2nd Stakeholder Consultation on a Restriction for PFAS
Fluoropolymers Product Group reply

V. Questions - Section A - General questions

Are certain uses of PFAS missing in the categories above?

- **Use of fluoropolymers (PVDF) as filtration elements:** Over the last 20 years, microfiltration ("MF") and ultrafiltration ("UF") have become ubiquitous in drinking water production and wastewater treatment worldwide due to their ability to remove harmful pathogens at >99.999%.
  Polyvinylidene Fluoride (PVDF, CAS 24937-79-9) stands out as the clear preferred material for filtration elements due to several key features: a) this **high purity plastic material meets the already stringent, and still evolving regulatory requirements for products used in drinking water production**; b) it is **resistant to a broad range of chemicals** including solvents and, more importantly in the water industry, acids, bases and oxidants and c) it can be converted into a hydrophilic material **with enhanced long-term resistance to fouling.**
  In conclusion, water and wastewater treatment needs the kind of stability and long service life that PVDF provides to make MF and UF and their undeniable public health benefits accessible to utilities around the world.

- **Fluoropolymer use in the chemical industry: Fluoropolymer use in the chemical industry is not addressed at all in the summary reports or listed as a specific use category**. In both the chemical industry and the petroleum/gas/mining industries, fluoroelastomers are, for example, used in seals and o-rings. Fluoroelastomers (such as FKM and FFKM) **increase seal performance** and **reduce maintenance in extreme chemical and temperature environments**. The seal is often the key point of failure and is therefore **critical to the overall equipment performance** and to **ensure safe operation**. Key applications in chemical processing and the oil and gas industry are, for example, downhole tools, valves, compressors, and pumps. PVDF is also used in this application of covers stock shapes, tubes, pipes used in extreme environment: hot and/or corrosive fluids and high purity water transportation, aiming at producing semi-conductors.

- **Fluoropolymer use in the aerospace & defense industry:** Fluoropolymer-containing products are also used in the aerospace industry which includes, for example, civil and military aviation, defense and satellite systems. These materials are used as **wear and friction components in jet turbine engines for commercial and military aircraft.** Such components are vane bushings, spacers, clamps, wear channels, and wear strips. **The high temperature capability** of these materials provides **significant weight reduction** in areas of the engine where metal components were previously used, allowing the engine to **consume less fuel.** The self- lubricating properties of parts made with this material technology provide **increased wear** and **durability, as well as low friction that extends the maintenance cycles** and improves **safety performance**. Fluoroelastomers are used in sealing applications to contain fluids in critical aerospace systems which **require superior chemical resistance** and a **wide temperature service range** when compared to other available elastomeric seal materials.

V. Questions - Section B - PFAS production (manufacturing) Questions in relation to the use (mainly for industry associations)

Do you have information that indicates that the information provided on the tonnage should be adjusted?

- [x] Yes
- [ ]

Please specify and/or refer to literature/public sources.

In 2017, FPG published its "Socio-economic Analysis of the European Fluoropolymer Industry" based on 2015 data. In 2015, around 52,000 tons of fluoropolymers were manufactured in Europe. A 2015 RnRMarketResearch.com report was expecting a 5.2% growth, in terms of volume, over the next five years. For PVDF the estimated growth is between 5-7%.

Based on this growth rate, FPG estimates the volume of fluoropolymer manufacturing around 54,700 tons in 2020. Therefore, the volume of fluoropolymers manufactured in Europe is at the lower range of the bracket proposed by the dossier submitters.

It is important to notice that even if the production of fluoropolymer is increasing potential industrial emissions are decreasing at the same time. This is due to important factors: progress of technologies, continuous improvement in emissions management and responsible manufacturing principles. (see FPG RMOA)

Do you have information that indicates that the information provided on the expected trend should be adjusted?

- [ ] Yes
- [x] No

Please specify and/or refer to literature/public sources.

The Members of the PlasticsEurope Fluoropolymers Product Group strive for better chemicals manufacturing, which is essential to prevent unforeseen emissions to the environment. Our manufacturing sites adhere to local and EU environmental regulation. Even so we are considering the continuous improvement via evaluation of additional measures that can further enhance responsible stewardship. Therefore, FPG members endorsed Responsible Manufacturing Commitment and Principles (See Chemservice RMOA attached to the questionnaire)

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Do you have information on risk management measures to minimize the use, human exposure and emissions to the environment?

- [x] Yes
- [ ] No

Please specify and/or refer to literature/public sources.

1. The evaluation of PTFE, ETFE, FEP, and PFA (Henry et al., 2018) shows that they satisfy the PLC criteria. These FPs are characterized by their high stability and the lack of environmental degradability. The industry currently evaluates other FPs to demonstrate their compliance with the PLC criteria. The results of this assessment are peer reviewed, to be published 10. 2021.

2. As FPs have very high MW, with most ranging from 100,000 to millions of Da, they cannot cross lung, skin, and gut these barriers and, consequently, they cannot be absorbed into the blood. Therefore, FPs are not bioavailable, and they are not capable of producing systemic toxicity. (RMOA 2.1.2. Hazard assessment - page 32 and onward)

3. Replies to RMOA questionnaire show: all FPs manufacturers implemented occupational health and safety management systems especially employees monitoring and control systems.

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V. Questions - Section D - PFAS production (manufacturing)
Questions in relation to impact of legislative measures (for companies and industry associations)

What is the economic impact (in euro) and social impact (e.g. jobs) on your business/company if the use of PFAS is prohibited?

a) In 3 years.

1. In terms of employment, Fluoropolymers contribute to over 23 million jobs across a range of critical industries (see FPG SEA):

   A. Direct employment: 1,700 people are employed in the FPG companies in the EU. Note this is just the companies taking part in FPG SEA. The number of employees directly related to the production of fluoropolymers in their basic form is 2,200 employees across the EU. These jobs will be disappeared if the use of PFAS is prohibited.

   B. Indirect employment: It is important to note that the direct jobs are simply the first stage in the value chain, employees are sustained from downstream activities. US FPs industry calculated a ratio of 1 direct job creates 9 indirect jobs. Therefore, 285,300 indirect jobs will be impacted by a phase-out. In total, 317,000 EU jobs are at risk.

2. In terms of economic impact, the industry is a highly innovative with an estimated €43m invested in R&D in 2015. In 2015, fluoropolymers sold were worth around €780m.

V. Questions - Section B - Waste
Questions in relation to the use (mainly for industry associations)

Do you have information that indicates that the information provided on the tonnage should be adjusted?

Yes

Please specify and/or refer to literature/public sources.

More than 50% of the fluoropolymers (FPs) in the market stays in use for many years, showing its durability and longevity. FPs have a small share by mass in the post-consumer waste streams. FPs are small fraction of the waste stream of complex end-products. Overall ~23 kt of FP waste was disposed of in 2017 (internal FPG study). To compared to the 313kt per year incinerated only by the Munich waste incinerator.

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V. Questions - Section E - Waste

Specific questions for the use

If available, please provide data on PFAS (or total F) measurements in flue gas, fly ash or bottom ash from waste incinerators (Energy from Waste installations, cement kilns, hazardous waste incinerator etc.).

Aleksandrov et al. (2019) reported no statistical difference between baseline PFAS emission levels and PFAS emission levels associated with incineration of polytetrafluoroethylene (PTFE) in a large pilot-scale facility representative of a municipal energy from waste (EfW) plant. Accordingly, they concluded that municipal EfW combustion of PTFE is not a significant PFAS emission source. When feeding elevated levels of fluorine in the form of PTFE for this testing, the authors noted "The fluorine content in the fly ash could be neglected compared to the HF [in the flue gas prior to control]."

According to Table 3.1 by Neuwahl et al. (2019) of the European IPPC Bureau, discharges of total fluorine from a European municipal EfW plant distribute as follows: 83-85% to bottom ash, 13-16% to fly ash, <1% to wastewater, <1% to wastewater treatment sludge, and <1% to atmosphere as cleaned flue gas. Their Figures 3.3, 3.4, 8.6, and 8.7 show the high degree to which plants achieve the 1 mg/Nm^3 for hydrogen fluoride (HF) emission limit.

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If available, please provide information on PFAS recycling.

The broad range of applications of FP in different end products increases the challenge for a proportionate recycling of FP. Incineration with energy recovery currently is the most eco-efficient waste management option for waste fractions containing fluoropolymers.

However, FP manufacturers work with users to recycle and reuse (Pro-K 2018) including: Primary recycling: direct reuse of ground PTFE; Secondary recycling: fluoropolymer thermo-mechanical processing or irradiation to create additives for other plastics; and Upcycling: pyrolysis yielding TFE and HFP monomers (Schlipf 2014, Invertec 2017, Pro-K 2018,PVDF recycling)