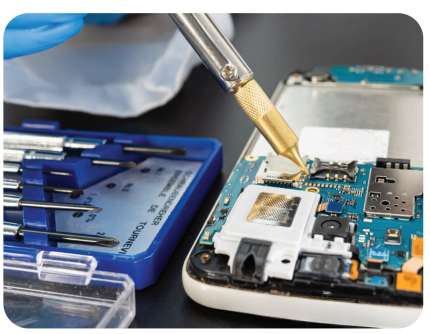
Fluoropolymers

Product Group of Plastics Europe

The Case for a Differentiated Approach to Fluoropolymers under the REACH U-PFAS Restriction proposal








November 2026

OUR ASK

FULL EXEMPTION AND CLARITY

The PFAS restriction should provide a **full exemption on fluoropolymer manufacture and uses.**

Immediate clarity on the long-term future of fluoropolymers in the EU is needed to avoid investment uncertainty and protect supply security.

REGULATE EMISSIONS, NOT MATERIALS

Fluoropolymers are considered safe in their intended use due to their properties. The principal issues relate not to fluoropolymers themselves during use, but to management **of non-polymeric PFAS emissions during manufacturing and end-of-life stages**.

The focus should therefore shift entirely to regulating and implementing robust emission reduction strategies.

LEVERAGING EXISTING LEGISLATION

The established framework of the **Industrial Emissions Directive (IED)** provides a mechanism for managing risks associated with emissions.

The IED sets permitting conditions and emission limit values based on **Best Available Techniques (BAT/BREF)**, which provides certainty for manufacturers to align their voluntary emission reduction efforts with official EU standards. At the end of life, fluoropolymer-containing waste can be safely managed through highly regulated waste treatment routes.

The proposed PFAS restriction covers thousands of substances with very different properties, uses and risk profiles. Fluoropolymers are a distinct subgroup that requires a differentiated regulatory approach. They are very large, stable and inert polymers used in applications where material failure could create safety, operational and environmental risks. A broad PFAS restriction applied to fluoropolymers would be disproportionate and would undermine Europe's industrial resilience and strategic autonomy.

THE CASE FOR EXEMPTING FLUOROPOLYMERS IS CLEAR:



Fluoropolymers do not pose an unacceptable risk

Fluoropolymers differ fundamentally from smaller PFAS substances typically linked to concerns about mobility, bioaccumulation or toxicity. Their ultra-long polymer chains make them stable, insoluble and chemically inert during intended use. As a result, they do not readily move through the environment or become available to living organisms as smaller PFAS substances.[1] [2]



Fluoropolymers are critical to Europe's economy & strategic autonomy

Fluoropolymers underpin Europe's industrial resilience, and are essential for applications in semiconductors, medical devices, transport, renewable energy and many other industries. Restricting them would weaken key value chains, undermine supply security and Europe's green and digital transitions.[3] In many applications, viable alternatives are not available. Where potential alternatives may be available, substitution would still require redesign, validation, and requalification, with potential performance or safety trade-offs.[4]



Fluoropolymers can be responsibly managed

Potential risks mainly relate to emissions of non-polymeric PFAS during manufacturing and at end of life. Manufacturing emissions are already being reduced through a dedicated industry Manufacturing Programme. At end-of-life, fluoropolymer containing waste represents less than 0.01% of European waste and is effectively handled through existing waste treatment systems, including waste incineration achieving destruction efficiencies of 99.9999%.[5][6]

WHAT IS AT STAKE?

Fluoropolymers are often used in small amounts, but they perform critical functions in high-value products and strategic technologies.

Their value lies in the combination of properties that ensure performance, safety and reliability under demanding conditions, including heat, chemicals, pressure and friction. This makes it difficult to replace them in many critical applications. A restriction would disrupt European economy and resilience. [3]

THE ECONOMIC IMPACT IS FAR LARGER THAN FLUOROPOLYMER PRODUCTION ALONE

€620 million
2,800 jobs

Fluoropolymer manufacturing in Europe supports around €620 million in output and 2,800 jobs.

€1.6 billion
14,500 jobs

Including suppliers and related upstream industries, this rises to around €1.6 billion in output and 14,500 jobs.

€360 billion
800,000+ jobs

Fluoropolymers are also essential enablers of downstream industries. In transport, energy and sealing applications alone, fluoropolymers support around €360 billion in output and more than 800,000 jobs.

These figures do not capture other critical downstream sectors such as semiconductors, clean energy, aerospace, defence, healthcare, chemical processing and advanced industrial equipment, meaning the real economic and strategic exposure is much higher.

Derogations would not safeguard strategic value chains

A derogation-based approach would not provide the long-term certainty needed for investment, production planning or supply security.

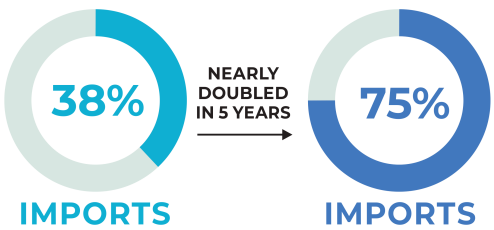
Many fluoropolymer applications rely on the same materials, production assets and supply chains across several sectors. If restrictions remove a large part of demand, EU production could become economically unviable – even where some uses are derogated. In practice, restricting some uses could jeopardise all uses.

PROTECT EUROPE'S STRATEGIC AUTONOMY

Europe needs its own fluoropolymer industry to secure strategic materials that are essential for key value chains. Yet dependence on non-EU supply has nearly doubled in just five years, with imports rising from 38% to 75%.

At a time when Europe is seeking to strengthen industrial resilience, strategic autonomy and clean technology deployment, a restriction could further weaken the remaining European fluoropolymer supply base by reducing demand, investment certainty and economic viability.

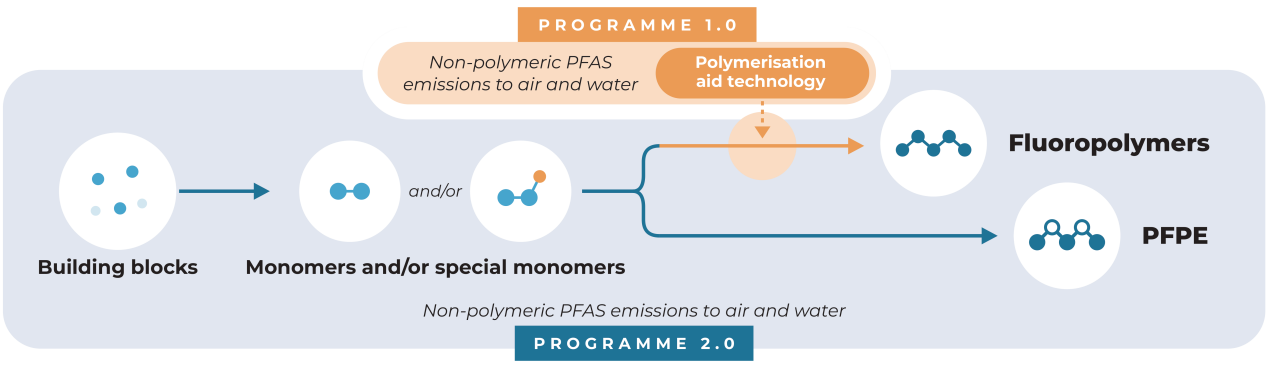
Europe needs a viable fluoropolymer industry of its own to secure strategic materials for today's critical applications and tomorrow's technologies.



MANUFACTURING

European producers are addressing non-polymeric PFAS manufacturing emissions through the Fluoropolymer Manufacturing Programme, launched in 2023 to reduce emissions, improve transparency and strengthen responsible manufacturing in Europe. The Programme is already delivering measurable reductions.

WHAT THE MANUFACTURING PROGRAMME COVERS



The Manufacturing Programme 1.0[7] focused on emissions linked to polymerisation-aid technology used in fluoropolymer production. The Manufacturing Programme 2.0 broadens the scope and covers emissions of non-polymeric PFAS across the full manufacturing process; from the integrated synthesis of precursors, monomers and specialty monomers through to the production of finished fluoropolymer products and PFPEs.

WIDER SCOPE, NEW TOOLS.

THREE PILLARS	MANUFACTURING PROGRAMME 1.0 Non-polymeric PFAS emissions linked to polymerisation-aid technology	MANUFACTURING PROGRAMME 2.0 Non-polymeric PFAS emissions across the full manufacturing process
1. Emission reduction Reducing emissions of non-polymeric PFAS residues from fluoropolymer manufacturing	**DELIVERED** **IN 2024** Each company achieved the following average emission factors: **AIR** below **0.009%** **WATER** below **0.001%** **IN PROGRESS** **BY 2030** Companies continue to work towards more stringent 2030 targets: **AIR** below **0.003%** **WATER** below **0.0006%**	**NEW** **BY 2030** Overall emission-factor target for all known non-polymeric PFAS residues from the combined monomer, fluoropolymer, fluoroelastomer and perfluoropolyether manufacturing process: Below **0.09%** for **AIR** and **WATER** combined
2. Technology exchange Supporting the deployment of state-of-the-art abatement technologies and monitoring solutions	**DELIVERED** Published air[8], water[9], and waste reports that outline the state-of-the-art technologies to prevent and reduce PFAS emissions	**CONTINUES** Technology exchange on best available emission-abatement solutions to share outcomes more broadly with stakeholders **NEW** Technology Exchange Platform for Analytical Techniques to support comparison of best practices and sharing of new analytical techniques and methods.
3. Safe handling Improving transparency and guidance for safe handling across the value chain	**DELIVERED** Published the Guide for the Safe Handling of Fluoropolymer Resins[10] – PTFE, ETFE, FEP, PFA, PVDF and ECTFE	**NEW** Expand the scope of the Safe Handling Guide to also cover: FKM, FFKM, FEPM, Ionomers, FEVE

Participating companies continue engaging with local authorities, support site-specific transparency, emission management planning and regulatory oversight.

Our priority is to **identify, control and continuously reduce non-polymeric PFAS emissions from fluoropolymer /PFPE manufacturing**, using effective technologies and operational measures. This delivers measurable environmental benefits while enabling continued production of fluoropolymers for critical applications.

The Participating Companies: AGC* ARKEMA Chemours DAIKIN SYENSQO GORE

* Due to the closure of its UK fluoropolymer manufacturing facility, AGC is not in a position to commit to the MP2.0 2030 emission-factor target.

USES & APPLICATIONS

SAFE USE IN CRITICAL APPLICATIONS

Fluoropolymers are generally considered safe during use. Their large, stable and inert polymer structure means they do not dissolve in water, cross cell membranes or break down into smaller toxic substances under typical conditions.

As a result, they are used in demanding applications where safety and reliability are essential, and where multiple performance requirements (e.g., chemical resistance, thermal stability, low friction, electrical insulation and biocompatibility) must be met.

They are found in components such as seals, membranes, coatings, cables, filters and piping; helping prevent leaks, corrosion, contamination and premature failure across many industries.



SUBSTITUTION CANNOT BE ASSUMED

Each use has specific performance, safety, qualification and operating requirements. An alternative that works in one use may not be feasible, safe, available or viable in another. Where alternatives exist, they may also carry their own hazard concerns, creating a risk of regrettable substitution.

The FPG Assessment of Alternatives study[4] found that, in the transport, electronics and semiconductor use cases examined, available alternatives do not meet the technical criteria needed to replace fluoropolymers:

In automotive applications, substitution is unlikely in the foreseeable term

In semiconductor applications, alternatives either fail critical performance requirements or lack evidence under real operating conditions

at least
€50 million
In one semiconductor use case alone, replacing fluoropolymer-based piping could cost at least €50 million

Substitution would also require significant time and investment in R&D, testing, certification, customer approval and manufacturing changes.

The study confirms that fluoropolymers' unique properties make them the best available solution for many strategic applications, with no alternatives meeting the necessary technical criteria in the case studies examined.

Similar findings have been reported by downstream users, who highlight the lack of viable alternatives for many applications, the technical challenges of substitution and the high socio-economic impact.[12]

Regulation should therefore be proportionate, evidence-based and recognise where viable alternatives are not yet available.

END-OF-LIFE

FLUOROPOLYMERS HELP PREVENT WASTE

Fluoropolymers' durability under demanding conditions reduces the need for replacement, repair and maintenance. Downstream users report that they can extend component and system lifetimes by factors of **3 to 10**, depending on the application. This directly supports the first and preferred step of the EU waste hierarchy: **waste prevention**.

FLUOROPOLYMERS REPRESENT A VERY SMALL SHARE OF WASTE IN EUROPE AND THERMAL WASTE TREATMENT IS EFFICIENT AND SAFE[5]

Fluoropolymers represent a **very small fraction of total waste.** The approximately 23,500 tonnes of fluoropolymer-containing waste collected in the EU in 2020 corresponds to less than 0.01% of total EU waste by mass.

Fluoropolymers are usually embedded in larger, complex products as thin coatings, linings, cable insulation, membranes, seals or gaskets. Their end-of-life route is therefore typically determined by the host product, rather than by the fluoropolymer material itself.

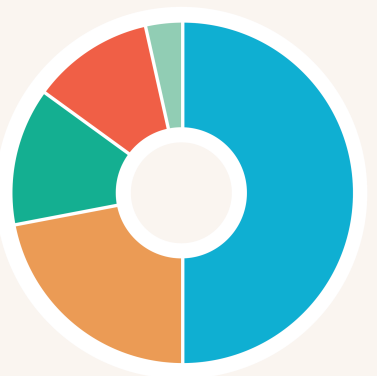
EUROPE ALREADY HAS EFFECTIVE ROUTES TO MANAGE FLUOROPOLYMER-CONTAINING WASTE[5]

Hazardous waste incineration achieves destruction efficiencies above **99.9999%** under regulated conditions. **Municipal waste-to-energy** shows comparable performance with hazardous waste incineration under routine operating conditions (supported by recent studies).[6][13][14][15]

Landfill is not the preferred route, but as the fluoropolymer materials are stable, they do not pose risks under landfill conditions.

Metal recycling: fluoropolymers are typically not recovered but thermally destroyed during smelting while the metal fraction is recycled.

Recycling is limited because volumes are low, materials are embedded in complex products, collection and sorting are difficult, and no secondary market exists at scale.



Main end-of-life routes

- Hazardous waste incineration: 50%
- Waste-to-energy: 22%
- Landfill: 13%
- Metal recycling: 11%
- Recycling: 3.5%

FURTHER SOLUTIONS ARE DEVELOPING

Innovative recovery and treatment technologies are under development and can complement existing end-of-life routes where technically feasible and environmentally meaningful.

THE SOLUTION

A PRAGMATIC, RISK-BASED REGULATORY FOCUS

A broad, 'one-size-fits-all' restriction lacks proportionality and is doing further damage to business confidence. The FPG calls for a risk-based differentiated approach that reconciles industrial and societal resilience:

1. **Full Exemption and Clarity:**
The PFAS restriction should provide a **full exemption on fluoropolymer manufacture and uses**. We need immediate clarity over the long-term future of fluoropolymers in the EU to avoid investment uncertainties.

2. **Regulate Emissions, Not Materials:**
Fluoropolymers are considered safe in their intended use due to their properties. Potential emissions of non-polymeric PFAS during manufacturing and end-of-life stages can be addressed by regulating and implementing robust emission reduction strategies. Recent studies have demonstrated that incineration achieves near complete destruction of PFAS.

3. **Leveraging Existing Legislation:**
The established framework of the **Industrial Emissions Directive (IED**) provides a mechanism for managing risks associated with emissions. The IED sets permitting conditions and emission limit values based on **Best Available Techniques (BAT/BREF)**, which provides certainty for manufacturers to align their voluntary emission reduction efforts with official EU standards. At the end of life, fluoropolymer-containing waste can be safely managed through highly regulated waste treatment routes.

CONCLUSION

Exemption with robust emission reduction strategies is a pragmatic solution that addresses concerns on PFAS pollution while providing the clarity needed to maintain investment and supply security in Europe.

A risk-based restriction that **recognises the voluntary manufacturing commitments** as a basis for alternative risk management will ensure timely implementation, simplify obligations, and sustain EU competitiveness and security. This approach should also reflect the available end-of-life evidence, which shows that fluoropolymer containing waste can be effectively managed through existing European waste treatment routes.

To maintain Europe's industrial base, support the green and digital transitions, and protect strategic autonomy, the only viable path is to distinguish between PFAS categories and provide a **full exemption for fluoropolymers**.

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About Fluoropolymers Product Group (FPG): The FPG is part of Plastics Europe, the industry association representing European polymer producers. It operates in accordance with the Plastics Europe governance rules, including Competition Compliance Rules. Plastics Europe covers the EU, plus UK, Norway, Turkey and Switzerland. The group's members are AGC Chemicals, Arkema, Chemours, Daikin Chemicals, Gujarat Fluorochemicals, Kureha, Syensqo, Solstice Advanced Materials, and Qnity.

MEMBER COMPANIES

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