impacts of alternative

Since there are no alternatives, a cost impact analysis cannot be carried out.

Supply and demand issues - can material producers meet the new increase?

We believe materials producers can meet the increase in new materials, but we doubt the overall emission, consumption of resource and production will be improved to the limited longevity and performance of alternative material.

Identify impacts to the end user (consumer) and end of life / disposal (if applicable)
Potential risk of higher severity: danger to life and limb, violation of the law. Additionally potential risk of incalculable service life due to systematic or randomly occurring failures. Since a long time, recyclability concepts are provided by the Automotive industry, to support the appropriate handling, recycling, treatment of end-of-Life Vehicles at the end of Product Life Cycle (e.g., Recycling Passports provided by suppliers / IDIS system (https://idis2.com/)). Due to the inert and safe properties of Fluoropolymers, no special handling is required and recommended by the Automotive industry for these Fluoropolymer containing articles.

Indicate industry time for change to move to this alternative (if available)

Since no alternatives are available on the market, these must first be developed, tested and introduced through the complete supply chain (from Tier 4 till to OEM). Fluoropolymers and F-elastomers (i.e., polymers of low concern) should be taken out of the scope of the PFAS restriction because there is no evidence, that the majority of used fluoropolymers / F-elastomers (about 94% according SETAC publication: https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4646) meet the OECD criteria of “polymers of low concern” of existing hazard or risks.

PFAS monomers and processing aids shall not be put under general suspicion of critical. The restriction must be carefully set up by substance related and risk based, under strict consideration of Article 68 REACh (“Introducing new and amending current restrictions”). For PFAS monomers and processing aids, which shall be restricted after considering REACh Article 68, suitable alternatives must be available on the market. These must first be developed, tested and introduced through the complete supply chain (from Tier 4 till to OEM):

- **The fluoropolymers should be removed from the scope of restriction as more appropriate risk management options are available to control PFAS emissions in the manufacturing phase.**
- **If fluoropolymers remain under the scope of PFAS restrictions, then a minimum transition period of at least 13.5 years is needed for PFAS monomers / PFAS processing aids.**
- **This exemption shall be reviewed and assessed by the Commission no later than 5 years after Entry into Force, to understand if alternatives are available.**

RISK IMPACTS ACC. TO ART. 68FF- REACH (COMMITTEE FOR RISK ASSESSMENT)

Fluoropolymers

6.0

PFAS - Risk Assessment		PFAS Restriction Proposal	Risk Assessment acc. to REACH / CJEU Case Law / ECHA Committee for Risk Assessment (RAC)			
			Phase	Hazard (RAC)	Exposure	Risk
Lifecycle Steps [a]	Processing	PFAS Production (raw material)	manufacture phase	yes	low	low
	Fabrication	Product Manufacturing		no	low	low (-> PLC [e])
	Usage (Consumer)	Product Use	use phase	no	low	low (-> PLC [e])
	Waste Disposal	Waste Management "landfill" [c]	end-of-life phase	no	low	low (-> PLC [e])
		Waste Management "incineration" [d]		no [b]	low	low

a) Lifecycle Steps - Cradle to Grave: from the raw material extraction through manufacturing & processing, transportation, usage & retail and use to final waste disposal
b) Fluoropolymers breakdown completely during incineration; no PFAS substances are produced; acidic decomposition products are generated but can be managed safely.
c) Waste Management acc. to Directive 2008/98/EC (EC 2008) / Directive (EU) 2018/851 (EC 2018) on Waste (Waste Framework Directive (WFD)) e.g., landfill
d) Waste Management acc. to Directive 2008/98/EC (EC 2008) / Directive (EU) 2018/851 (EC 2018) on Waste (Waste Framework Directive (WFD)) e.g., "Siedlungsabfall-verbrennungsanlagen (MVA)", "Sonderabfallverbrennungsanlagen"
e) Polymere of Low Concern acc. to OECD

Evaluation Criteria:		
Hazard	Exposure	Risk
yes	high	high
no	low	low

SOCIO ECONOMIC IMPACTS

Impact on consumers:

- Reduced durability.
- Increase in service parts.
- Increased service intervals and service costs.

Impacts to other EU initiatives and regulations:

- Increase in current CO2e performance.
- Impacts net zero CO2 strategies.
- High number of product adaptions.
- Applying the use of PFAS for Spare Part based on and with the “Repair as Produced Principle”.
- Applying the use of PFAS substances during Production of derogated PFAS.
- Applying the use of PFAS for O5A with connection to the production date before restriction entry into force.
- Applying the use of PFAS in vehicles type-approved before PFAS restriction entry into force and spare parts for these vehicles because the "PFAS-free" changes are vehicle type approval relevant.

HARDCHROME PLATING

EXECUTIVE SUMMARY

Further use of PFOS required for the hardchrome plating application which is in line with the EU POP Regulation and limited only for the use as mist suppressant in closed-loop systems.

A derogation influences the authorized hardchrome applications for the automotive industry with review periods up to 2032 and expected prolongation of these authorizations for several years.

Currently, the proposed restriction only considers hard chrome applications as potential derogation for consideration and 6.5 years estimated until 2031 (worst case).

The purpose of the POP derogation is workers safety by mist suppressant and should be strengthened by a derogation under the draft PFAS restriction and in line with the authorized uses under EU REACH.

Therefore, a derogation should consider 13.5 years to not conflicting with EU POP and other parts under EU REACH.

INTRODUCTION

The automotive industry fully supports the proposal to minimize the release and dispersal of PFAS through water and biota and as part of the CSS. We understand that substances that pose uncontrollable risks due to their properties should be regulated. However, the broad regulation of the entire group of PFAS substances seems not to be appropriate.

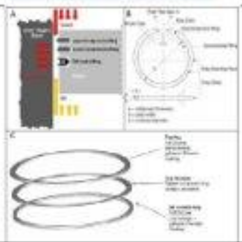
The relevant application hardchrome plating is already extremely restricted, first by REACH Annex XIV, allowing only authorized hardchrome applications for which no alternative exists. These applications had been scrutinized by ECHA, MS and COMM resulting in some automotive applications with review periods up to 2032.

Secondly, the important use of PFOS in mist reduction avoiding emissions has been seen of high importance to allow derogation under the restrictive EU POP regulation for closed loop applications as no alternatives exist.

acea
DRIVING MOBILITY FOR EUROPE

AUTOMOTIVE USES

The first part (fuel injectors, valves, piston rings) is relevant for ICE vehicles only while the second part and production tools are relevant for all kind of vehicles:

1. Parts without which a car would not start	
Fuel injectors: Essential function of the chrome layer to meet the current and future CO_2 targets under EU emission standards.	
Valves: Requires chrome plating for chemical and wear resistance, substituted (eg nitrocarburizing) in cases with lower technical requirements.	
Piston rings: Advanced particle enhanced chrome layer for compression and/or oil ring required to meet functionality and life time and to fulfill future emission legislations (eg CO_2/NO_x).	

2. Parts without which a car would not stop	
Brakes: Critical parts with strict design criteria, several years of full scale testing and type approval requirements, **not changeable for existing models and spare parts,** some brake callipers require nitrocarborizing, other callipers require chrome plating, brake exempter shafts and angle balls require chrome plating in heavy-duty drum brakes.	
Piston rods: The shock absorber rods are also relevant for short braking distance; any failure of the highly stressed functional chrome-plated layer is unacceptable.	
Tools to produce automotive parts: Not of direct use in the car, however, some tools, press dies, machinery and production equipment require the hardness to last longer and the low adhesion and thus being more efficient in producing thousands of parts.	

Main applications/functions

- PFOS to reduce the chromium(VI) mists in the baths for hard chrome plating. This important function has been recognized in the EU POP Regulation.

Critical criteria / properties of the substance in these applications

- Mist reduction is critical to reduce emissions of chromium(VI)

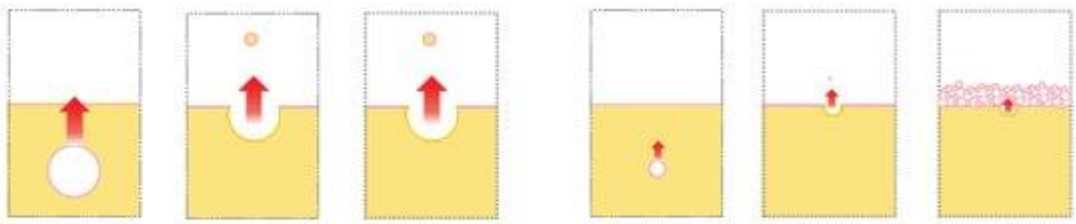


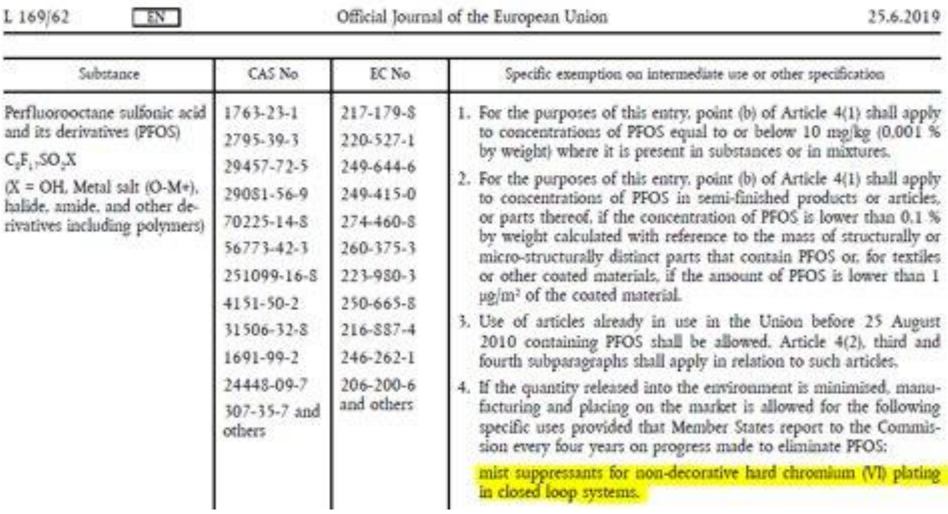
Figure 13: Illustration of the effect of mist reduction agent (right) and no mist reduction agents (left)

Figure 14: Emission of chromium during the processes (mist reduction agent (right) and no mist reduction agents (left))

What

Performance criteria required, external specifications, legal requirements etc?

Mist suppressant to reduce air contamination and Chromium(VI) emissions and reduction of chemicals.



L 169/62 EN Official Journal of the European Union 25.6.2019

Substance	CAS No	EC No	Specific exemption on intermediate use or other specification
Perfluorooctane sulfonic acid and its derivatives (PFOS) $C_8F_{17}SO_2X$ (X = OH, Metal salt (O-M+), halide, amide, and other derivatives including polymers)	1763-23-1 2795-39-3 29457-72-5 29081-56-9 70225-14-8 56773-42-3 251099-16-8 4151-50-2 31506-32-8 1691-99-2 24448-09-7 307-35-7 and others	217-179-8 220-527-1 249-644-6 249-415-0 274-460-8 260-375-3 223-980-3 250-665-8 216-887-4 246-262-1 206-200-6 and others	1. For the purposes of this entry, point (b) of Article 4(1) shall apply to concentrations of PFOS equal to or below 10 mg/kg (0,001 % by weight) where it is present in substances or in mixtures. 2. For the purposes of this entry, point (b) of Article 4(1) shall apply to concentrations of PFOS in semi-finished products or articles, or parts thereof, if the concentration of PFOS is lower than 0,1 % by weight calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS or, for textiles or other coated materials, if the amount of PFOS is lower than 1 μg/m² of the coated material. 3. Use of articles already in use in the Union before 25 August 2010 containing PFOS shall be allowed. Article 4(2), third and fourth subparagraphs shall apply in relation to such articles. 4. If the quantity released into the environment is minimised, manufacturing and placing on the market is allowed for the following specific uses provided that Member States report to the Commission every four years on progress made to eliminate PFOS: mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems.

Figure 15: Extract from PFOS restriction under POP

Why were this substance chosen for this function – e.g. cost benefit ratio, engineering considerations:

Low power yield at Chrome plating leads to the remaining electricity to be used for the electrolysis of water. Spray mist is formed by gas bubbles that burst at the electrolyte surface of up to 10 m/. Spray preventers reduce surface tension and prevent the formation of spray fog (gas bubbles that form are smaller and have fewer energy). The importance and alternativeness of PFOS has been scrutinized and accepted under the EU POP Regulation.

EMISSION CONTROL MEASURES

Measures taken to ensure safe handling and environmental release:

- Only allowed in closed loop systems.
- The aim of the use of the substance is solely to reduce emissions.

ANALYSIS OF ALTERNATIVES

Identify where commercially available alternatives do not exist and estimate time for them to be available in a production environment.

Substitutive mist suppressants are used in decorative chrome plating but not in hard chrome plating. The reason according to experts is found in the much higher current density and the much thicker layer structure in the hard chrome plating that causes the interference with these other mist suppressants or their degradation products. These technical requirements have been recognized in the exemption in the EU POP Regulation.

Identify cost impacts of alternatives

Costs are not the reason as alternatives are used in decorative chrome plating, however, these alternatives are technically not possible for the hard chrome plating (see above).

Identify impacts to the end user (consumer) and end of life / disposal (if applicable)

The mist suppressants do not enter the consumer phase, it is a pure issue in terms of workers safety in the plating industry. On top, use is only allowed in closed systems and disposal of the baths only under strict requirements of the authorities.

SOCIO ECONOMIC IMPACTS

Fuel injectors, valves and piston rings are only relevant for ICE vehicles while brakes and piston rods are required for all type of vehicles including the electric vehicles, additionally the machinery producing the vehicles require hard chrome plated parts. This is recognized by authorities through the long review periods for hard chrome applications under the many granted REACH authorizations for chromium trioxide. Without any of these parts, a vehicle cannot be completed and e.g. without brakes not be sold. The impact is high for our industries.

Include impact on consumers.

In final consequence when ignoring the given exemption under EU POP regulation, all authorizations under EU REACH, and the benefit on workers safety in the plating industry, no transport vehicles available for consumer or only without engine or brakes.

Identify impacts to other EU initiatives and regulations.

The draft restriction and the proposed draft derogation of only of 6.5 interferes with the derogation under the EU POP Regulation

The draft restriction and the proposed draft derogation of only of 6.5 interferes with the authorization under the EU REACH Regulation