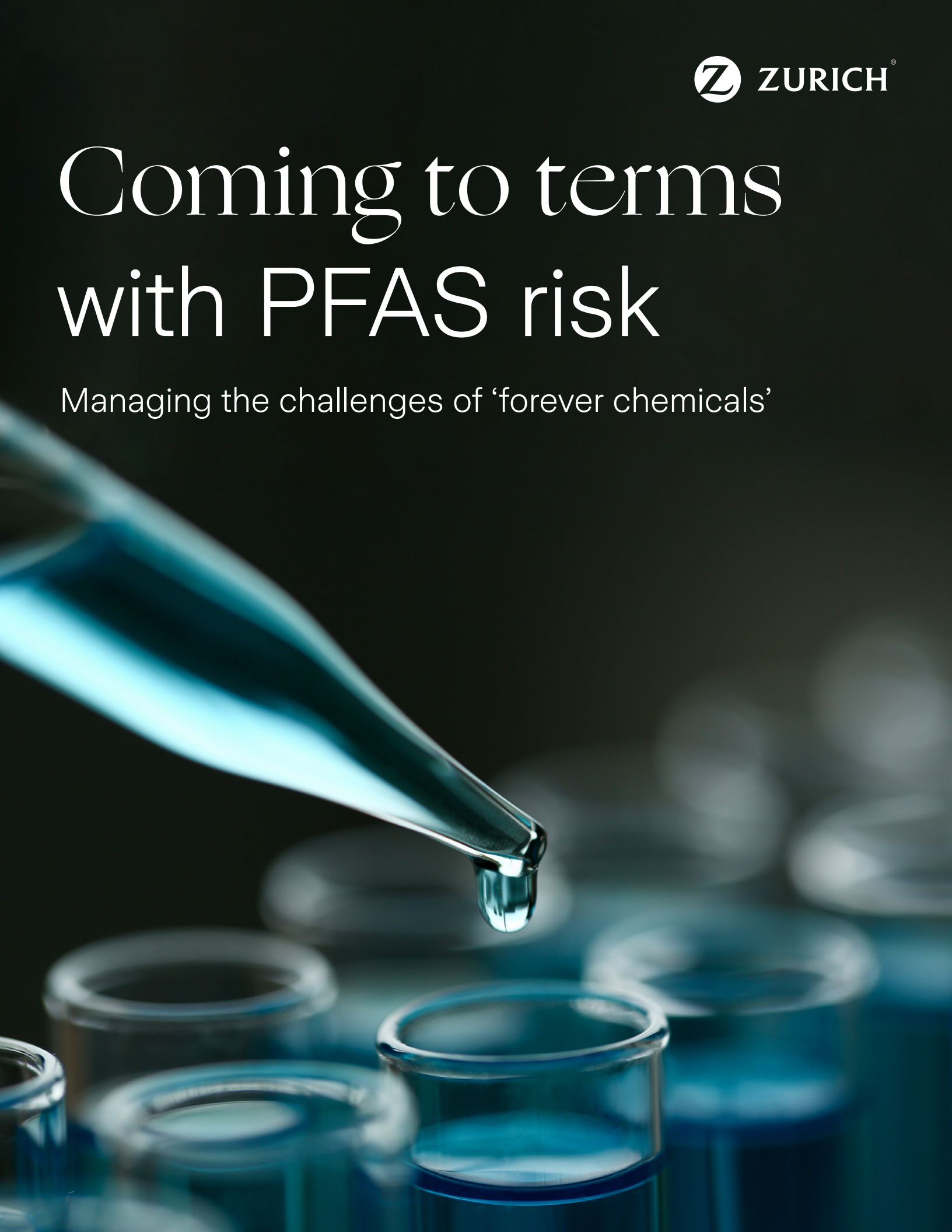
ZURICH

Coming to terms with PFAS risk

Managing the challenges of ‘forever chemicals’



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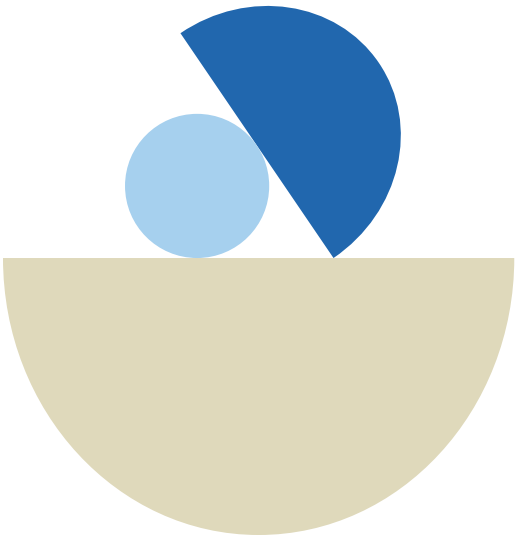
I. Forever and a day...

It's been said nothing lasts forever, but one innovation created almost 90 years ago seems intent on defying that maxim. Perfluoroalkyl and polyfluoroalkyl substances, known collectively as PFAS, have been employed in a myriad of industrial, commercial and consumer applications since their discovery in the 1930s. Initially heralded as a multi-functional wonder of modern invention, with applications ranging from non-stick cookware coatings to revolutionary lubricants and life-saving firefighting foams, PFAS are now considered to be hazardous to human health and the environment. And thanks to the remarkable stability of PFAS over time, having demonstrated great resistance to normal breakdown in the environment, they may persist essentially forever.

For businesses that have utilized PFAS chemicals in manufacturing or in the products that they distribute, new federal and state regulations, reporting requirements and potential liability exposures may present the dawning of a risk scenario some say has allusions to the wave of asbestos litigation in the 1980s. Insurers, too, are grappling with this new risk challenge, as customers look to the industry for answers.

In this report, we will explore some of the history of PFAS substances, how they became integral to modern life, the discovery of their impacts on human health, and what businesses can do to mitigate the risks of a family of substances that may persist in our environment forever and a day.



II. The ‘wonder chemical’

The formulation that spawned the PFAS revolution of the 1940s and 1950s was discovered by accident in 1938 by a DuPont researcher trying to create an alternative to fluorocarbon-based refrigerants. After one experiment, the researcher discovered that a frozen, compressed sample of the fluorocarbon tetrafluoroethylene had formed a white, waxy solid with unusual properties. Further experimentation demonstrated that the compound exhibited a remarkable ability to repel both water and oil, in addition to functioning as a durable, highly successful lubricant.[1]

During World War II, the serendipitous, new compound was used in the development of the first atomic bombs. It proved highly effective in the manufacture of gaskets and valves needed to safely contain highly toxic uranium hexafluoride at the Manhattan Project’s uranium plant in Oak Ridge, TN.[2]

In the 1950s, the “wonder chemicals” saw wide use in commercial, industrial and consumer applications. Researchers discovered that new PFAS variants could be engineered for a host of different functions simply by tweaking a few molecules in the formulation. PFAS compounds can be engineered to be simultaneously highly water and oil resistant – a very rare trait in chemistry. They can also be engineered to reduce the surface tension in water and oil, making other chemical reactions more efficient. With yet another tweak, PFAS can be adapted to form dense, highly impermeable films.

Thanks to their amazing versatility, PFAS variants were put to use in everything from firefighting foam to food packaging, chrome plating, water repellant sprays for clothing, stain resistance coatings for carpet and upholstery, waterproof-coatings for electronics and to “smudge-proof” cosmetics. Soon, PFAS chemicals began touching the lives of people around the world in a multiplicity of ways.

Significantly, PFAS chemicals remain stable in the presence of other chemicals, ultraviolet radiation from sunlight, and high-temperature environments. While their chemical structures can be readily adapted for a wide range of roles, the fluorine/carbon bonds, one of the strongest bonds in chemistry, make PFAS extremely stable, giving them the durability that improved many products.

But it is that very same stability that imbues PFAS substances with the ability to resist breakdown in the environment. And therein lies the problem.

PFAS by the numbers

- **14,000-plus PFAS chemicals in the environment***
- **120,000 sites in the US with PFAS exposure risk****
- **98% of Americans have PFAS in their blood*****
- **Up to 100% PFAS removal with activated carbon†**
- **Almost 90% PFAS removal possible by reverse osmosis‡**

* PFAS and Worker Health. National Institute for Occupational Safety and Health (NIOSH). Centers for Disease Control and Prevention. 25 September 2024.

** Gillam, Carey; Chang, Alvin. “Revealed: more than 120,000 US sites feared to handle harmful PFAS ‘forever’ chemicals.” The Guardian. 17 October 2021.

*** Coulson, Morgan. “The Omnipresence of PFAS – and what we can do about them.” Bloomberg School of Public Health, Johns Hopkins. 28 March 2024.

† Reducing PFAS in Drinking Water with Treatment Technologies. U.S. Environmental Protection Agency. 23 August 2018.

‡ Ibid

III. What we know now

Because PFAS compounds are incredibly stable, once they are introduced into the environment, they can accumulate in living systems and persist in soils and water without breaking down. It is estimated that levels of PFAS chemicals exist in the blood of 98% of Americans.[3]

Although estimates vary, today there may be more than 14,000 compounds in the PFAS family present in commercial and consumer applications as well as in landfills, waterways and chemical waste sites.[4] In the United States, it is estimated that there are approximately 120,000 sites with PFAS exposure, including airports and firefighter training centers where fire-suppressant foams are used, as well as manufacturing facilities and waste disposal sites.[5]

PFAS chemicals are implicated in a wide range of potentially adverse impacts on human health. Long-term PFAS exposure is suspected to cause alterations in the human immune system, possibly suppressing the effectiveness of vaccines. They are also alleged to play a role in the depression of thyroid function as well as contributing to the development of kidney and liver disease. Other effects are alleged to include lipid dysregulation, resulting in increased cholesterol with implications in heart disease, in addition to insulin dysregulation, which could trigger or worsen diabetes.

Among the most worrisome potential impacts alleged are adverse reproductive and developmental outcomes, such as low birth weight, and various forms of cancer.

PFAS chemicals are not eliminated by natural body processes that routinely metabolize and break down other substances. In effect, once they are introduced into the tissues of a human or animal body, it is not able to efficiently remove them.

While PFAS compounds have been detected in wastewater, typically this is due to runoff from industrial sites, firefighting foam or leaching from other products in the waste stream, not from human or animal waste. Once introduced into a living system, PFAS chemicals will most likely remain across the lifespan of the organism.

VI. The risks to business

Companies that employ PFAS in their manufacturing processes are being challenged by an evolving regulatory and legal environment. As reporting requirements expand and the potential for environmental and personal injury litigation grows, many companies are seeking less-problematic alternatives to PFAS, while also strengthening risk controls and protections.

But some businesses may not even be fully aware of the existence of PFAS in the products they are distributing for sale, particularly if other businesses in the supply chain might be using processes or packaging materials containing PFAS compounds. A lack of knowledge of a company's PFAS exposures represents a potentially costly risk exposure at a time when the eyes of government and the plaintiffs' bar are focusing more closely on these chemicals.

An initial wave of PFAS litigation has already targeted contamination of municipal water systems from run-offs of fire-retardant foams and other PFAS substances. Recent headlines chronicled one settlement over $1 billion.[6] Another reported settlement exceeded $10 billion.[7]

Risks to municipal water systems may be an ongoing source of concern and potential litigation, with more legal and regulatory actions on the horizon. But the second tranche of PFAS litigation – personal injury – may turn out to be even more costly, as cases move through the discovery process. The potential for "nuclear verdicts" – those of $10 million or more – are significant, with a variety of suspect PFAS-related ailments currently being studied.

While the recognized health effects of asbestos exposure were asbestosis, mesothelioma, non-mesothelioma lung cancers and other impacts on the pulmonary system, PFAS chemicals may be implicated in a variety of different disease processes. Because PFAS exposure cannot be definitively tied to a signature ailment, all parties to PFAS litigation – companies that manufacture or use PFAS chemicals, insurers and the plaintiff's bar – will face challenges that may complicate their arguments in court. For instance, was an individual's diabetes caused or exacerbated by exposure to PFAS, or was it a result of lifestyle issues?

A wave of litigation driven by alleged health effects attributed to PFAS is part of the legal system abuse that fuels "social inflation," which refers to the disproportionate increasing loss costs on liability based claims as compared to general economic inflation. Social inflation is also driven by public attitudes (such as corporate mistrust) and jury biases, along with other forms of legal system abuse such as attorney advertising and trial tactics.

PFAS-related lawsuits generally fall into the following categories, reflecting the broad impacts of the substance on public health and the environment:[8]

- **Product liability claims**

  Lawsuits involving individuals or groups who claim exposure to PFAS through contaminated products, such as non-stick cookware, food packaging or firefighting foam.

- **Environmental contamination lawsuits**

  Governments or water utilities suing manufacturers for allegedly contaminating water supplies, seeking to require companies to pay for cleanup and remediation of PFAS-contaminated water sources. Individuals with wells and surface water have also brought such suits, as well as some who have brought claims of diminution of property values due to PFAS contamination.

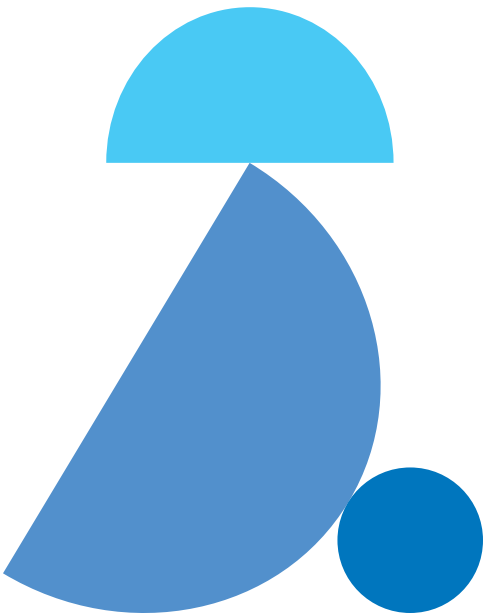
- **Personal injury claims**

  Suits brought against manufacturers by individuals claiming health problems linked to PFAS exposure.

- **Class action lawsuits**

  While the above types of litigation can be brought as individual suits, class actions can be initiated when the causation and injury to a group of complainants are largely the same, combining multiple actions into a single case. Similarly, Multi-District Litigation (MDL) is the gathering together of disparate cases from multiple jurisdictions for discovery purposes in which the linking factor is PFAS.

V. Evolving regulation



With growing concern over the potential health effects of exposure to this long-lived class of chemicals, some states are now requiring that PFAS not be intentionally added to clothing, food packaging and other consumer goods, firefighting foams and other applications. Negotiations are ongoing over voluntary market phase-outs of PFAS in some food packaging.

There are also ongoing investigations in a number of states regarding the presence and levels of PFAS in food products. Seafood, for example, can be particularly susceptible to direct contamination through the presence of PFAS in water.[9]

In 2024, a Michigan farmer's livelihood was essentially ruined due to the discovery of PFAS contamination of his entire stock of 150 cows. The contamination occurred when the farmer used an EPA-approved fertilizer comprised of biosolids from processed waste to grow feed for his herd. The sludge had been contaminated during processing by the release of PFAS chemicals into wastewater by a local business. The animals consumed the crops fertilized by the biosolids and accumulated PFAS in their tissues. After tests by Michigan environmental authorities, his entire 400-acre farm was deemed unusable. All 150 cows were seized by the state and forbidden to be sold.[10]

Maine is at the forefront of investigating PFAS contamination in agriculture, including land application of sludge-based fertilizers. State environmental authorities began investigating PFAS contamination at farms in 2016 when milk at a particular dairy was found to contain high levels of PFOS, a PFAS variant. Maine's Department of Agriculture, Conservation and Forestry created an action level for PFOS in milk. The discovery of PFAS contamination in agricultural products led to the passage of a state law requiring the ongoing investigation of soil and groundwater for the presence of PFAS from the land application of sludge and/or septic fields[11]

As a part of its PFAS initiatives, the EPA has set new limits on PFAS levels in drinking water, requiring municipalities and industries to comply with tighter thresholds. The agency's updated Safe Drinking Water Act will now set Maximum Contaminant Levels (MCLs) with regard to certain PFAS compounds. This will require water utilities to install new and costly treatment systems or face potential penalties.

The year 2025 could be a landmark year in the regulation of PFAS substances. Focusing on issues related to PFAS has been a federal priority since 2021. That year, the Environmental Protection Agency (EPA) published its "PFAS Roadmap," which outlines strategies for research into PFAS effects, control of the proliferation of PFAS in industrial and consumer products, and potential cleanup and remediation approaches.[12]

In response to growing concerns about the presence of PFAS in the environment and the potential impacts on human health, the EPA has put forth new reporting requirements under two major PFAS data-gathering programs:

- **Toxic Substances Control Act ("TSCA") Retroactive Reporting to 2011**

  This reporting requirement calls for a one-time report on all PFAS and PFAS-containing articles that have been manufactured or imported since 2011.

- **Emergency Planning and Community Right-to-Know Act ("EPCRA") Expanded Toxic Release Inventory ("TRI") Reporting for 2024 and Later**

  This section will require annual reporting on the quantity, uses, releases and disposal of PFAS by all companies that may have such exposure.

It has been estimated that the EPA's new reporting requirements covering all PFAS used in products since 2011 could impact up to 130,000 businesses, with many businesses reporting on PFAS for the very first time. Because many products have historically contained PFAS, it has been recommended that all companies that manufacture or import goods should undertake a process to evaluate their products.[13]

Some states are also moving forward with their own legislation regarding the reporting and control of PFAS in consumer products. Maine approved a law in July 2021 prohibiting the sale of new rugs, carpets and fabric treatments that contain intentionally added PFAS, with an effective date of Jan. 1, 2023. As of Jan. 1, 2026, Maine is banning the sale of all products with intentionally added PFAS, including cleaning products, cookware, cosmetics, juvenile products, textile articles, upholstered furniture, and products that do not contain PFAS but which are distributed for sale in fluorinated containers, and more.[14]

Other states have enacted or are pursuing their own regulations regarding PFAS. In Illinois, Senate Bill 2705, an expansion of an earlier PFAS Reduction Act passed by the General Assembly, requires manufacturers of products containing intentionally added PFAS to submit information to the Illinois EPA by Jan. 1, 2026. The Legislation also calls for a ban on the manufacture and sale of all products that intentionally contain PFAS by 2032.[15]

California and New York have also enacted bans on PFAS in food packaging, textiles and cosmetics. California's law now prohibits the sale of all consumer products containing intentionally added PFAS.[16]

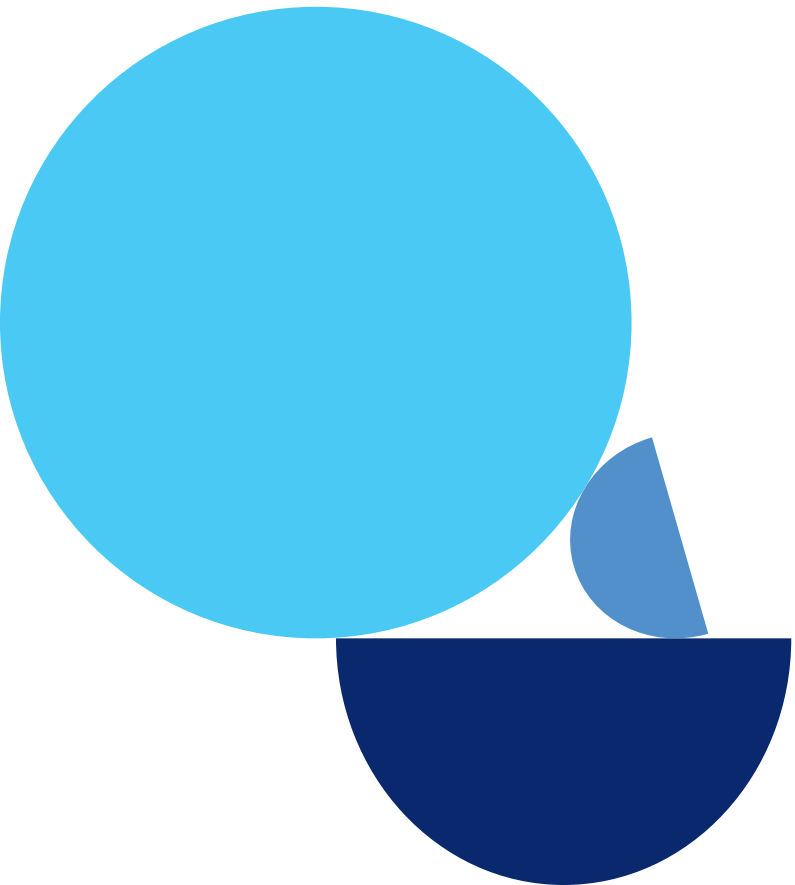
Outside the U.S., countries in the European Union have introduced a near-total ban on PFAS in consumer products, forcing multinational corporations to reformulate products for compliance. EU regulations now classify PFAS as Substances of Very High Concern (SVHC), requiring manufacturers to find alternatives.[17]

VI. Potential insurance implications

As the PFAS risk picture unfolds, no one can be sure what form the next unknown will take. With thousands of PFAS chemicals already in the environment and no great certainty that all long-term effects are known, some insurers already are or plan to specifically exclude coverage for PFAS risk.[18] The Insurance Services Office (ISO) has designed a standardized Commercial General Liability (CGL) policy that excludes PFAS.[19]

PFAS exposures predominantly fall in two major categories: premises exposure and products liability exposure. For customers located in the U.S., underwriters have been assessing whether insureds have exposure to PFAS since the nature and scope of the risk became more widely recognized. How insurers react to exposure varies. Some may include limited response under pollution liability coverage, while CGL insurers may apply exclusions.

VII. Technology solutions



A variety of technologies have been found to remove at least some PFAS from drinking water. These include activated carbon filters, ion exchange resins and high-pressure membranes (also known as reverse osmosis) that can be used in drinking water treatment facilities, water systems in individual buildings, or even at points of use in home kitchens, baths and showers.[20]

- **Activated carbon**

  Commonly used to remove natural organic compounds, taste and odor compounds, and synthetic organic chemicals in drinking water treatment systems, activated carbon is effective because it is a highly porous material and provides a large surface area to which contaminants may be captured. Depending on flow rate, the type of PFAS to be removed, and the characteristics of the activated carbon bed, the percentage of PFAS removal can be as high as 100%.

- **Ion exchange resins**

  These are highly porous, polymeric materials that are acid, base and water insoluble. Tiny beads making up the resin are derived from hydrocarbons and act like tiny, chemical magnets that attract and prevent contaminating substances from passing through the water system.

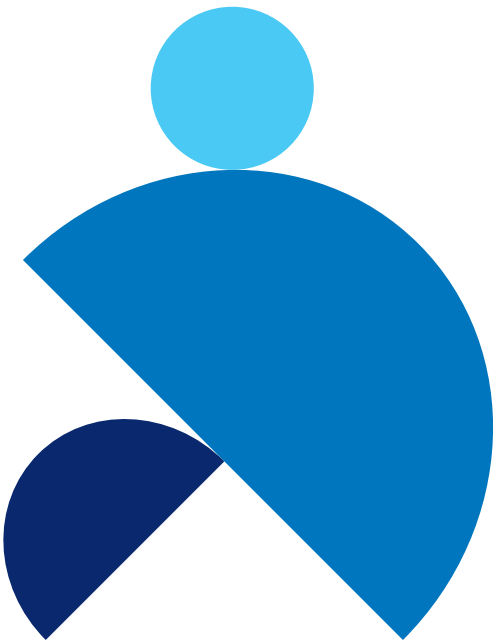
- **High-pressure membranes**

  High-pressure membranes, such as nanofiltration or reverse osmosis, have been extremely effective at removing PFAS. Research shows that these types of membranes are typically more than 90 percent effective at removing a wide range of PFAS variants.

Researchers at the University of Buffalo recently reported cutting-edge filtration technology using a “molecular nanocage” that can capture the bulk of PFAS chemicals found in water far more effectively than traditional filtering techniques. Fashioned from organic nanoporous material specifically designed to capture only PFAS pollutants, the tiny, chemical-based filtration system removed 80-90% of PFAS from sewage and groundwater during initial studies, with very low adverse environmental effects.[21]

While effective at capturing PFAS contamination in water, these filtration techniques do not answer the challenge of removing PFAS contamination from soil. Further, water filtration techniques capture PFAS chemicals but do not destroy them. This means that filtration media need to be swapped out and disposed of on a regular basis, usually consigned to secure landfills. At one time, the EPA suggested high-temperature incineration, but the recommendation was ultimately withdrawn.

VIII. What businesses can do now



While science continues the search for more effective ways to eliminate PFAS from the environment, governments continue to promulgate laws to help protect the environment and their constituents. As a result, good risk management practices suggest that businesses know the potential presence and scope of these chemicals within their own operations, processes and products.

While alternatives for PFAS and various remediation tools are being researched, there are a number of proactive steps businesses can take to potentially reduce their PFAS risks:

- Investigate where PFAS chemicals may exist in your processes and/or products; in particular, consider places where PFAS may exist without the company's knowledge.
- Review your supply chain to determine where PFAS may exist in the products and components your suppliers provide. Also, ask supply chain contractors whether they have put in place processes to determine whether their own suppliers have PFAS exposure.
- For industrial processes that may require PFAS chemicals, attempt to confirm that safety procedures are in place to protect workers and to prevent the escape of PFAS compounds into the environment.
- Explore PFAS alternatives that may be available and stay abreast of alternatives that may be in the development pipeline.
- Plan and allocate capital investment to install fire protection systems that do not use PFAS-based chemicals. If fluorine-based foam systems are required in some cases, establish protocols to contain and remediate any discharges, and minimize discharges during training.

IX. The way forward

Is there an endgame to the PFAS risk challenge? Clearly, the ability of PFAS chemicals to remain in the environment virtually forever means that business, government and individuals will need to be cognizant of them as far into the future as we can see from this moment in time.

However, progress is being made in the collaboration of business and science seeking better, safer alternatives to PFAS substances, and in research into neutralizing the potentially adverse effects of PFAS on human health and the environment. In the interim, by taking steps to increase their awareness of these substances and making the appropriate risk management decisions to control them, businesses can take positive steps to ensure that PFAS chemicals do not have to be a forever risk to employees, customers and financial well-being.

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