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Comments for Annex XV restriction report on Per- and polyfluoroalkyl substances (PFAS)

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Contents

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A. Introduction

IVK welcomes the opportunity to contribute to the public consultation issued by the European Chemicals Agency (ECHA) regarding the restriction proposal of Per- and polyfluoroalkyl substances (PFAS) under Regulation (EC) No. 1907/2006 (REACH). We appreciate the work performed by the five submitters of the restriction proposal and the efforts of the European authorities on the protection of human health and the environment in front of the effects of the PFAS substances that are of concern. However, we strongly disagree to restricting fluoropolymers (FLPs), which have completely different intrinsic properties compared to small molecule PFAS substances.

IVK Europe[1] represents the joint interests of companies producing sheets made of plastic and caoutchouc for a multitude of applications. IVK Europe's 13 company members create an annual turnover of close to 4.8 billion EUR and more than 12,000 jobs. Of IVK's 13 members, not all use fluoropolymers, but those that do have provided the following socioeconomic data.

The following table provides an aggregated overview of the volumes in metric tonnes of fluoropolymers used within the EEA by IVK members who participated in the public consultation. The majority of the fluoropolymer volume relates to the use of PVDF (polyvinylidene difluoride),

[1] IVK Europe: Home (ivk-europe.com)

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with some volume also contributed by THV (comprised of three different monomers: tetrafluoroethylene, hexafluoropropylene and vinylidene fluoride).

Tons of Fluoropolymer Used per Year				
2018	**2019**	**2020**	**2021**	**2022**
139	146	155	198	172

The IVK members who contributed to this submission have provided the following aggregated revenue figures for business related to fluoropolymers:

Revenue Related to Fluoropolymers (millions of Euros)				
2018	**2019**	**2020**	**2021**	**2022**
186	190	196	418	571

Across the companies that use FLPs, the number of workers potentially impacted by the proposed restriction is as follows:

Country	Number of Jobs
Germany	3,280
Belgium	200
France	120
Total	**3,600**

B. Request for exemption of Fluoropolymers

The proposed restriction does not differentiate between fluoropolymers (covering fluoroplastics such as PVDF, ECTFE, FEP, PFA, PTFE, etc., as well as fluoroelastomers such as FKM, FFKM, etc.) and other families of PFAS. Fluoropolymers have unique properties that distinguish them from other PFAS, and they do not have the environmental and toxicological profiles associated with some substances in this class of chemicals that are of concern. For this reason, we strongly

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believe that the restriction proposal should differentiate between the different families of PFAS based on their chemical composition, their toxicological profile, and the production method (e.g., the production of fluoropolymers without fluorinated polymerisation aids).

Fluoropolymers are durable, stable, and mechanically strong in harsh conditions in a variety of sectors including but not limited to automotive, aerospace, environmental controls, energy production and storage, and electronics, as well as in technical apparel. They are also stable in air, water, sunlight, chemicals, and microbes, and chemically inert, meeting the requirements for low levels of contaminants and particulates in manufacturing environments critical for the food and beverage, pharmaceutical, medical, and semiconductor industries. Finally, fluoropolymers are biocompatible, non-wetting, non-stick, and highly resistant to temperature, fire, and weather. These unique characteristics make them a critical material for a broad range of industries and sectors, playing a diverse and crucial role for society, with few, if any, viable alternatives, and making them essential in numerous technologies, industrial processes, and everyday products. Furthermore, the restriction of fluoropolymers will make it impossible to achieve key goals set by the European Union, such as the Green Deal, the transition to a circular economy, and the autonomy of Europe in critical technological sectors.

Beyond their socio-economic value for European industry, their unique stability means that they are low-risk polymers for human health and their environment. Trying to replace them in their many applications would lead to substitution with alternatives (when available) that do not provide the same advanced performance and safety as fluoropolymers. Furthermore, any alternative that may be suggested to replace fluoropolymers will need to perform at least at some degree (even if at lower levels) of chemical and temperature resistance, which means that such alternatives will likely be persistent materials like fluoropolymers.

Since fluoropolymers are different from the other families of PFAS, there is no scientific, economic, or social basis to justify regulating them in the same way as all the PFAS. For this reason, we request that fluoropolymers should be fully exempted from this restriction proposal under the REACH regulation.

C. Use applications

Several of the companies that make up IVK Europe use fluoropolymers in applications that span a variety of sectors. We believe these uses have been overlooked in the current restriction proposal, and we hope that the information provided below will help support a broad exemption of fluoropolymers, or at least derogation of these specific uses.

1. Tensile Architecture

This use application is considered by IVK to be missing from the restriction proposal and should be exempted. Although Annex E to the restriction proposal states that there is “High substitution potential at Entry into Force (EiF) for architectural membranes, we disagree with this assessment, and we appreciate the opportunity to provide more information.

1.1 Description of the product and its use

IVK’s member companies manufacture polyester fabric coated with flexible PVC for several applications. These companies produce PET/PVC/FLP membranes for building and construction applications including:

- Tensile architecture (roofs and facades),
- Modular buildings,
- Solar protection (window blinds & shades).

In most of those applications the membrane is supported by a metallic structure (mostly steel or aluminum.

Tensile architecture (roofs & facades) is the main field of application where FLPs are crucial to provide improved durability (at least 2 times higher than without FLPs) and anti-soiling and cleanability performance.

Light tensile membranes have several benefits such as:

- Low environmental impacts compared to alternatives solutions that are heavier (metal, aluminum, glass sheet, polycarbonate)
- Transparency and natural light penetration
- Solar protection (canopies, sails, awning, blinds)
- Lightweight buildings without foundation that are modular, removable, mobile, flexible.

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1.2 Functional properties required in use

FLP (PVDF and THV) top-treatment provides a significantly higher lifespan to the PVC-coated polyester fabrics. For instance, for tensile roofs, the durability is extended from 10 to 20 years or more thanks to FLP protection.

One key aspect for the construction of tensile envelopes is the requirement of durable performance, which is challenged by the inherent lightness of the membranes.

Required warranties requested by customers for these applications are a minimum of 10 years, and up to 30 years.

This level of durability can only be met by using fluorocarbon additives for:

- lacquering the coated fabrics to enhance the longevity and durability against weathering factors.

The standard range and above (>10y warranty) use lacquers which contain fluoropolymer additives.

1.3 Availability of alternatives

Among the various alternatives (for architectural membranes, technical textiles, TULAC) mentioned in the restriction proposal text we have the following comments to clarify:

Concerning the base fabric, many alternatives for fibers are mentioned such as cotton, polyester, polyamide, glass fibers, aramid, and carbon fiber, but none of them can be durably used in construction without being protected by a coating:

- Cotton, polyamide and polyester fibers are sensitive to UVs.
- Glass fibers are sensitive to hydrolysis.
- Carbon fibers are very fragile to folding.

None of these fibers can be used directly for outdoor applications exposed to rain, UV, etc. They must be coated to be protected against outdoor exposure. Moreover, the coating also improves the fire performance for fibers that burn easily like polyamide and polyester.

Please note that polyester and glass fibers are already the most widely used in coated fabrics for construction, but they must be protected and coated respectively with PVC/FLP and PTFE.

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Concerning the coating, many alternatives are mentioned among which polyurethane and silicone are the most relevant, but they are not suited for outdoor construction membranes:

- For PVC without FLP: As mentioned earlier, its durability is 10 years instead of 20+ years with FLPs.
- Silicone is very resistant to UV radiation, but it has poor soiling resistance and cleanability that makes it inappropriate for outdoor architectural uses. The Besiktas stadium roof in Istanbul is the only example of a big project done with silicone, and it failed after few years and has been replaced by PES/PVC/FLP membrane.
- Polyurethane is sensitive to UV radiation and has poor soiling resistance.
- Polyester/PVC membranes with TiO_2 are divided into 2 categories:
    - Photocatalytic TiO_2 (anatase): it makes the surface hydrophilic and promotes the development of micro-organisms (algae, etc.). In addition, the photocatalytic activity attacks the PVC and degrades it over the long term.
    - Non-photocatalytic TiO_2 (rutile): in this case, it is a standard PVC pigmented with white TiO_2 with 10 years durability, and it cannot work without FLPs for more than 20 years in long-lasting tensile architecture.
    - Dendrimers, polysiloxanes, paraffin-based formulations, modified melamine resins: these types of materials are inappropriate and clearly out of the scope of this application.

Concerning alternative membranes (fabric + coating):

- Polyester/PVC membranes with PVF film: membrane is more rigid with limited width and has never been widely used because of its significant disadvantages.
- Fiber glass/silicone membranes: This type of product has existed since 2000 but has not been commercially successful because of its fragility and very poor soiling resistance. Most projects fail, and the only big project (Besiktas stadium roof in Istanbul) failed after few years and has been replaced by PES/PVC/FLP membrane.
- Polyester-based membranes: Polyester fibers are already used for fabric, but they must be coated (mostly with PVC) for UV & fire protection and lacquered with FLP to make them durable enough for architectural uses.

<u>There is no alternative to FLP lacquer for polyester/PVC membranes that does not significantly degrade the durability and the soiling resistance.</u>

IVK Members have worked on developing alternatives to PES/PVC/FLP membranes over the last 20 years and never found any alternatives. The only existing alternatives to PES/PVC/FLP membranes on the market are glass/PTFE membranes using a FLP coating (PTFE). IVK Members

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have attempted to develop other alternatives like glass/silicone but always failed. IVK members also produce PES/PVC membranes without FLP but for other markets that do not need high durability and soiling resistance.

1.4 Product lifecycle

For polyester/PVC membranes, FLPs (PVDF and THV) are used as a lacquer on the top of the PVC coating. Consequently, they are used at very low rate: less than 1% of the total mass. However, the benefit to the final product is very important. Additionally, the suppliers of these FLPs are producing them without PFAS processing aids & surfactants (small PFAS molecules that are considered hazardous to the environment/human health).

While end-of-life appears to be one of the only significant concerns with fluoropolymers discussed in the restriction proposal, before speaking about end-of-life, it seems important to highlight that FLPs provide higher soiling resistance and higher durability to the concerned products.

A PES/PVC membrane with FLP (PVDF and/or THV) protective lacquer will last 20 years instead of 10 years without FLP. A PES/PVC membrane without FLP that is hardly cleanable and lasts only 10 years would not be used in tensile architecture applications (roofs & facades). Over 20 years of service life, a membrane without FLP would need to be dismantled and recycled or landfilled/incinerated (and replaced with a new one), while a membrane with FLP protection will cover the entire service life.

The FLPs in this application (PVDF and THV) are used at low percentages, because they are concentrated in the top protective layer. Nevertheless, they are essential to make polyester/PVC membranes long-lasting and performing acceptably for lightweight building envelopes.

Regarding end-of-life options, the majority of polyester/PVC membranes is incinerated in state-of-the-art incinerators. Recycling of PES/PVC coated membranes is technically feasible through existing mechanical and chemical recycling processes.

Texyloop is a mechanical recycling process that has been operational for 10 years in Italy (1,500 t/year). Polyloop[2] is a new mechanical recycling process inspirated from Texyloop but at lower scale to facilitate local recycling and allowing recycling of a wider variety of PVC composite

[2] Polyloop

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products. Polyloop is aiming to recycle more PVC composite materials, and it will be operational at the end of 2024.

1.5 Socio-economic impacts

Without exemption of fluoropolymers or at least substantial derogations, PES/PVC membranes could no longer be used in tensile architecture and related applications. This would result in big losses for the business of IVK members and consequently on the business of the downstream user industry that generate much bigger revenues/sqm, because membranes are a component of a more elaborate final product (roof, façade, …) that includes additional work of engineering, manufacturing, installation, and maintenance. As the membrane is the most important and visible component of the roof or façade, users cannot accept any solution without a durable and soiling-resistant membrane. If FLPs were no longer available for this application, the business producing these membranes would be terminated in the EU, and any continued manufacturing would have to be done outside the EEA.

Additionally, because end-users demand lifetimes which cannot be met with fluoropolymer-free membranes, they will be forced to use other types of materials (e.g. concrete, glass or steel) which have proven higher CO_2 emissions and do not provide same benefits and combination of performances (lightweight, sun shading, transparency, ….).

1.6 Other Impacts

In addition, another special membrane is being sold for its high translucence and fibre reinforced properties in the tensile architecture industry. This product can be classified as a "tensile reinforced ETFE membrane", sold only where glass and related high translucent composites together with ETFE foils can't be used structurally for the completion of the building envelope.

Tensile architecture relies only on membranes which contain fluoropolymers (as additives, coatings or fully). REF: https://publications.jrc.ec.europa.eu/repository/handle/JRC132615

Additionally, a Eurocode for execution has been submitted to EU commission. This Eurocode relies only on the use of fluoropolymer-containing membranes. REF: CEN/TC250 "Structural Eurocodes" | Eurocodes: Building the future (europa.eu) CEN TC 250 WG5 / TS19102

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1.7 Impact of a fluoropolymer restriction on EU policy areas

Polyester/PVC membranes have globally lower environmental impacts (especially carbon footprint) than the competitive heavier solutions (aluminum, steel, polycarbonate, glass sheet, etc.). Without FLP protection, they could not be used as a low carbon footprint alternative to those heavy solutions. Below is a comparison of the carbon emissions associated with such products:

For a polyester/PVC architectural membrane (1kg/m²) product for roofs, the global warming impact is 5 kg CO_2/m² (see French INIES database: *"ARCHITECTURE TENDUE - Membranes composites"*)

For a competitive large steel panel (8 to 13 kg/m²) product for roofs, the global warming impact is 27,9 kg CO_2/m² (see French INIES database: *"Couverture en acier simple peau ou peau extérieure d'une couverture double peau de masse surfacique comprise entre 8,05 et 13,35 kg / m²")*

For a competitive polycarbonate 20 mm (approx. 20 kg/m²) product for roofs, the global warming impact is 42,7 kg CO_2/m² (see French INIES database: "Grands éléments de couverture en polycarbonate [ép. 20mm] - DONNEE ENVIRONNEMENTALE PAR DEFAUT").

Coated textiles are lightweight materials that require fewer resources for construction compared to traditional building materials like concrete or steel. This means less extraction of raw materials from the earth and reduced energy consumption during manufacturing. By using coated textiles, we can significantly lower the demand for limited resources and mitigate the environmental impact associated with their extraction.

Additionally, the lightweight membrane allows for a lighter structure. A roof with metal panels requires a heavier metal structure than a membrane roofs and consequently higher impacts for the final roof (This is proven by LCA comparison). The lightweight structures made from coated textiles have lower transportation and installation costs. Due to their lightness, these materials can be easily transported, reducing fuel consumption and greenhouse gas emissions during transportation. Moreover, the installation process is simpler and quicker, requiring less heavy machinery and energy. This results in a reduced carbon footprint throughout the entire construction process.

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Coated textiles for solar protection also possess excellent solar protection, contributing to energy efficiency and reducing the carbon emissions associated with cooling. The advanced coatings applied to these textiles can provide comfortable indoor environments while reducing the need for excessive energy consumption. By utilizing coated textiles for solar protection, we can decrease the energy demands of buildings and subsequently lower their carbon emissions.

Furthermore, the use of coated textiles in lightweight structures enables greater design flexibility and adaptability. These materials can be easily manipulated and assembled into various shapes, allowing for creative architectural designs and efficient space utilization. As a result, it is possible to optimize the use of available resources and minimize waste during the construction process.

Lastly, coated textiles have a longer lifespan compared to some traditional building materials. When a lightweight structure made from coated textiles reaches the end of its life cycle, the materials can be recycled or repurposed, reducing waste and minimizing the demand for new resources. This promotes a more sustainable approach to construction and contributes to the circular economy.

In conclusion, building lightweight structures using coated textiles offers significant advantages in terms of resource depletion and global warming potential. These materials reduce resource consumption, lower transportation and installation costs, enhance energy efficiency, and promote design flexibility while being recyclable and durable. Embracing such innovations in construction can contribute to mitigating the environmental impact of buildings and fostering a more sustainable future. Combining the advantages of building lightweight structures using coated textiles with the key values of using fluoropolymer additives further enhances their sustainability and performance.

2. Flexible Membranes for Biogas Production

IVK would like to note that the application of fluoropolymers in architectural membranes for biogas production is missing from the current restriction proposal. This application is unique in that it overlaps the building/construction, technical textiles, and energy sectors.

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2.1 Description of the product and its use

Fluoropolymers are used in the production of roof membranes for flexible biogas production units.

Recent decades have demonstrated the importance of biogas production from agricultural, industrial, household and public waste waters. Fermentation of non-valorised organic residues from these industries, in so-called anaerobic digesters, allows the production of biomethane together with as valuable by-products such as pure CO_2 (needed for industrial applications) and natural fertilizers. The highest value product, the biomethane, can directly be injected into the natural gas network, greening the natural gas footprint, or it can be transformed into electricity and sold through cogeneration units. The byproducts are currently undervalued, but this is expected to change soon.

Production of biogas is currently supported by the Repower EU program set forth by the EU commission. The aim of Repower EU is to secure our energy supply and reduce our dependence on foreign energy in Europe. In 2022, EU biogas plants have generated more than 20 billion Cubic Meters (BCM) of biogas (biomethane has a LHV of 36MJ/m^3; LHV=lower heat value). European Commission and member states are currently deploying biogas plant support schemes with the ambition to reach 40 BCM by 2030. 40BCM represents approximatively 10% of our annual EU gas demand today. Supporting this ambition, several IVK members produce membrane technologies used in flexible biogas production plants.

The main technology of biogas plants involves the use of a double membrane flexible roof. The upper membrane protects the digester against environmental conditions, while the inner membrane acts like a lung, expanding during gas generation (fermentation), storing gas, and shrinking during further gas processing. Like tensile architecture, biogas membrane products have fluoropolymer additives both at fiber and lacquer levels. Addition of fluoropolymers allows the products to achieve durability and performance requirements for long term flexible gas barriers, but also for external envelopes. The warranty and use lifetime are over 10 years, reaching 20 years in some cases.

Biogas production has the potential to be a triple win for green energy, waste management, and bio fertilizers. It involves converting organic waste materials, such as agricultural waste and food scraps, into methane-rich biogas through the process of anaerobic digestion. This biogas can then be used to generate electricity and heat, reducing dependence on fossil fuels. Additionally, the

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waste materials are broken down, reducing the amount of waste in landfills, and the process also produces a nutrient-rich fertilizer for crops. Overall, biogas production can play a significant role in creating a sustainable future.

FLP-free coated textiles can be used in biogas applications; however, they typically benefit significantly from the addition of fluoropolymers.

Fluoropolymer treatment plays a crucial role in enhancing the performance and durability of coated textiles used in anaerobic digesters. These specialized treatments provide a range of benefits that are essential in the demanding environment of digesters.

2.2 Functional properties required in use

Fluoropolymer additives in coatings offer exceptional chemical resistance, protecting the textiles from the corrosive effects of acids, alkalis, and other aggressive substances present in the digester. This resistance ensures the longevity of the coated textiles, preventing premature degradation and maintaining their integrity over time.

Secondly, fluoropolymer treatments provide excellent water repellency, creating a hydrophobic barrier that prevents the absorption of moisture into the textile substrate. This is particularly important in anaerobic digesters, where high humidity and moisture levels are prevalent. By repelling water, fluoropolymer-treated textiles can maintain their structural stability, preventing the growth of bacteria or fungi and minimizing the risk of microbial deterioration.

Moreover, the low surface energy of fluoropolymers imparts non-stick properties to the coated textiles. This non-stick characteristic inhibits the adhesion of organic matter, sludge, or other residues on the surface, facilitating easy cleaning and maintenance of the digesters. It helps prevent clogging, reduces the frequency of cleaning cycles, and improves overall operational efficiency.

Furthermore, fluoropolymer treatments enhance the UV resistance of coated textiles, protecting them from the harmful effects of prolonged sun exposure. This UV stability extends the lifespan of the textiles, ensuring their continued performance even in outdoor installations where exposure to sunlight is inevitable.

In summary, the fluoropolymer treatment of coated textiles used in anaerobic digesters is essential to address the unique challenges of this environment. It provides chemical resistance,

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water repellency, non-stick properties, and UV stability, all of which contribute to the longevity, cleanliness, and efficiency of the digesters. By investing in fluoropolymer treatments, operators can optimize the performance and durability of their coated textiles, ultimately leading to more reliable and effective anaerobic digestion processes.

It should also be noted that the benefits of fluoropolymers in biogas plants essentially include everything discussed in section 1 under tensile architecture as well (lightweight, fewer resources required to build, lower carbon footprint, less transportation fuels used, etc.).

FLPs in lacquer
Fluoropolymers have an excellent water and oil repellency. Because of this, no dirt can adhere to the material and dirt which lays on the material is easily removed. No other material can offer this level of performance.

2.3 Availability of Alternatives

Fluoropolymer lacquer alternatives
Lacquers can be used that do not contain fluoropolymers but are instead completely acrylate based. However, using fluoropolymer-free lacquers results in a faster fouling of the material and a significantly reduced lifetime. This leads to negative economic and environmental effects (related to decarbonization and circularity).

2.4 Product lifecycle

Fluoropolymers are used as additives in the lacquer. However, the compatibility/crosslinking with the base material is very high, and there is no abrasion of the lacquer occurring in the application. Thus, there are not any emissions.

The most common routes of disposal today are landfill or incineration, but recycling is also possible. In the case of landfilling, the very low amounts of fluoropolymers would remain encapsulated in the PVC matrix.

2.5 Socio-economic impacts

Without FLPs, sufficiently durable biogas membranes cannot be produced for certain installations, which will have a significant impact on the biogas industry. It is estimated that ca. 30% of all biogas fabrics is based on FLPs. Downstream users demand lifetimes which cannot be met with fluoropolymer-free membranes. Hence, customers will choose other types of materials

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which have a higher CO_2 impact. If fluoropolymers could no longer be used for this application, this part of our business would have to be terminated. Workplaces would be lost too.

3. Coated Fabrics for Tent Applications

This use application is considered by IVK to be missing from the restriction proposal.

3.1 Description of the product and its use

Tent halls represent a significant application of PVC coated polyester fabrics. The size may vary from 5 to 60 m large and length from 10 to Hundred meter long for permanent ones. This application includes high end products with advanced properties and durability according to the required regulations of this EU sector. The materials produced are in all cases durable from 15 years for temporary, seasonal tents that are installed and dismantled several times for events or industrial halls to 25 years for fixed and permanent ones mostly used for industrial halls. These structures protect the covered area from external weather conditions. Buildings like tent halls or event halls benefit from membrane products which are both economically competitive and performing.

For both rental and long-term tent businesses, such lightweight membrane halls require durable performances challenged by the environmental conditions. In general, the premium part of the business requires warranties of 10 years and lifespan > than 10 years.

3.2 Functional properties required in use

These performances can only be met by using fluoropolymer additives for:

- lacquering the coated fabrics to enhance the longevity and durability against environmental conditions.

3.3 Socio-economic impacts

Fluoropolymer-containing tent fabrics constitute a significant revenue of our industry. Transition of Downstream Users to other (less sustainable) material types will lead in a loss of this turnover and loss of workplaces.

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3.4 Other impacts

Coated fabrics allow the construction of large & light tents using light fabric combined with a light metallic structure and without need of heavy concrete foundations. Those so-called tents or membrane buildings may be permanent (for long term use) or temporary. The temporary structures are modular, frequently dismantled and re-installed and durable. The latter are essential for supporting a variety of industrial activities (to adapt storage capacities) and for all events (sports, leisure, fairs, tradeshows, circus tents,…).

If the use of fluoropolymers in coated fabrics is derogated, the lacquers must also be derogated in order to allow for the manufacture of these coated fabrics. The listed profession relies on the use of fluoropolymers. Currently these materials are covering 100% of the recently submitted CEN TC 250 / WG 5 / 19102.
https://eurocodes.jrc.ec.europa.eu/policies-standards/centc250-structural-eurocodes
https://publications.jrc.ec.europa.eu/repository/handle/JRC132615

3.5 Impact of a fluoropolymer restriction on EU policy areas

Please refer back to section 1.7, as coated fabrics for tent applications share the same important benefits on circularity and decarbonization as they do in tensile architecture.

4. Window Profiles and Lamination Foil

This use application is considered by IVK to be missing from the restriction proposal.

4.1 Description of product

FLPs are used in lamination foils, which have a PVDF top layer for high performance properties. These foils are laminated on various substrates for the building industry - mainly window profiles and façades.

The lamination foil consists of a colored and, if necessary, printed base film and a transparent PMMA/PVDF layer on top. The PVDF layer is necessary for the high-performance and protection properties of the film, which can be used for decades in every climate. The warranty provided is up to 20 years.

4.2 Functional properties required in use

PVDF provides the following properties important to this application:

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- Weather resistance: low water absorption prevents shrinking and expanding.
- UV-resistance: lack of interaction with UV light prevents damage on the surface.
- Chemical resistance: no damage occurs on the surface using from cleaning agents. This also makes it possible to remove graffiti.
- Low surface tension: inherently dirt-repellent and therefore easy to clean.

4.3 Availability of alternatives

Alternative materials combining all advantages of PVDF (mentioned under 4.2) do not exist for these types of exterior applications (building sector) with such high-performance requirements.

An obvious alternative is a laminated foil without PVDF, which already exists for more moderate climatic conditions with lower requirements. However, the performance of such film with a PMMA top layer is not comparable with the PVDF product.

In the current restriction proposal, wood and aluminum profiles are mentioned as alternatives. This solution is out of scope because it is a totally different material basis compared to the PVC profile with film lamination. The proposal neglects that PVC window profiles have the highest share in the market. In addition, PVC profiles, due to their excellent insulation ability, are important to help reach the EU's goals of decarbonization and the green deal.

Substitution is not a promising solution. The nearest substitution would be to use a similar film without the PVDF surface, which is based on known components. However, such a foil would never provide the same performance as the current product.

4.4 Product lifecycle

The quantity of PVDF needed to produce the final film is very low. In thickness it is around 3% only. This means that a large amount of lamination film can be produced with a small quantity of PVDF.

End-of-life

PVC window profiles with PVDF surface can be recycled in the established way of the industry. The recycling process is organized by the different window profile system houses or by the organisation Rewindo.[3] Unusable profile sections from production can be recycled directly by the extrusion company.

[3] Rewindow

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4.5 Socioeconomic impact

The production of foils with PVDF surfaces would have to be discontinued because it is no longer possible to supply all markets (because of strong climatic conditions). This would result in a loss of turnover and a loss of workplaces.

4.6 Impact of a fluoropolymer restriction on EU policy areas

Circularity: The use of PVDF increases the durability and the life span of the product significantly compared to alternative products without PVDF. Therefore, replacement of the product is much less necessary, resulting in less impact on the environment. It is a main advantage of PVDF window profiles that they can use for a very long time (without additional maintenance). In terms of circularity, the best solution is to use materials that last for a long time, rather than using substandard materials that need to be replaced frequently.

Nevertheless, there is also an advantage at the end of the life span, which always comes at some point, because laminated window profiles can be recycled. An established business for this recycling process is already in place (see: www.rewindo.de).

The performance of window profile lamination films has been confirmed by RAL-Gütegemeinschaft Kunststoff-Fensterprofilsysteme e.V.[4] The films with a PVDF surface fulfill round about the double requirement given in the document RAL-GZ 716, where this requirement is already the high class of certification. Testing is done according to EN 513:2018.

5. Artificial Leather

Multiple IVK member companies are involved in the production of artificial leather upholstery for both, automotive and non-automotive applications.

The high abrasion and chemical resistance of PVDF allows to produce products with long lifetimes. Additionally, the material provides hygienic advantages in health care applications due to resistance to disinfectants, as well as reduced consumption of cleaning agents due to anti stain properties.

[4] GKFP

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The only alternatives for this application are acrylic lacquer systems. However, these would result in significantly reduced lifetime compared to PVDF.

If PVDF could no longer be used in the EU, our industry would be forced to use an inferior alternative such as acrylic lacquer for EU customers. For non-EU customers, relocation of this production outside the EU will follow. Our industry expects to lose important business parts due to reduced properties in the EU.