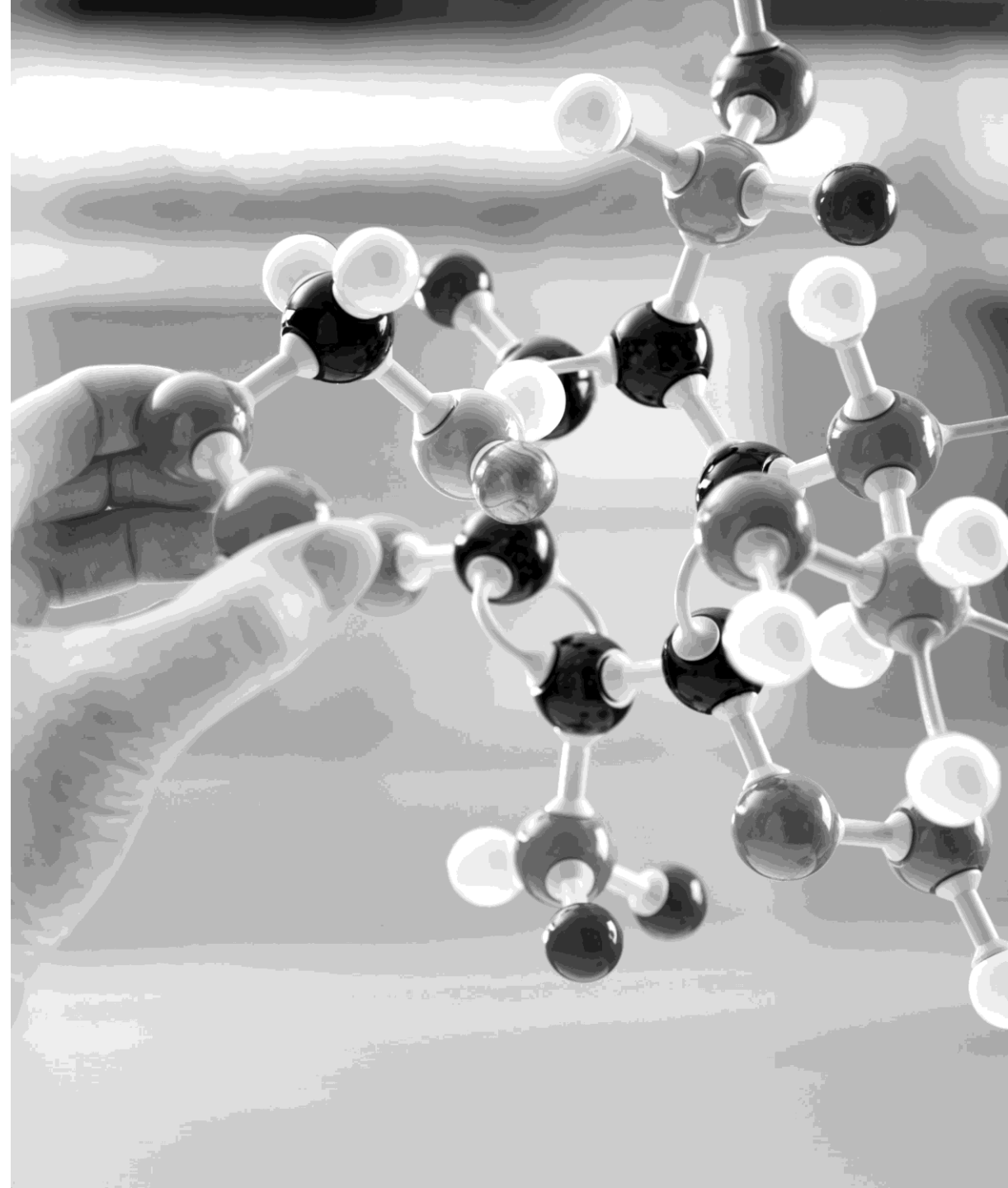


Turn **PFAS** restrictions into a competitive advantage.

PFAS are emerging as a major environmental and regulatory challenge across industries. But what if these challenges could be transformed into opportunities for your business?

By understanding the **evolving regulations and exploring alternatives**, you can stay ahead of the curve and unlock new avenues for growth.

Why don't you start right now?





Why would you care?

Per- and polyfluoroalkyl substances (PFAS) are a class of synthetic chemicals widely used across industries, but their increasing presence as environmental pollutants and associated health risks are raising alarms. As regulations tighten, the need to navigate these changes effectively becomes more urgent.

Manufacturers are facing mounting pressure to mitigate risks related to PFAS while also aligning with evolving regulatory frameworks. Now is the time for businesses to adopt proactive strategies that reduce their exposure and leverage new market opportunities.

With regulatory compliance and risk mitigation at the forefront, businesses can:

- Ensure adherence to upcoming regulations, **avoiding penalties and product bans**
- **Strengthen competitive positioning** by understanding market shifts and alternative solutions
- **Identify sustainable growth opportunities** through innovative approaches to PFAS alternatives

Let's delve into the challenges and actionable insights to turn PFAS-related risks into opportunities for your business.



What do you need to know about PFAS?

- **PFAS (per- and poly-fluoroalkyl substances)** are a group of **over 14,000 chemical compounds** that have been extensively used for decades in **industrial and consumer products** for their **exceptional resistance to heat, water, and oil**.
- These **man-made substances** are created by replacing **hydrogen atoms in carbon bonds with fluorine**, making them highly stable but non-degradable, earning the nickname "**forever chemicals**." Once released into the environment, PFAS cannot break down into simpler substances like carbon dioxide or methane, contributing to their extreme persistence. In addition to persistence, **certain PFAS subgroups exhibit concerning properties, including bioaccumulation in organisms, high mobility in water, soil, and air, long-range transport potential, and toxic effects on humans and ecosystems.**
- **Exposure to PFAS** has been **associated with serious health issues**, including cancer, liver and heart damage, as well as immune and developmental harm to infants and children.
- **Growing public awareness** of the dangers posed by PFAS, especially in drinking water and food supplies, **has led to increased demand for action from governments.** As a result, **strict new regulations are being implemented globally.**
- Restrictions and bans could have a profound **impact on manufacturers and users of these chemicals** if regulatory changes are not properly anticipated.



How will PFAS affect industrial companies?



Operations

Supply chain adjustments: Restrictions are forcing companies to source alternative materials, disrupting established supply chains.

Production modifications: Businesses need to redesign processes to eliminate or replace PFAS, which could lead to temporary production slowdowns, costs increase, and a need for R&D investment.



Sustainability

Sustainability goals: Many companies view PFAS regulations as a way to align with sustainability and environmental stewardship goals.

Reputation management: Adopting PFAS-free alternatives can improve public perception of companies involved in production.

A shift in consumer preferences: Growing awareness of PFAS risks might influence consumers to favor products labeled as "PFAS-free," altering market dynamics.



Financials

Increased compliance and certification costs: Industries must invest in testing, reformulation, and compliance documentation to meet new regulations.

Litigation and cleanup costs: Companies may face lawsuits or be required to remediate PFAS-contaminated sites, adding significant expenses.

R&D investments: The development of alternatives to PFAS requires substantial investment in research and innovation.



Competitiveness

Early adopter competitive advantage: Strict regulations are driving investments in R&D for PFAS-free alternatives. Companies that proactively phase out PFAS and develop alternative materials could be positioned as leaders in sustainability.

Innovation advantage: Companies with strong innovation pipelines may outpace competitors unable to adapt quickly.

To prepare your business for PFAS restrictions and seize new opportunities, begin by considering these key questions:

- What are the best-case and worst-case scenarios for supply chain and production transitions?
- How can the company prepare for each?
- How will these changes affect business continuity and the ability to scale operations in the future?
- Could the switch to PFAS alternatives be marketed as a step toward sustainability or adherence to stricter environmental regulations?
- How might this affect the company's reputation among customers, stakeholders, and regulators?
- What is the short-term vs. long-term financial impact of these changes?
- What pricing strategies can be employed to balance increased costs while remaining competitive?
- How can this impact my product portfolio?
- How are competitors addressing similar challenges?
- Are there lessons to learn or best practices to adopt?
- What are alternatives developed?
- What can be learned from a business and R&D perspective?

Are you ready for PFAS regulations?

Global PFAS regulations are evolving rapidly, driven by mounting pressure from civil society and a growing recognition of the environmental and health risks these substances pose.

While PFAS exposure is a worldwide challenge, regulatory approaches vary across regions, creating complex compliance landscapes for businesses.

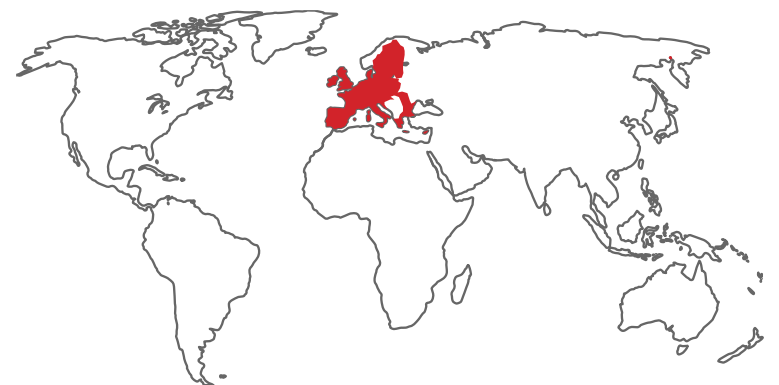
In some areas, regulations are being enforced aggressively, while in others, the pace of change is slower, yet still significant. Understanding the nuances of regulations in different regions is crucial for companies looking to navigate the shifting regulatory environment effectively.

Keeping up with these changes can provide a competitive edge and help businesses stay ahead of potential risks and compliance challenges.

	 EUROPE	 U.S.	 ASIA-PACIFIC
 KEY REGULATORS	European Chemicals Agency (ECHA)	- U.S. Environmental Protection Agency (EPA) - State-level agencies	National bodies, including: - Japan's and South Korea's Ministry of the Environment (MOE) - China's Ministry of Ecology and Environment (MEE)
 KEY REGULATIONS	- REACH - EU POPs - EU Restriction Proposal (2023) - Food Contact Materials - Cosmetic Products	- CERCLA (Superfund) - Toxic Substances Control Act (TSCA) - Safe Drinking Water Act (SDWA) - State-Level Regulations	- POPs - National regulations
 CURRENT PFAS RESTRICTIONS	MEDIUM HIGH Currently: Substance-specific restrictions (main focus on key substances, PFOS, PFOA, PFHxS) Aim: Comprehensive ban on +10,000 substances	MEDIUM Regulations are advancing at both federal and state levels, with some states (e.g., Minnesota, Maine) implementing stricter rules than at the federal level	LOW APAC countries have enforced PFAS restrictions under the Stockholm Convention (POPs) but are not pursuing broader bans (except in specific industries or countries)
 PARTICULARLY AFFECTED INDUSTRIES	- Textiles - Food packaging - Cosmetics - Firefighting foams	- Water utilities - Firefighting foam - Packaging - Textiles - Cosmetics	- Textiles - Food packaging - Cosmetics (South Korea, Thailand)

Europe: Denmark, Norway, Germany, Sweden, and the Netherlands are proposing a full PFAS restriction to phase out over 10,000 substances.

- The European Chemicals Strategy for Sustainability (2020) aims to phase out harmful chemicals, including PFAS, unless their use is essential. **Key regulations stem from the EU REACH** and, secondarily, the POP Regulation (aligned with the Stockholm Convention on Persistent Organic Pollutants), both of which **impose restrictions on PFAS**.
- The EU's regulatory approach to PFAS risks has largely focused on specific substances, primarily **PFOS and PFOA**. However, in January 2023, a proposal by five European countries (Germany, the Netherlands, Denmark, Sweden, and Norway) suggested a **comprehensive ban on PFAS production and use in the EU/EEA**. The restriction concerns around **10,000 PFAS** (defined as “Any substance that contains at least one fully fluorinated methyl (CF₃-) or methylene (-CF₂-) carbon atom (without any H/Cl/Br/I attached to it)”).
- Following public comment and ECHA committee opinions, the European Commission will decide on its adoption. **The law could potentially take effect in 2026 or 2027**. A complete ban, with a transition period of 18 months or a complete ban that includes time-limited derogations for certain uses, is investigated.



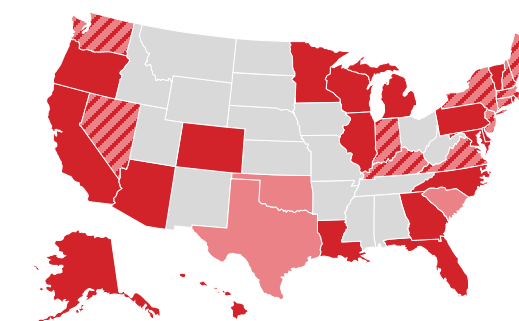
- 2009 ▪ The EU supports adding **PFOS** to the **Stockholm Convention**, targeting the global elimination of this chemical
- 2020 ▪ **PFOA** is banned under the POPs Regulation
- 2023 ▪ The Commission adds **PFHxS** group to the EU's POPs Regulation
- 2023 ▪ The national authorities of Germany, Denmark, the Netherlands, Norway, and Sweden are proposing a restriction covering a **wide range of PFAS uses**; the proposal is under review
- 2026 ▪ **PFHxA**, its salts, and related substances will face restrictions in the EU/EEA starting in April 2026

The proposal for a comprehensive ban in Europe, if adopted, would implement one of the world's most restrictive rules for PFAS, which would lead to a massive impact on industrial stakeholders.



U.S.: PFAS restrictions are increasing both at federal and state levels.

- In the U.S., regulation is advancing at **both federal and state levels**, driven by increased awareness and legal actions.
- The U.S. is **not officially a signatory to the Stockholm Convention**. This means the U.S. is not legally bound by the convention's provisions; however, it often aligns with its objectives through independent regulatory actions.
- At the federal level, the U.S. Environmental Protection Agency (EPA) oversees the regulation of harmful chemicals. Its main **focus is on controlling PFAS levels in municipal water supplies**. While no PFAS are outright banned, the EPA **promotes voluntary phase-outs by companies**. In April 2024, the EPA set the first national drinking water standards for PFAS, with Maximum Contaminant Levels as low as 4 ppt to protect public health. Additionally, **PFOA and PFOS were designated as hazardous substances** under CERCLA (Superfund), enhancing transparency and accountability in cleaning up PFAS contamination.
- In contrast, state-level regulations can be **significantly more stringent**. **Maine and Minnesota** have adopted PFAS restrictions similar to those under consideration in the EU. Other states have targeted PFAS bans in specific consumer-facing sectors, such as food packaging and cosmetics.



■ Introduced ■ Adopted ■ Introduced & Adopted

Policies for Addressing PFAS (as of Jan 2025, source: Safer States)

Leading states

Top 3 states in the number of adopted policies:

Main: 21
California: 20
New Hampshire: 15

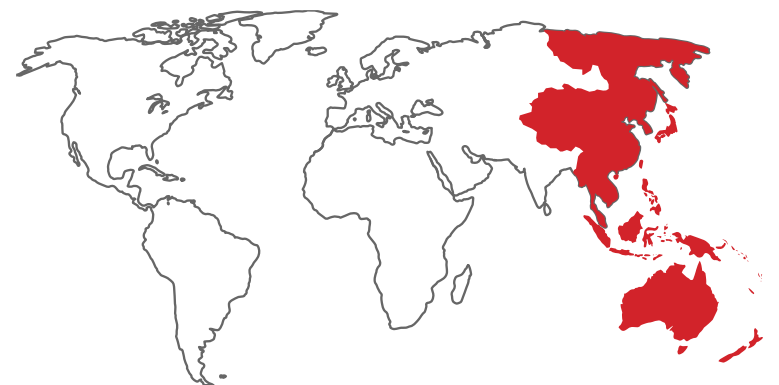
A wide product range ban is currently in place in 3 states:

Main
Minnesota
Washington

The complex and rapidly evolving regulatory landscape in the U.S. demands close monitoring to enable adaptation, foster the development of PFAS-free alternatives, and ensure compliance with both federal and state regulations.

Asia-Pacific: Despite certain restrictive measures and the adoption of the Stockholm Convention, the movement towards broader PFAS bans is limited.

- Several Asia-Pacific countries have initiated regulations targeting specific PFAS compounds, as the region generally aligns its efforts with international conventions like the Stockholm Convention. Under these international agreements, PFAS are often classified as POPs, resulting in restrictions or bans on major groups such as PFOA, PFOS, and PFHxS, including their salts and related substances.
- Several countries are advancing or planning stricter PFAS controls to keep pace with regulatory developments in the US and EU. For example, following the EU's lead, **New Zealand will prohibit PFAS in cosmetics starting January 2027**. Concerns over PFAS contamination in drinking water are also driving action. **Taiwan plans to impose limits on PFAS levels in drinking water by July 2027**, while **Japan enforces restrictions and monitors PFAS in its water supply**.
- In summary, the APAC region exhibits a diverse regulatory landscape concerning PFAS, with countries implementing bans and restrictions tailored to their national priorities and international commitments.



Key initiatives in major APAC countries



China

- In 2023, the country published its first **List of New Pollutants for Priority Management**, which includes certain PFAS substances, including PFOS, PFOA, and PFHxS.



Japan

- In September 2024, **138 PFOA-related compounds were classified as Class I Specified Chemical Substances**. This classification would prohibit their manufacture, import, and use, from January 10, 2025.



South Korea

- In June 2024, the Ministry of Environment (MoE) updated the list of persistent organic pollutants (POPs) to include perfluorohexane sulfonic acid (PFHxS), its salts, and related compounds.

Regulatory landscapes are continually evolving. Stakeholders in the APAC region should stay informed about national and international developments concerning PFAS to ensure compliance and mitigate potential risks associated with these substances.

What are alternatives to PFAS?

Significant progress has been made in developing PFAS-free materials that match the performance of traditional PFAS products, offering non-stick properties and water and oil resistance. While some PFAS-free alternatives are already available in the marketplace, most have yet to be developed or adopted, presenting opportunities for innovation and differentiation.

The table below highlights examples of PFAS-free alternatives across selected industries.

SECTOR	APPLICATIONS EXAMPLES	PFAS ALTERNATIVE EXAMPLES (APPLIED OR IN RESEARCH PHASE)	DIFFICULTY TO REPLACE PFAS
 Food Packaging	Bags, boxes, wrappers and lines, straws, bowls, plates, food-trays	Polylactic Acid (PLA), Silicone Coatings, Clay and Wax Coatings, Bamboo, Palm leaf	MEDIUM
 Construction	Roofing, flooring, insulation, heat pumps, cooling units, solar panels, wiring, sealants, adhesives, coatings, glass, plastics, rubber	Silicone-based materials (e.g., silicone-modified polyester), Acrylic-based materials, Polyurethane coatings, Epoxies, Bio-based materials, Titanium dioxide-based coatings, PVC-coated polyester, High-density polyethylene	MEDIUM/HIGH
 Medical Devices	Pacemakers, cardiac stents, joint replacements, orthopedic devices, surgical gloves, surgical devices, catheters, tubing, blood bags	Silicone-based alternatives (e.g., medical-grade)	HIGH
 Electronics	Electronic devices (e.g., Printed circuit boards), Semi-conductors, Manufacturing process (e.g., Heat Transfer Fluids)	Silicone-based alternatives, Acrylic resin, urethane resin, epoxy, mineral oils, vegetable oils, certain waxes, PVC, PP, PE, PEEK	HIGH
 Transport	Engines, Brakes, Fuel components, Electronics, AC, Lubricants, Seals, Coatings, Wiring insulation	Silicone-based materials, Acrylic-based materials, Thermoplastics and thermoset polymers, Graphene-based coatings	HIGH

Are you looking for inspiration?

As companies increasingly prioritize sustainability and regulatory compliance, many industry leaders are proactively investing in PFAS-free alternatives. These initiatives not only align with evolving global regulations but also position businesses as pioneers in sustainable innovation.

The table below showcases examples of companies that have transitioned to PFAS-free solutions, highlighting their strategic approaches and product offerings.

COMPANY	INDUSTRY	CASE STUDY
	 Chemicals	- Clariant is a global specialty chemicals company committed to sustainable and innovative solutions across various industries, including agriculture, automotive, and plastics - As of December 2023, Clariant transitioned to a fully PFAS-free additive portfolio. This proactive measure aligns with anticipated global regulations and underscores their dedication to sustainable solutions - Their PFAS-free offerings include Ceridust™ 8170 M (chemical family: modified maleic anhydride grafted polyethylene), a texturing agent for powder coatings, and the AddWorks™ PPA line of polymer processing aids
	 Construction  Textiles	- DesignTex is a leading company specializing in the design and manufacturing of applied materials for the built environment. With over 60 years of experience, they offer a diverse range of products, including upholstery, wallcoverings, panel fabrics, window coverings, and privacy solutions - Since October 2024, DesignTex eliminated PFAS from all their products and inventory. They offer a range of products without finishes, as well as alternative PFAS-free finishes that provide stain resistance, ensuring safety and durability without compromising performance. Additionally, their upholstery offerings are devoid of flame retardants and antimicrobial additives - DesignTex's sustainability initiatives extend beyond chemical elimination. Through its Loop-to-Loop platform, it has implemented programs to upcycle textile waste into new yarn, contributing to a circular economy
	 Food Packaging	- Tetra Pak is a leading global provider of food processing and packaging solutions, renowned for its aseptic packaging technology that extends the shelf life of perishable products without refrigeration Tetra Pak has stated that there are no PFAS in Tetra Pak packaging, except for a few references where the quantities are minimal and well below current European regulatory concerns. Tetra Pak is committed to phasing out PFAS in the near future, anticipating that other packaging producers might be required to do so by law in the next decade - The company has developed an aseptic carton, the Tetra Brik Aseptic 200 Slim Leaf, which features a paper-based barrier that significantly reduces the use of aluminum. This innovation decreases the carton's metal content to 0.05%, compared to the typical 5%, and increases its renewable content to 90%. Additionally, this carton is free of PFAS

What are the risks of ignoring PFAS restrictions?

As regulatory pressures surrounding PFAS continue to escalate, particularly with increasing restrictions, major manufacturers are facing significant challenges in adapting to this evolving landscape.

The following case studies highlight how companies are taking decisive actions to adjust their operations, mitigate legal liabilities, and manage reputational risks in response to PFAS regulations.

COMPANY	INDUSTRY	CASE STUDY	IMPACT
	 Chemicals	Chemours was created in 2015 as a spin-off from DuPont, a company that had been a major player in the development and production of PTFE (known as Teflon). The company communicated that it plans to eliminate at least 99% of PFAS air and water emissions from their manufacturing processes by 2030. In parallel, however, Chemours has actively lobbied within the European Commission, including engagements with the Directorate-General for Research and Innovation, seeking additional exemptions from the proposed PFAS restrictions.	▪ Reputational impact: Negative publicity from environmental harm erodes public trust and impacts relationships with stakeholders, including investors and local communities ▪ Financial impacts: Chemours has faced legal actions from various entities alleging PFAS contamination. For instance, in June 2023, Chemours, along with DuPont and Corteva, agreed to a USD1.19 billion settlement to resolve claims that they contaminated U.S. public water systems with PFAS ▪ Extra expenses (lobbying against PFAS ban): Efforts to secure derogations and influence PFAS-related policies demand time, financial resources, and strategic focus that could otherwise go toward innovation or expansion ▪ Impact long-term is currently unclear and will depend on the success of its lobbying actions. The chemical sector benefits from favorable attention within the European Commission, particularly as Brussels prioritizes "competitiveness." This focus could lead to more lenient regulations or policies that balance environmental concerns with industry growth, providing some relief to affected companies in the short term
	 Chemicals	3M (Minnesota Mining and Manufacturing Company) has been closely linked to the development, production, and use of PFAS for decades. The company developed Scotchgard™ (a water- and stain-repellent product) and became a major supplier of PFAS for industrial and consumer applications.	▪ The impact of PFAS restrictions on 3M, a major producer and user of PFAS in various industries, is significant and multifaceted, affecting its operations, finances, and reputation ▪ Phase-Out of PFAS Production: In 2022, 3M announced plans to discontinue PFAS production by 2025. This decision involves restructuring operations and potential layoffs ▪ Litigation and Settlements: 3M faces numerous lawsuits related to PFAS contamination, with substantial legal and settlement costs. For instance, in 2023, 3M agreed to pay over USD 10 billion to settle lawsuits regarding PFAS contamination of water supplies



Wrapping up

The increasing presence of PFAS is prompting **regulatory changes that manufacturers must navigate effectively**. The focus has shifted from whether to transition away from PFAS to how to do so in the most strategic and effective way.

The growing environmental and health risks associated with PFAS, alongside tightening global regulations and rising consumer **demand for safer, more sustainable alternatives**, make it crucial for businesses to act quickly. Manufacturers now face **the challenge of adapting supply chains, exploring safer material alternatives, and complying with rapidly evolving regulations**. With regional regulatory variations, staying ahead is **key to avoiding fines, legal penalties, and reputational harm**. Meanwhile, those who delay action risk losing market share to competitors who prioritize PFAS-free products.

To navigate these challenges, manufacturers need a strategic, data-driven approach. Developing a roadmap for phasing out PFAS, informed by industry trends, market shifts, and competitor actions as well as exploring alternative logistical chains, is essential for success.

If this challenge resonates with you, now is the time to **explore how you can turn PFAS restrictions into opportunities**. The path forward lies in informed decision-making and tailored strategies to ensure compliance while seizing the potential of safer, alternative solutions.

Ready for more insights? Let's connect.



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