

WE NEED TO TALK ABOUT PFAS

Turning a risk into an opportunity

From ski wax to food wrappers, nonstick cookware, and semiconductors, per- and polyfluoroalkyl substances (PFAS), known as “forever chemicals,” have impacted the world since the 1940s due to their unique properties, such as water and oil repellency. These synthetic chemicals persist indefinitely in the environment, raising concerns about their ecological and health impacts. As regulatory scrutiny grows, understanding PFAS dependency and how to optimally respond to possible issues in the supply chain is vital for manufacturers and investors. In this Viewpoint, we discuss recommended actions for companies that wish to be part of the solution.

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FOREVER CHEMICALS EVERYWHERE

PFAS are a class of ubiquitous synthetic chemicals that have been used for decades. Often referred to as “forever chemicals,” PFAS are known for their resistance to breaking down, allowing them to persist and accumulate in the environment indefinitely. Of the thousands of PFAS types in existence, approximately 250 have commercial significance. These chemicals are valued for their unique properties, such as the ability to repel water, oil, and dirt, as well as their resistance to extreme temperatures, pressures, and pH levels. As a result, PFAS are found in a wide range of everyday products, including water-resistant clothing, food packaging, cosmetics, electronics, cars, and ski wax (see Figure 1). They are, in fact, everywhere.

In the early 2000s, health concerns about PFAS started to rise globally due to growing evidence linking these chemicals to serious health issues, such as various types of cancer, high cholesterol, obesity, thyroid disease, liver damage, and pregnancy-induced hypertension. Studies have shown that most people have some amount of PFAS in their blood. The early warning signs were present decades ago, as documented by a lawsuit

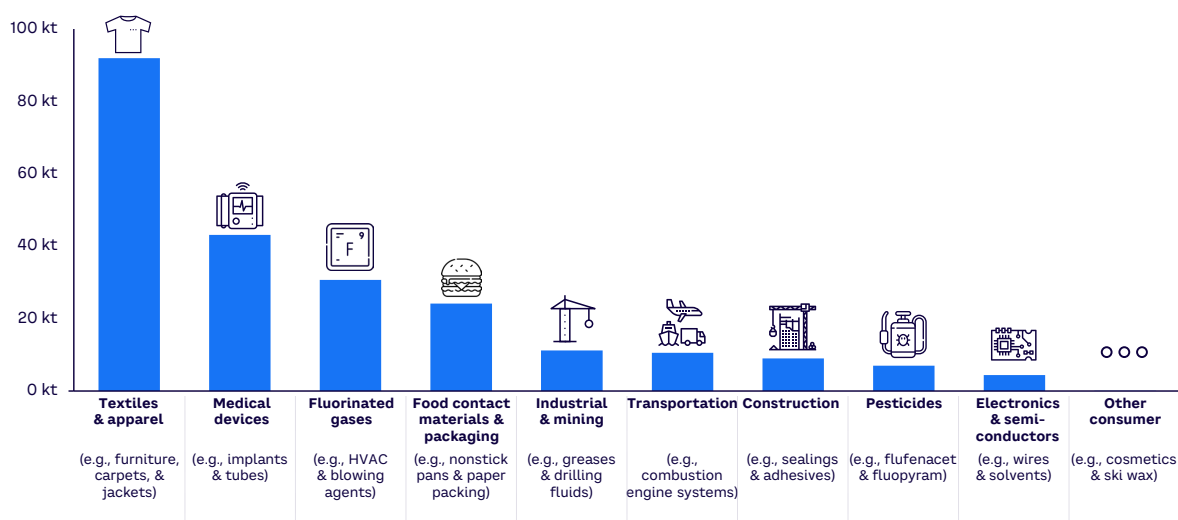
against US multinational chemical company DuPont, which involved water contamination from PFOA, a type of PFAS, at a West Virginia, USA, farm in the 1990s. This case, dramatized in the film *Dark Waters*, highlighted the dangers of these chemicals, yet the absence of regulation rendered these signs insufficient to trigger widespread efforts to find alternatives.

Even today, many people remain unaware of their exposure to PFAS or the sources of contamination in everyday life. However, the issue is steadily gaining attention; several European countries are now pushing for greater transparency and decisive regulatory action governing the use of PFAS.

RISING REGULATORY PRESSURE

Between 2019 and 2023, the EU added three groups of PFAS to its list of Substances of Very High Concern (SVHC). The EU’s Chemicals Strategy strongly prioritizes phasing out PFAS, with a proposal to regulate them as a group submitted to the European Chemicals Agency (ECHA) in January 2023. A consultation is now open for gathering and reviewing evidence, which may eventually lead to a near-total ban by ECHA on PFAS in Europe.

Figure 1. European annual volume of virgin PFAS on the market by end use



Source: Arthur D. Little, European Chemicals Agency (ECHA), Eurostat

Significant legal challenges to the use of PFAS can be observed at the national level. Chemours, a US chemical company, was prosecuted in the Netherlands and found liable for environmental damage caused by PFAS over several decades. Another notable example comes from Sweden, whose Supreme Court ruled in favor of the residents of the municipality of Kallinge, who were affected by PFAS after fire-protection foam from an F17 jet contaminated the groundwater. This court victory potentially creates a domino effect, as other local authorities may feel encouraged to file lawsuits over PFAS contamination, thereby dramatically increasing litigation risks for producers and downstream companies that use PFAS-containing materials.

These challenges aren't limited to Europe. In 2006, the 2010/2015 PFOA Stewardship Program was launched in the US. This voluntary initiative includes eight prominent chemical producers, including DuPont, BASF, and 3M, committed to reducing emissions and the use of PFOA and related chemicals. In 2023, the US Geological Survey (USGS), which studies the nation's natural resources, detected at least one type of PFAS in 45% of collected drinking water samples, which might be a conservative estimate. In the same year, 3M agreed to a settlement of US \$10.3 billion with a group of US public water suppliers after the company recognized changing sentiments around regulation and public awareness.

Several US states, including California, New York, and Washington, are taking significant steps to address the PFAS problem. In Maine, for instance, a new law requires manufacturers to disclose the presence of PFAS in their products. By 2030, the state plans to enforce a complete ban on products containing PFAS unless the chemicals are deemed essential by the federal US Environmental Protection Agency (EPA) or equivalent state agencies. In February 2024, the Biden-Harris administration finalized the National Primary Drinking Water Regulations (NPDWR), the first-ever national, legally enforceable drinking water standards intended to combat PFAS pollution.

BUSINESSES CAN MITIGATE THE RISKS ASSOCIATED WITH PFAS WHILE SETTING NEW STANDARDS FOR SUSTAINABLE PRACTICE

Growing regulatory pressure, though not yet affecting all regions, already shapes corporate strategies, particularly among major producers of PFAS. One notable example of a company retooling its corporate strategy is 3M, historically one of the world's largest manufacturers of PFAS, which in 2022 announced its plan to phase out the production of all PFAS by the end of 2025. This decision will impact over a billion dollars of the company's yearly revenue.

Another example of shifting priorities is the Investor Initiative on Hazardous Chemicals (IIHC), an organization consisting of more than 60 global asset managers, such as Credit Suisse, BNP Paribas, and PGGM. Members actively influence company portfolios, urging firms to develop actionable plans for phasing out hazardous chemicals, including fluorinated substances.

While PFAS pose undeniable risks to human health and the environment, the mounting pressure to regulate these substances also opens significant opportunities for innovation. Both established companies and new entrants are developing PFAS-free alternatives, pioneering cleaner business models and take-back schemes, and creating end-of-life treatment solutions for existing PFAS products. In the textile industry, for example, brands like Norrøna and Patagonia have adopted PFAS-free water-repellent technologies, proving that businesses can mitigate the risks associated with PFAS while setting new standards for sustainable practices.

Companies that lead the market with these innovations demonstrate that proactive change is both possible and profitable.

ESSENTIAL ... OR NOT?

For companies that rely on PFAS, a crucial factor driving urgency is whether these chemicals are essential to their operations (see Figure 2). Essential use cases, where viable substitutes are harder to find, will likely be given longer timelines to transition and find new equivalent alternatives. For example, medical applications are more likely to receive derogation for several years if not longer whereas a company using PFAS to produce nonstick pans might only get a year after a ban is announced.

Whether or not a specific application of PFAS is essential is a hot topic of debate and relying on this status is a risky strategy.

First, use cases considered essential now may not retain that status in the future, as alternatives emerge and become increasingly more economically viable. For example, specialized foam is a highly effective tool for fighting flammable gas fires, but most contain PFAS.

WHETHER OR NOT A SPECIFIC APPLICATION OF PFAS IS ESSENTIAL IS A HOT TOPIC OF DEBATE

The Dutch Organisation for Applied Scientific Research (TNO) is collaborating with the US Strategic Environmental Research and Development Program (SERDP) to work on a PFAS-free firefighting foam that uses clay nanoparticles, water-soluble polymers, surfactants, and extinguishing agents. In addition to firefighting foams, TNO actively develops alternatives to PFAS chemicals for electronics and semiconductor applications.

Second, even companies whose application of PFAS is deemed essential still face significant risk of reputational damage. A parallel can be drawn with the case of chromium-6, a carcinogenic substance once widely used as an effective corrosion inhibitor.

Figure 2. Essential vs. nonessential use of PFAS

CONSIDERED AS ESSENTIAL USE	NONESSENTIAL USE
 Medical devices & healthcare Implants, surgical instruments, medical tubing	 Consumer goods Water-resistant clothing, nonstick cookware, ski wax
 Aerospace & aviation Fuel & hydraulic system seals	 Food packaging Fast-food wrappers, paper & cardboard packaging
 Defense & military equipment Firefighting foam, protective gear	 Cosmetics Makeup & personal care products
 Semiconductors (microchips) & electronics (wire insulation)	 Household products Stain-resistant carpets & furniture, cleaning products

Source: Arthur D. Little

MANY COMPANIES INVOLVED IN NONESSENTIAL PFAS APPLICATIONS ARE ALREADY SHIFTING TOWARD ALTERNATIVES

The use of chromium-6 faced public outrage and legal battles in various parts of the world, particularly in the US and the Netherlands. Dutch railway companies encountered severe repercussions from using chromium-6 in their train paints. Workers involved in train maintenance and refurbishment were exposed to the carcinogen, leading to health concerns similar to those linked to PFAS. Railway companies have since ceased using chromium-6 in their operations but continue to grapple with litigation, damage claims, and ongoing investigations.

Many companies involved in nonessential PFAS applications are already shifting toward alternatives. Multiple global brands have either announced bans on PFAS or declared that their products are, in fact, PFAS-free. The Environmental Working Group (EWG), an American nonprofit, has compiled a comprehensive list of these companies and the parameters of their commitments. For example, IKEA currently bans PFAS in its textiles and paper and chemical products (e.g., paints, oils, cleaning agents), but PFAS remains present in its electrical products, where replacement is more challenging, as well as in a variety of nonstick pans.

The transition away from PFAS is underway, but challenges remain:

- **Clarity on sunset dates.** Uncertainty around regulatory timelines complicates effective planning for transitions.
- **Pacing replacement material developments.** The speed of new, safe alternatives may not keep up with regulatory pressures and market demands.
- **Cost considerations.** Alternative materials may be more expensive, impacting product pricing and viability.
- **Finding suitable alternatives.** Developing alternatives that match performance can be technically challenging.

In the EU, more than 50% of annual PFAS production is tied to nonessential uses, such as apparel and food packaging, where alternatives are already available. Phasing out PFAS in these sectors could also lead to a significant reduction in emissions, highlighting a clear opportunity for companies to adopt safer materials.

THE NEED TO ACT

Many companies, whether directly or indirectly through their suppliers, face significant risks related to forever chemicals usage, but early action can help turn risks into a competitive advantage.

The issue for many businesses is that PFAS exposure is an invisible threat. Companies may not always be aware of their own PFAS risks, as these chemicals can be embedded in components they source from third parties, and disclosure requirements are far from universal. Companies that are aware of the presence of PFAS in their products must decide how to react in a timely manner and determine an adequate response. Product recall? Information sharing? To whom and by when? A 2023 Sustainalytics survey showed that globally, only 10% of chemical companies had a strong hazardous substance management program, and over 40% had none.

The message is clear: early action on PFAS can transform a threat into a business opportunity. As awareness grows and regulations tighten, the question for businesses is no longer whether they should act, but how quickly can they adapt before getting disrupted by PFAS-free alternative solutions. Five critical questions can help organizations navigate this issue:

1. **Do I have a PFAS problem in my (investment) portfolio?** How big is the problem now? How big will it be tomorrow?
2. **What do I do with existing products and solutions?** Can I continue selling current products without incurring risks? How do I deal with the installed assets?
3. **Are there suitable and well-performing alternatives or solutions available, such as new safe molecules with similar properties?** Is there a risk of disruption by PFAS-free solutions for certain applications? Can I outsource a breakthrough development, for example, to a consortium?
4. **What does PFAS exposure mean for my competitive position?** Are there opportunities to improve it?
5. **What targets and timelines should I establish?** Should I be proactive or reactive? How should the transition be organized?

COMPANIES THAT ARE AWARE OF THE PRESENCE OF PFAS IN THEIR PRODUCTS MUST DECIDE HOW TO REACT IN A TIMELY MANNER AND DETERMINE AN ADEQUATE RESPONSE

CONCLUSION

PREPARING FOR A PFAS-RESTRICTED FUTURE

MANUFACTURERS AND BRANDS MUST BE PREPARED TO ADAPT THEIR (PRODUCTION) PROCESSES TO MEET NEW REQUIREMENTS

It is only a matter of time before more stringent PFAS restrictions are implemented globally. Manufacturers and brands must be prepared to adapt their (production) processes to meet new requirements for both PFAS and non-PFAS components across various applications. Several uncertainties — timing, cost, and available alternatives — complicate this transition. However, five proactive measures can mitigate risks and position companies for success in a PFAS-restricted future:

- 1 Assess PFAS exposure** in product portfolios, analyzing information from suppliers and value chain partners.
- 2 Closely monitor legislation** in relevant markets.
- 3 Look for existing technologies, start-up partners, and research teams** that may each hold part of the solution.
- 4 Identify and invest** in new alternative materials or solutions.
- 5 Develop a comprehensive PFAS strategy** to mitigate long-term risks and gain competitive advantages.



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