Safe Handling of Fluoropolymers: Best Practices for Workplace Safety and Emissions Control

Webinar hosted by the Fluoropolymers Product Group (FPG)

20 October 2025

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Webinar Agenda

- **About FPG** | Valentina Mauri
- **Safe Handling Guide – Part 1** | Kevin Cockshott
- **Next edition of Safe Handling Guide – Part 2** | Kevin Cockshott
- **Technical Exchange Platform** | Takayuki Nakamura
- **REACH Restriction Updates** | Valentina Mauri
- **Moderated Q&A**

Please note:

- The **Q&A** at the end of the event is with written questions only. Please share your questions for us via the Zoom Q&A tab. We will try to answer as many questions as possible. Note that we have a FAQ page on our website here: https://fluoropolymers.eu/faq/#about-product
- This audience includes the entire value chain and is the ideal platform to share evidence, listen, and engage constructively.
- The webinar is not being recorded.
- This presentation will be sent to all registrants.

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About FPG & fluoropolymers

Valentina Mauri
Senior Director
of Global Strategic Advocacy

About FPG

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The **Fluoropolymers Product Group (FPG)** represents Europe's leading fluoropolymer producers and experts

We are the voice of the industry calling for responsible manufacturing, sustainable life cycle management and regulatory clarity.

We are a Product Group of Plastics Europe, headquartered in Brussels.

We ensure that fluoropolymers can continue to play their vital role in enabling innovation and sustainability across key industries, including healthcare, renewable energy, semiconductors, transportation and more.

The FPG Members are:

AGC
ARKEMA
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GFL GUJARAT FLUOROCHEMICALS
GORE
Honeywell
SYENSQO ADVANCING HUMANITY
KUREHA

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Properties of Fluoropolymers

- Fluoropolymers differ fundamentally from other PFAS due to their unique properties.
- They are safe and durable by design.
- They can be safely manufactured, used, and managed.
- They are chemically inert, non-mobile, not water-soluble, and non-bioavailable. They remain stable under extreme temperatures and extreme environmental conditions.
- They are high-performance materials, which underpin many critical sectors such as healthcare, semiconductors, clean energy, manufacturing, transport and aerospace.
- They are non-replaceable, as current alternatives cannot match their unique combination of performance, efficiency, and safety.
- Fluoropolymers are crucial for preserving Europe's industrial resilience and innovation capacity. They are used in almost all sectors, often interconnected.

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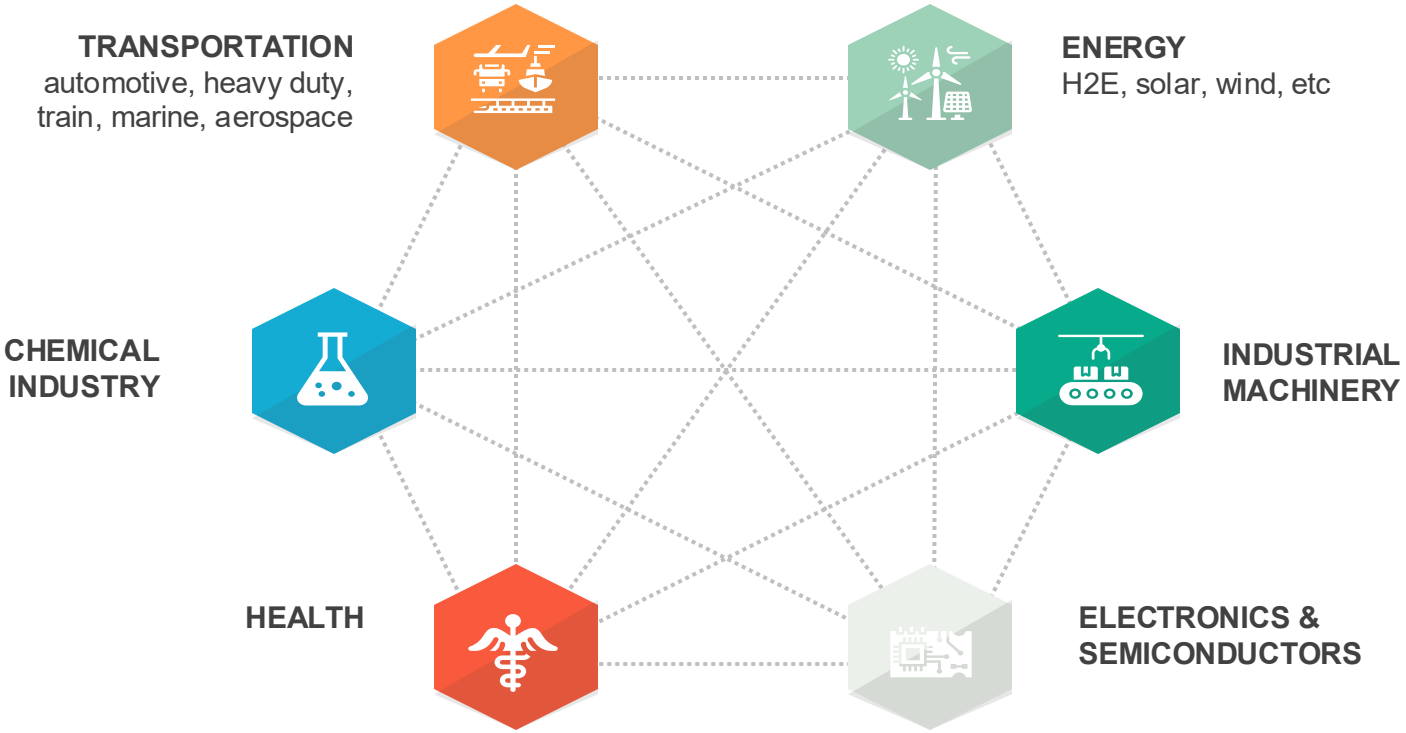
Europe is a net exporter of fluoropolymers.

The value of fluoropolymers sold in the EEA in 2022 was €1 – 3 billion.



Sectors are highly interconnected

Looking ahead

In the medical field, among many other uses, fluoropolymers **eliminate the need for invasive bypass surgeries** in patients with blocked arteries by using catheters.

Fluoropolymers in catheters offer low-friction, non-stick and clot-resistant surfaces that **improve patient comfort and safety**.

Please stay tuned for our upcoming webinar focusing on the medical sector.

Examples of Societal and Environmental Value

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- **Durability and Efficiency**: Extend product lifespans, reduce maintenance, and lower energy consumption, contributing to sustainability goals.
- **Climate Goals:** Their role in clean energy technologies (e.g., hydrogen, batteries) supports EU climate ambitions/
- **Health**: Ideal for medical devices because they are non-reactive with human tissue, making them safe for use in implants and catheters. They don't trigger immune responses or degrade inside the body, which is crucial for long-term medical applications.
- **Safety** : Their unique chemical and physical properties make them ideal for demanding environments where reliability, durability, and non-reactivity are critical.

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The FPG Manufacturing Programme

FPG and its members are committed to the safe use and sustainable manufacturing of fluoropolymers, as well as to responsible end-of-life solutions.

- **Voluntary Emissions Reductions** (link to 8 September webinar available in Appendix)

FPG members made a voluntary commitment in September 2023 to reduce emissions to water and air of non-polymeric PFAS residues from polymerization aid technology.

- **Safe Handling Guide** (covered today)

The updated and comprehensive guide is a commitment to inform downstream users of fluoropolymers on their safe handling and use.

- **Technology Exchange Platform** (covered today)

The platform was conceived to promote the adoption of commercially available state-of-the-art technologies to minimize non-polymeric PFAS emissions in manufacturing, while preserving confidential business information and IP rights.

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FPG's Safe Handling Guide – Part One

Kevin Cockshott
Advocacy Specialist

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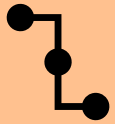
About Fluoropolymer Resins

Fluoropolymer resins are essential materials in high-performance applications across industries such as aerospace, electronics, healthcare, and energy.



They have unique properties such as chemical resistance, thermal stability, and non-stick characteristics.

Their safe processing and responsible waste management are critical to ensuring environmental and occupational safety.

Part One of **FPG's Safe Handling Guide** provides comprehensive guidance on the **Safe Handling Guide for Fluoropolymer Resins**.

FPG's Safe Handling Guide

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- FPG released **Part One** of their updated guide for the **safe handling, processing and waste management of fluoropolymer resins in September 2025.**
- **It is the first of two Guides** and cover materials such as PTFE, ETFE, FEP, PFA, PVDF, and ECTFE
- **Part two** is expected to be published next year, and will address fluoroelastomers and other specialty fluoropolymer substances
- Both editions aim to equip the industry and its downstream users with **robust safety information** and **best practices in emission control.** Fluoropolymer resins offer **outstanding chemical resistance**, thermal stability, and durability. However, as per normal industry practice, they **require specific handling practices to ensure safety and performance.**

The Guide is an essential pillar of FPG's Manufacturing Programme

Download your copy from the FPG website

Safe Handling Guide of Fluoropolymer Resins

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Part One of the FPG Safe Handling Guide

- **The Guide reflects current knowledge and best practices for handling fluoropolymer resins safely**, minimizing health risks and environmental impacts, and ensuring compliance with regulations across Europe and associated regions.

- **Fluoropolymer resins are generally inert and safe to handle at room temperature**. However, **thermal processing**—such as extrusion, molding, or welding—requires careful control due to the potential release of hazardous substances at elevated temperatures

It provides:

- Detailed recommendations for precautionary safe handling and risk mitigation
- In-depth information on the different types of fluoropolymer resins, including their thermal properties and specific handling requirements
- An extensive table summarising typical melting points, service temperatures, and processing temperatures for each polymer type

It covers safe practices for:

- Transport & unloading
- Manual handling (powders/dispersions)
- Mixing, sintering, extrusion, welding

Safe Handling Guide of Fluoropolymer Resins

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Table 1: Typical melting points, continuous use and processing temperatures of Fluoropolymers

Polymer	Typical melting point (C°)	Typical maximum continuous use service temperature (C°)	Typical processing temperature (C°)*
PTFE	330-340**	260	380
FEP	250-270	205	360
PFA	280	225-260	360-380
ETFE	180-280	150	310
ECTFE	190-240	150	280
PVDF	160-175 (homopolymers) 100-180 (copolymers)	140	230

*Note that the processing temperatures in this table are actual polymer temperatures, not oven or equipment temperatures which may be significantly higher.
**Gel point.

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Overview by type of fluoropolymer resins

Non-melt processable fluoropolymers

PTFE (Polytetrafluoroethylene): Exceptional chemical resistance and thermal stability, non-melt-processable and typically used in applications requiring high purity and non-stick properties. **Safe handling involves sintering processes and attention to thermal degradation.**

Overview by type of fluoropolymer resins

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Melt-processable fluoropolymers

- **ETFE (Ethylene Tetrafluoroethylene)**: A tough, UV-resistant resin with good impact strength and melt-processability. It is widely used in architectural films, wire insulation and more.
- **FEP (Fluorinated Ethylene Propylene)**: Offers PTFE-like chemical resistance but is melt-processable and transparent. Common in tubing and cable insulation.
- **PFA (Perfluoroalkoxy Alkane)**: Combines PTFE's chemical inertness with melt-processability, making it ideal for semiconductor and chemical processing.
- **PVDF (Polyvinylidene Fluoride)**: Mechanically strong, translucent resin with excellent UV resistance and piezoelectric properties. Used in batteries, coatings, and piping.
- **ECTFE (Ethylene Chlorotrifluoroethylene)**: Offers a balance of chemical resistance, mechanical strength, and processability. Used in linings and cable jacketing.

☑ **Safe handling includes avoiding overheating and ensuring proper fume extraction.**

Thermal properties and specific handling requirements

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Key Safety Takeaway (Standard industry practice)	Details
Temperature Control Is Critical	Process within recommended temperature range; overheating can cause thermal decomposition and release hazardous gases like hydrogen fluoride (HF).
Ensure Adequate Ventilation	Use local exhaust ventilation or fume extraction during heating and processing; prevent inhalation of fumes that can cause polymer fume fever.
Use Appropriate Personal Protective Equipment (PPE)	Wear gloves, safety goggles, eye protection, respiratory protection when handling powders or during thermal processing; protect against skin contact with hot materials and airborne particles.
Handle Powders with Care	Avoid creating dust clouds with powdered forms (e.g., PTFE); use dust control to reduce inhalation risk and prevent combustible dust hazards.
Fire Safety and Storage	Store away from open flames and high heat; though generally flame-resistant, fluoropolymers can release toxic gases when burned.
Waste Management	Dispose of waste according to local environmental regulations; avoid uncontrolled incineration; use approved recycling or disposal channels.
Training and Awareness	Ensure workers are trained in safe handling; maintain access to safety data sheets (SDS) and emergency protocols.

Standard PPE Requirements for FP Resin Safety

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Following standard good industrial practice

PPE Type	When Needed	Recommended Gear
Respiratory Protection	Formation of dust cannot be controlled adequately	CE-approved respirators for particulates
Eye Protection	During grinding, heating, or handling powders	Safety goggles or face shields to protect against splashes, dust, and thermal hazards
Hand Protection	During handling of hot materials or powders	Heat-resistant gloves for thermal processing; Chemical-resistant gloves when working with cleaning agents or additives
Skin and Body Protection	During processing or maintenance activities	Long-sleeved clothing or lab coats; Flame-resistant garments in high-temperature environments
Foot Protection	In industrial settings with risk of spills or heavy equipment	Safety shoes with non-slip soles and protective toe caps

Following standard good industrial practice:

- Ensure PPE is properly fitted and maintained.
- Train personnel on the correct usage and limitations of PPE.
- Combine PPE with engineering controls (e.g., ventilation) for comprehensive protection.

Fire Safety, Storage and Waste Management

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Although fluoropolymers are generally flame-resistant and difficult to ignite, they can burn under extreme conditions, releasing hazardous gases.

Prevention

- Store away from ignition sources and follow fire safety protocols
- Follow local regulations for disposal, including the safe disposal via incineration with emission controls
- Follow Firefighting guidance and explosion prevention in paste extrusion
- In case of fire then firefighting service should be informed of potential for toxic and corrosive gases
- Recycle where feasible through approved channels (mechanical, thermal, chemical)
- Air and water treatment technologies for PFAS and particulates

Overview

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Summary of typical melting points, service temperatures, and processing temperatures for each polymer type can be found in the guide. These are core manufacturing properties:

- **Melt-processability**: PTFE is not melt-processable, while the others are suitable for extrusion and molding.
- **Maximum Operating Temperature**: PTFE and PFA offer the highest thermal resistance, ideal for high-temperature applications.

Here are some of the broader performance properties that make manufactured FPs critical:

- **Chemical Resistance**: PTFE and PFA lead with exceptional resistance, making them suitable for aggressive chemical environments.

- **Mechanical Strength**: ETFE, PVDF, and ECTFE provide superior mechanical durability.

- **Transparency**: ETFE, FEP, and PFA are transparent; PVDF and ECTFE are translucent.

- **UV Resistance**: ETFE, PVDF, and ECTFE offer excellent resistance to UV degradation, suitable for outdoor and high-exposure applications.

This comparative analysis supports material selection based on specific performance needs in sectors such as **chemical processing, electronics, architecture, and automotive**.

Communicating Down the Supply Chain

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- FPG producers supply Safety Data Sheets (SDS) to direct customers for regulatory compliance.
- Once fluoropolymers are processed into articles, they fall outside the scope of REACH and SDS requirements.
- The Safe Handling Guide (SHG) provides extended safety information beyond SDS. SHG is designed to support downstream users- including processors, fabricators, and end–users.
- It promotes best practices in emissions control, handling, and workplace safety.
- SHG helps ensure consistent safety standards throughout the value chain.

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Key Takeaways

- Fluoropolymers are safe when handled correctly
- Risks are manageable with proper controls
- FPG supports best practices across the value chain
- The Safe Handling Guide (SHG) provides extended safety information beyond safety data sheets. SHG is designed to support downstream users – including processors, fabricators and end-users.
- Guide available to download, via Guide for the Safe Handling of Fluoropolymer Resins

The Safe Handling Guide, developed by the FPG, is primarily designed to support safe handling and industrial use of fluoropolymer materials within Europe and associated regions (including the EU, UK, Norway, Turkey, and Switzerland).

Next edition of Safe Handling Guide – Part 2

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Safe Handling Guide of Fluoroelastomers
Part Two of FPG's Safe Handling Guide

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Expanding FPG's commitment to responsible manufacturing and workplace safety, **Part 2** of the Safe Handling Guide will extend best practices to cover additional fluoropolymer materials and applications.

Part two will include:

- **Fluoroelastomers** (FKM, FEPM, FFKM)
- **Fluorionomers** and other specialty fluoropolymer substances

Objectives:

- Provide guidance on the safe handling, processing, and end-of-life management of fluoroelastomers and related materials.
- Support downstream users with practical recommendations for emission control, personal protection, and environmental stewardship.
- Ensure consistent industry standards across all fluoropolymer families, complementing *Part 1* of the Guide.

The second edition will be developed collaboratively by FPG members through the Manufacturing Programme and released in due course.

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Technical Exchange Platform

Takayuki Nakamura
Senior Technical Advisor

The Technology Exchange Platform (TEP)

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What is the TEP?

- The **Technology Exchange Platform** is an initiative being developed by **FPG** to support **collaboration and innovation in emission reduction** across the fluoropolymer industry, while protecting confidential business information.
- The platform builds upon the Safe Handling Guide and seeks to identify commercially available technologies to accelerate the reduction in non-polymeric PFAS residues in emissions to air and water, improve industrial hygiene, and enhance emissions monitoring and management.
- It facilitates the sharing of best available technologies by promoting proven technical solutions in support of sustainable manufacturing.
- It's a key part of FPG's broader commitment to **responsible manufacturing**, alongside voluntary emission reduction and safe handling guidance.

» As one of the **three pillars** of FPG's **Manufacturing Programme, the platform** underscores FPG's commitment to **transparency, sustainability, and continuous improvement** in fluoropolymer production.

The Technology Exchange Platform (TEP)

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What technologies are being used to reduce the emissions?

- With consideration of EU anti-trust law, it is up to each company to implement the technologies that it considers appropriate to reducing emissions at their manufacturing sites, notably considering the fluoropolymers produced and the specificities and usages of their manufacturing process.

- FPG members have agreed to collect information on commercially available **state-of-the-art technologies** in emissions' control and to establish a technologies' exchange platform allowing to share such best practices, while preserving confidential business information and IP rights.

At what level are emissions currently at fluoropolymer manufacturing sites?

- All manufacturers are working in close cooperation with their local authorities responsible for supervising and regulating the production sites, who are fully aware of the emissions levels at the relevant sites.

- The authorities collate comprehensive and detailed information on a regular basis.

Technology Exchange Platform (TEP) Progress

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How is the platform progressing?

- The platform has made important progress in 2024 and 2025, facilitating the exchange of information on advanced emissions control methods through regular meetings of experts under legal supervision.
- The information collected is then verified and consolidated prior to external communication.

→ A cross-sector report is being created, compiling the best available techniques to measure, prevent and reduce PFAS emissions to air and water.

Technology Exchange Platform (TEP) Next steps

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What are the next steps for the platform?

- The aggregated, anonymised input collected from the members of the platform on state-of-the-art technologies will be made available to stakeholders when fully consolidated.

- ‘We will initiate discussions with relevant European Union organisations that are dedicated to promoting industrial competitiveness and the advancement of key technologies essential for building a sustainable and competitive future.’

Key Takeaways

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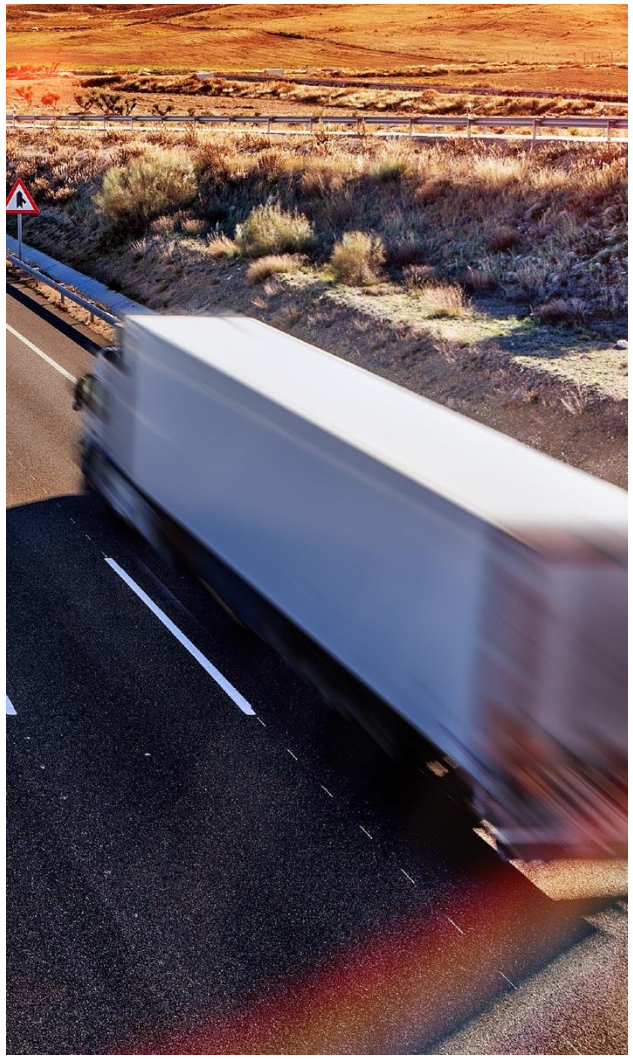
- **Accelerating Emission Reduction:** Currently focusing on non-polymeric PFAS residues in emissions to air and water, it accelerates emissions reduction by enabling members to learn from successes and challenges in fluoropolymer manufacturing.
- **PFAS Residue Reduction:** Focusing on non-polymeric PFAS residues helps minimize environmental impact and meet regulatory expectations effectively.
- **Facilitating Industry Collaboration**: The platform supports collaboration across industry to share knowledge and adopt best available technologies safely while safeguarding intellectual property and commercial confidentiality.
- **Supporting Sustainability & Transparency:** The platform promotes sustainable manufacturing practices, transparency, and continuous improvement in emission management



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REACH Restriction Updates

Valentina Mauri
Senior Director
of Global Strategic Advocacy

The PFAS REACH Restriction

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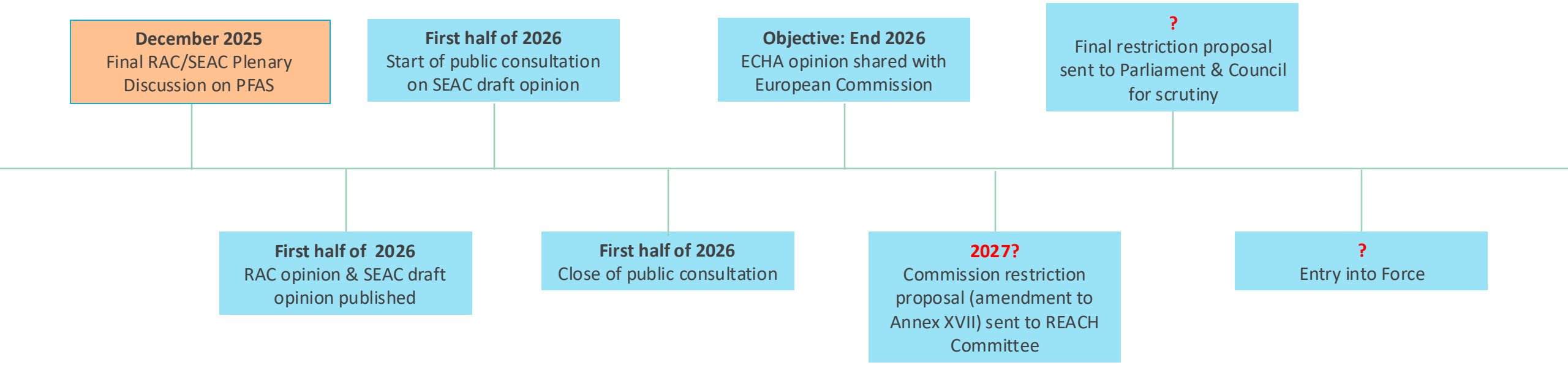
- In February 2023, ECHA proposed an EU-wide restriction on **all PFAS**, covering over 10,000 substances across 14 sectors—later expanded to include 8 more in the June 2025 update.
- **On 20 August 2025**, ECHA published an update for the Restriction Dossier - the **Background Document.** This is the Dossier Submitters' update to the initial restriction proposal.



The PFAS REACH Restriction – Next Steps

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Next steps:

- ECHA's assessment of the restriction is ongoing and scheduled to conclude at end of 2026.
- **ECHA plans to launch a public consultation on the draft SEAC opinion in March 2026. It will focus on the socio-economic impacts of the proposed PFAS restriction.**
- The European Commission should present a proposal soon after receiving ECHA's opinion.
- The consultation is expected to run for 2 months.
- The SEAC consultation is a critical moment for downstream users and stakeholders to **contribute evidence** and make their voices heard.
- Note: The submission process will not allow attachments and **only a limited amount of text** – so prepare early and condense the information you're providing => be clear, factual and concise.

→ ECHA will be hosting a webinar on 30 Oct from 11:00 to 13:00 EET **offering insights into the consultation process**. Register via below link:

https://www.echa.europa.eu/-/webinar-consultation-on-pfas-draft-opinion

Continuing our Collaboration

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FPG is **committed to promoting innovation, safe use, sustainable manufacturing and stewardship** across the industry for all our products. As the voice of the industry across Europe, we actively contribute to the debate, **advocating for a balanced regulatory environment based on scientific facts** to ensure that European industries remain competitive and sustainable.

- FPG and its members uphold the highest standards in responsible manufacturing and end-of-life management.
- Through our Voluntary Emissions Reduction Programme, members have successfully met EU and UK milestones, reducing non-polymeric PFAS emissions.
- The updated Safe Handling Guide equips downstream users with practical tools to ensure workplace safety and emissions control.
- The Technical Exchange Platform fosters collaboration and transparency, helping industry share proven solutions and accelerate sustainability progress.

Appendix

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- **FPG Manufacturing Programme (MP)**
  - FPG Statement on the Manufacturing Programme 2025 - Plastics Europe
    - Slides from the September MP webinar are available here: 8-Sept-2025-FPG-presentation-for-Webinar.pdf

- **ECHA publication 20 August 2025, Updated PFAS restriction proposal (Draft Background Document)**
  - https://echa.europa.eu/-/echa-publishes-updated-pfas-restriction-proposal

- **ECHA update on the timeline for the evaluation of the proposal**
  - 6775e241-204e-af0a-a2d0-4c16ba2c138d

- **FPG Statement on ECHA's Updated PFAS Background Document**
  - https://fluoropolymers.eu/2025/08/27/fluoropolymers-recognised-fpgs-statement-on-echas-updated-pfas-background-document/

- **FPG Statement, call for clarity**
  - https://fluoropolymers.eu/2025/07/10/fpg-calls-for-clarity-on-fluoropolymers/

- **FPG Press Release on the Updated Safe Handling Guide**
  - FPG Releases its Comprehensive Guide on Safe Handling of Fluoropolymer Resins - Plastics Europe

Q&A

Thank you

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https://fluoropolymers.eu/