

From Crisis to Catalyst: How Chemicals Are Powering Tomorrow



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For the chemicals industry—so deeply embedded in the machinery of global trade—2025 is a reckoning. In conversations with executives across the sector, one theme surfaced again and again: uncertainty. But beneath the noise, a deeper shift is underway. The industry is no longer content to react; it is rethinking where it operates, how it builds resilience and what role it will now play in a fractured, fast-changing world. The old logic—low-cost global trade, predictable policy, centralized production—is breaking down. In its place, a new playbook is emerging: one rooted in resilience, reinvention and a sharper sense of long-term purpose. This report captures that pivot, in the voices of those confronting it firsthand.

And nowhere is this upheaval more apparent than in the turning tides of geopolitics. With supply chain disruptions from the Red Sea to the Panama Canal, conflict from Ukraine to the Middle East and now sweeping tariffs under a second Trump administration in the U.S., the industry is recalibrating—adapting to a world tilting away

from global integration toward fragmentation and self-protection. But pressure doesn't just disrupt—it accelerates change. In chemistry, as in life, higher pressures lead to faster reactions. As Jakob Sigurdsson, CEO, Victrex, puts it: “The modern world would not exist without chemistry, and it will not exist without a strong understanding and deployment of it. Chemistry is integral to a better future in multiple ways—what matters is how we deploy it and approach innovation responsibly.”

For Dick Richelle, CEO of Royal Vopak, resilience is rooted in long-term contracts and diversified operations—both across product mix and geography—helping it absorb geopolitical shocks and supply chain disruptions: “Key trends over the last five years include geopolitical uncertainty, which has led to increased demand for strategic storage in key locations and a shift in manufacturing and energy demand toward the East.”

IN THIS REPORT...



**JEFF ROWE | CEO,
SYNGENTA GROUP**

Trade restrictions impact farmers; many agricultural products rely on exports. Regulatory hurdles make innovation more expensive and time-consuming, with broader implications for food security and sustainability.



**NANCY BECK | PRINCIPAL DEPUTY ASSISTANT
ADMINISTRATOR, EPA OFFICE OF CHEMICAL
SAFETY AND POLLUTION PREVENTION**

We continue to decrease the backlog of new chemicals under review with the agency and find ways to review new submissions in a more timely manner.



**JEAN-YVES PARISOT | CEO,
SYMRISE**

Despite economic pressures and rising tariffs, we're investing in innovation and collaborating with partners to secure key raw materials and anticipate future supply chain disruptions.



**REBECCA LIEBERT | CEO,
LUBRIZOL CORPORATION**

Emerging technologies like flying cars and Mars missions demand entirely new surface solutions; we're committed to innovating in these areas to meet those future challenges.

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Uber Freight

We partner with the world's largest
chemical companies to manage their
complex logistics needs.

uberfreight.com





Geopolitical uncertainty increases the need for energy security and storage. Vopak is doubling its investments in gas and industrial infrastructure within its global network.

**DICK RICHELLE | CEO,
ROYAL VOPAK**



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Localizing raw material production has become a critical imperative to mitigate the risk of supply disruptions, advance sustainability objectives and, soon, support an increase in underlying demand in the U.S. Ascent is positioned to play a significant role in this domestic manufacturing renaissance.

**BRYAN KITCHEN |
PRESIDENT AND CEO, ASCENT INDUSTRIES**



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It's a snapshot of a broader shift across the chemicals industry, where strategy is being rebuilt for a world in flux. From trade policy to regulation, supply chains to sustainability, the chapters that follow explore how this highly varied sector—spanning personal care, water, plastics, agriculture and logistics—is adapting under pressure and where it's headed next.

Tariffs and Trade Wars

As the foundations of globalization begin to shake, companies across the chemicals sector are rethinking their operating models. In the interest of absorbing ongoing shocks, many are shifting away from traditional low-cost, globally integrated systems in favor of more regionally resilient strategies. “The U.S.-China trade war, pandemic-induced supply chain crises and inflation partly due to the Ukraine war have pushed companies to reshoring or nearshoring production,” explains Christian Hartel, president and CEO, Wacker Chemie AG. Reshoring, dual sourcing and shifting production closer to demand are no longer backup plans—they're becoming standard practice. For some, the move has already proven its worth. “Our business model has evolved in response to globalization and shifting manufacturing

patterns,” says Alope Lohia, founder and group CEO, Indorama Ventures. “This regional approach helped us during the COVID-19 pandemic, when the supply chains broke down. We were able to meet demand locally, while many others faced challenges.”

But operational shifts are only half the battle. Companies operating across Asia, Europe, North America and Latin America now face a messy regulatory patchwork. The EU's Green Deal, the U.S.'s push for energy independence and Asia's divergent standards are making compliance more expensive, more complex and more fragmented. Succeeding in this environment means adapting fast to local rules, without losing global focus.

Tariffs are also adding friction at every step of the value chain. Once background noise, trade policy is now a live risk to margins, competitiveness and long-term investment. For Marcello Boldrini, CEO, Kraton Corporation, they are a major concern: “especially with new trade policies potentially reshaping the industry. While they aim to level the playing field, they could create barriers between regions like Europe, the U.S. and China. A balanced, global approach is crucial to maintaining competitiveness while advancing sustainability.” Greg



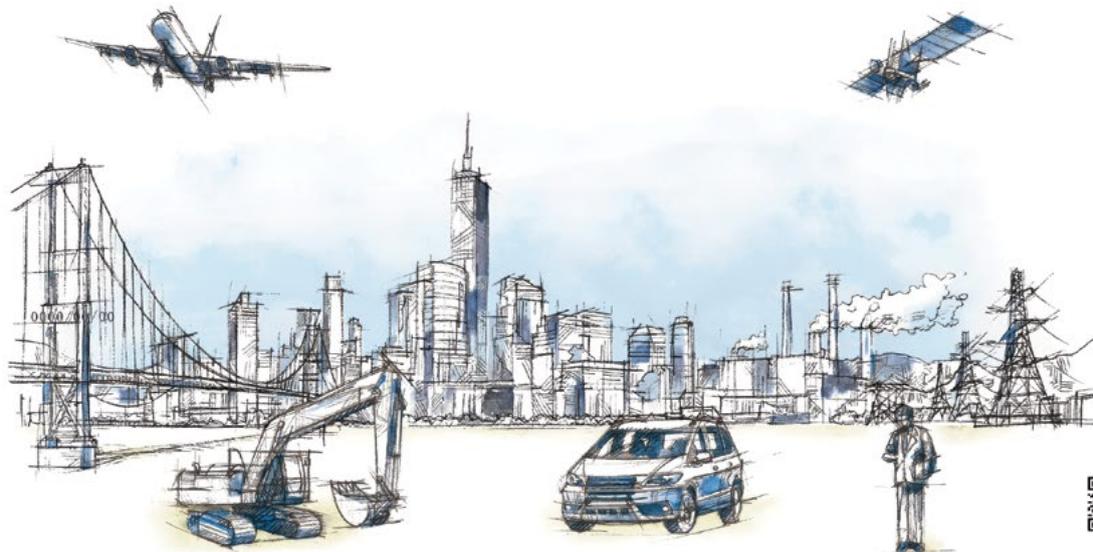
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The most important pivot over the past 10 to 20 years has been the growing role of sustainability as a primary driver of innovation. For us, it's not only the key to growth but also an area where we invest heavily. Every year we spend around 7 percent of our turnover on R&D.

MARTIN BABILAS | CEO,
ALTANA AG



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► Moffatt, president and CEO, the Chemistry Industry Association of Canada (CIAC), concurs: “Tariffs on imports from the U.S. are essentially taxes, increasing costs for individuals and businesses. It raises input costs for manufacturers, ultimately impacting consumers.”

Still, not everyone shares the concern. Jennifer Abril, president and CEO, SOCMA, remains optimistic that the new administration will support domestic production with strong incentives. “Certainty in trade and tax policies will encourage further investment and growth in the U.S. specialty chemical sector.” Even in this climate of disruption, the industry is turning the page. A new identity is taking shape—rooted in innovation, climate leadership and technical reinvention. Breakthroughs once seen as future bets are now core to strategy: low-carbon process chemistries, advanced recycling, bio-based materials and AI-powered manufacturing. “Green chemistry, decarbonization and the circular economy have evolved beyond mere regulatory requirements to become central pillars of business strategy,” explains Roberto Ramos, CEO, Braskem.

For instance, Bryan Kitchen, CEO of Ascent Industries Co., sees upside in the anticipated rise in domestic oil and gas production under the second Trump administration. He is confident that the shift toward bio-based solutions is accelerating: “What’s particularly exciting is the growing preference for more sustainable chemistries over traditional petrochemical options. Our bio-based chemistries are well-positioned to meet this shift.”



MARK LEIGH | PRESIDENT, TOKAI CARBON CB

Businesses struggle with unpredictability, and shifting U.S. policies have made planning difficult. Tariffs on Mexico and Canada have been introduced and removed twice.



MICHAEL HANSEN | GROUP PRESIDENT AND CEO, HEMPEL

We’ve adapted to operating in a world where external shocks are constant. The key isn’t to wait for stability but be resilient enough to navigate uncertainty effectively.



LIM WEY-LEN | EXECUTIVE VICE PRESIDENT,
SINGAPORE ECONOMIC DEVELOPMENT BOARD

Despite global trade concerns, Southeast Asia’s continued growth and demand for chemicals provide a strong base for Singapore to tap into.



KENNETH T. LANE | PRESIDENT AND CEO,
OLIN CORPORATION

The chemical industry, a barometer of economic activity, has seen many companies hit low earnings levels. Companies are focusing on core operations rather than overextending.



BRYAN KITCHEN | CEO, ASCENT INDUSTRIES CO

We expect growth to materialize more significantly in late 2025 and into 2026, especially as reshoring initiatives are executed.



ROBERTO RAMOS | CEO, BRASKEM

The most significant change is the demise of the European producers, particularly after the Russian Ukraine invasion. Companies simply couldn’t compete with the rising energy costs.

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Ascent’s defoamers, for instance, have transitioned from being 100 percent petro-based to up to 81 percent vegetable-based and renewable. Yet progress is constrained. Uncertainty around trade flows and policy signals continues to chill investment, even for companies ready to make moves. “Global trade uncertainty is another factor—uncertainty in trade flows makes it difficult for companies to commit to major investments,” notes Mark Plamondon, executive director, Alberta’s Industrial Heartland Association.

Rerouting the Supply Chain

In the chemicals industry, logistics is a major contributor to emissions and a growing source of operational risk. Transporting raw materials and finished products across land, sea and sky forms the backbone of the supply chain. But in 2025, overreliance on single routes, chokepoints at major ports and geopolitical friction have exposed just how fragile—and emissions-intensive—chemical logistics can be. According to Deloitte, around 75 percent of the average chemical company’s carbon footprint comes from value chain emissions, much of it linked to transport.

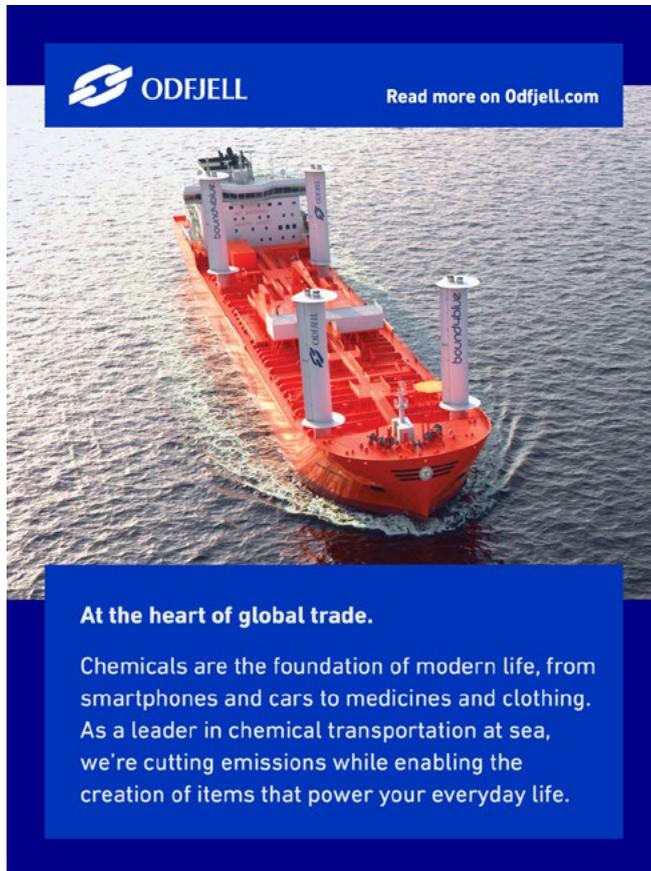
These pressures aren’t theoretical—they’re disrupting daily operations. “Disruptions, once rare events, now occur every two to three months, such as the Red Sea crisis and tariff-related container scrambles,” said Chee Foong Wan, CEO, PSA BDP. “The world is increasingly polarized, and we’ve seen heightened demand for trade compliance and supply chain restructuring advice.” In an industry built on precision and timing, that’s not a delay—it’s a breakdown.

Smart Logistics

To meet these challenges, technology — and particularly AI — is emerging as a two-pronged solution: helping to reduce emissions and improve the flexibility and efficiency of global logistics systems. Uber Freight, for example, is leveraging AI algorithms within its platform to optimize transport. These systems consolidate shipments heading to similar destinations, reducing the number of trucks on the road. In doing so, they cut fuel use and lower costs, delivering clear wins for both efficiency and emissions.

“We’ve launched an Emissions Dashboard using the GLEC Foundation’s methodology to calculate carbon outputs. Shippers can track emissions in real time and identify opportunities to convert modes, like switching from truck to intermodal, significantly reducing carbon footprints,” said Jeff Brasier, VP of Client Engagement at Uber Freight. PSA BDP is pursuing a parallel approach, having developed carbon emissions tracking tools that provide emissions data, which enable customers to monitor environmental impact. “We focus on multi-modal solutions, integrating air, sea, land and digital technologies. Visibility, automation and global coordination are critical, so we provide tools like control towers and data-driven insights to enhance efficiency,” said Chee Foong Wan, CEO of PSA BDP.

These tools, combined with operational improvements, are allowing logistics providers to act more decisively on sustainability goals.



Greening the Fleet

AI-enabled features such as live tracking, predictive routing and emissions transparency are making it easier than ever for shippers to act on both logistical and environmental insights. But digital systems are only part of the equation. Logistics providers are also investing in low-emission hardware, from green trucks to wind-powered cargo ships. Electric trucks are beginning to scale in regions with mature charging infrastructure, especially China and Western Europe. PSA BDP is establishing green truck corridors, and Uber Freight is working to bring electric vehicles into its active fleet.

At sea, innovation is also beginning to reshape how goods move—and how emissions are addressed. Although aviation often garners the most attention, shipping is a larger emitter, accounting for roughly 3 percent of global greenhouse gas emissions, triple that of air travel. Norwegian chemical tanker operator Odfjell has just performed a successful first-of-its-kind transatlantic voyage using suction sails, sailing from Antwerp to Houston. “We’re also exploring ship design improvements, like lighter hulls and energy-saving features, that would be impractical for retrofitting existing ships. So far, our range of energy-





JEFF BRASIER | VP OF CLIENT ENGAGEMENT, UBER FREIGHT

We use AI algorithms to identify candidate shipments based on shipping patterns, sizes and release days.



HARALD FOTLAND | CEO, ODFJELL

We have performed our first near carbon-neutral transatlantic crossing, using a combination of sails and biofuels.



THIES GRAGE | HEAD OF INNOVATION & SUSTAINABILITY, HOYER GROUP

Emissions come from road transport and ocean shipping. In Europe, we've made progress by increasing intermodal transport—using rail and short-sea shipping to cut road emissions.

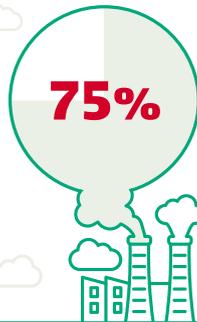
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Value chain emissions

make up about

of the average chemical company's total carbon footprint.

Source: Deloitte, 2024



▶ efficiency initiatives has reduced the intensity of carbon emissions of our owned fleet by 53 percent compared to the 2008 baseline. Future vessels could be designed more like sailing ships to maximize wind propulsion,” said Harald Fotland, CEO, Odfjell. The sails, which could reduce fuel consumption by around 8 percent, are just one example of how maritime logistics is evolving. Balancing the financial risks of novel technologies with their long-term value remains a challenge, but companies like Odfjell continue to invest in transformative technologies that could redefine the future of maritime logistics.

Formulas for Food Security

Food security is one of the defining challenges of our time, and the chemical industry is central to solving it. As the global population nears 10 billion by 2050, demand for food is rising fast. Yet the resources to meet that demand—arable land, labor and water—are shrinking. Since 1960, arable land per person has declined by over 50 percent, according to the Food and Agriculture Organization of the United Nations, due to urbanization, erosion and climate stress.

At the heart of this dilemma lies a simple question: How do we produce more food, using fewer resources, with less environmental impact? The answer increasingly lies in fertilizers, crop protection and chemistry-led innovation. Fertilizers alone account for roughly 50 percent of global food production, according to the International Fertilizer Association (IFA). Without them, crops would reach only a fraction of their potential.

“For decades, there was plenty of farmland available, and basic commodity fertilizers were sufficient. But as arable land becomes limited, efficiency is now the priority,” says Bruce Bodine, CEO of The Mosaic Company, highlighting the industry-wide shift enhancing yield per acre. However, innovation is crucial to mitigate their



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environmental footprint. For example, innovations at the ICL Group include AI-driven nutrient blending and biodegradable fertilizer coatings to reduce waste and runoff.

Compounding this is a worsening labor shortage. In the U.S., the average farmer is nearly 60, and younger generations inheriting the land are becoming less inclined to pick up the baton. “Labor shortages in rural areas are a growing problem, leading to increased demand for automation,” says Jeff Rowe, CEO of Syngenta Group. To address these challenges, the chemical industry is not only advancing crop protection products but also driving innovation in digital farming tools. Companies like Syngenta are using AI, not only in the lab, but in the field too: “AI is assisting farmers directly—providing digital agronomists that help them make real-time decisions,” Rowe adds. These tools are especially impactful for smallholder farmers in remote regions, where local agronomic support is often limited.

AI also plays a critical role upstream, helping chemical companies identify new active ingredients and optimize genetic combinations, advancing discovery processes in a similar way to pharmaceutical development. “We use AI to identify new active ingredients and genetic combinations. Machine learning helps us optimize our selection process, making research more efficient,” Rowe explains. He cites a recent launch of a crop protection product that helps farmers in high-risk regions prevent pest-related crop losses and avoid full-season wipeouts. Without such solutions, farmers in Brazil faced the possibility of losing their entire harvests. This highlights the critical role that science — and chemistry in particular — plays in supporting food security in vulnerable areas.

As the agricultural landscape evolves, the chemical industry is expanding beyond synthetic solutions. One area of rapid growth is biologicals—natural products derived from living organisms—that are increasingly integrated into modern crop protection strategies. These inputs are seen not as replacements but as complements to traditional agrochemicals, often providing more targeted and environmentally conscious modes of action. “Biological inputs, with their diverse modes of action, are critical tools to address this challenge,” says Eda Reinot, CEO of Certis Biologicals. Their product “tackles tough soil-borne fungal and bacterial diseases when applied in-furrow ... enhancing crop fertility, increasing nutrient uptake and root-shoot weight.”

As chemical companies expand into biological solutions, startups like Loam Bio are advancing microbial products that rebuild soil carbon, a resource often overlooked by traditional inputs. Guy Hudson, co-founder and CEO of Loam Bio, notes that 20 percent to 60 percent of carbon has been lost from farm soils, despite its essential role in soil health, water retention and nutrient availability. While nitrogen levels can be managed with existing tools, no comparable solution existed for soil carbon. In response, the startup is developing a biological treatment designed to increase and stabilize carbon levels in agricultural soils: “Research indicates that applying these fungi can increase soil carbon by up to 20 percent, with some studies showing a 9.4 percent rise in total organic carbon. This leads to better crop yields and more durable carbon storage.”



Traditional bleach-based solutions come with harsh odors, equipment damage and limited applicability. Quanticare, a groundbreaking disinfectant wipe and spray that replaces bleach, is approved for use in health care, offering superior efficacy while addressing these drawbacks.

SANJEEV RASTOGI | CEO, ARXADA



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This evolution in inputs reflects a broader shift: from volume to value, from extraction to regeneration. Circular models are emerging across the industry. “We extract all the proteins that are not usable for ethanol out of the corn to make corn oil and distillers’ grain products. Both are used for animal feeds or biodiesel,” explains Stuart A. Rose, executive chair of REX American Resources.

Much of the growth potential lies in Latin America, which holds over one-third of the world’s potential arable land and 28 percent of its renewable water. “Argentina has the resources—fertile soil, skilled labor and strong agricultural expertise—to double food production. Stability and reduced export tariffs will accelerate this growth,” says Federico Alonso-Hidalgo, general manager of Gleba.

The path ahead is steep, but the tools are evolving. “With the right data, passion and resolve, the industry can rise to the challenges ahead,” says Raviv Zoller, CEO, ICL Group. That optimism, grounded in chemistry, rooted in the soil, is how we feed the future.

Ascent Chemicals
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Simplifying Care

Chemistry by Design

[NASDAQ: ACNT]

AscentChem.com

The advertisement features a central image of hands being washed with soap suds. The background is a blurred blue and white. The Ascent Chemicals logo is at the top left. The main headline is in large white font. The 'Chemistry by Design' logo is in an orange box at the bottom right. The NASDAQ ticker and website are in white boxes at the bottom.

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AscentChem.com

What's in the Water?

Water is under relentless pressure; from toxic chemical pollution to unchecked industrial overuse, a vital resource is becoming one marked by scarcity and contamination. As droughts become more widespread and water-intensive industries like data centers and microelectronics continue to boom, so does the demand for clean, reliable water. As Rod McNelly, VP and GM, water solutions and services, North America, industrial and utilities, Xylem Inc., puts it: “Ten years ago, droughts were largely confined to arid regions, but now, nearly every state in the U.S.—except Alaska and Kentucky—has experienced droughts.”

With that rising demand comes a need for chemical-driven treatment solutions. “Contaminants such as PFAS, which weren’t on the radar 20 years ago, are now major concerns,” says McNelly. “At least 60 percent of the U.S. population is likely to have ‘forever chemicals’ in their tap water.” Once seen as part of the problem, chemical companies are now actively working to be part of the solution. The urgency and scale of the global opportunity are hard to overstate. Scott Rook, CEO of Chemtrade Logistics, explains that its chlorine helps treat up to: “70 percent of drinking water in Western Canada and up to 60 percent in the Western U.S. Only 40 percent to 50 percent of Brazil’s sewage is treated, but the government aims to increase this to over 90 percent within five years. The potential for growth in water treatment chemicals in Brazil is enormous.” As water use intensifies, so, too, does the complexity of what needs to be removed. New contaminants are emerging—ranging from persistent industrial chemicals to microscopic plastic particles—adding new layers to water treatment requirements. “Water quality is multifaceted, involving removing contaminants, killing bacteria, and addressing emerging issues like per- and polyfluoroalkyl substances (PFAS) and microplastics. While we excel in coagulant production, filtration—a rapidly growing field—is an area we’re exploring. We’re investigating how to enter this space and align it with our broader water treatment business strategy,” Rook adds.

Olin Corporation is also scaling up to meet the demand. “While many think of chlorine as primarily for swimming pools, it’s also essential for water treatment,” says Kenneth T. Lane, president and CEO. “We’re leaders in bleach production ... and we’re looking into building a salt-to-bleach plant in Southern California to meet regional needs.” Beyond chemistry, microbial control is equally crucial. Sanjeev Rastogi, CEO of Arxada, notes: “Our products ... are used extensively in sectors like health care, restaurants and hospitality, from cleaning surfaces to maintaining hygienic water systems.” In food, the risks are even starker. “In the U.S. alone, there are approximately 48 million cases of foodborne illnesses annually, resulting in 3,000 deaths. ... We treat the water used in agricultural irrigation to prevent microbial growth on fruits and vegetables.” From filtration and coagulants to chlorine and microbe control, the chemicals industry is no longer just part of the water conversation—it’s leading it.

Plastic’s Second Act

Fourteen million tons of plastic enter the ocean annually, and microplastics are turning up everywhere—from our food to our bodies. Once focused on mitigating damage, the industry is now beginning to lead with design. Companies are rethinking plastic at the molecular level, challenging long-held assumptions about what’s recyclable—and how.

“A decade ago, plastic pollution was barely part of the global conversation,” says Jacob Duer, CEO of the Alliance to End Plastic Waste. “While climate change has long been a central focus, plastic waste only gained significant attention in the past eight years. Despite its relatively recent prominence, the response has been remarkably swift.” That response now includes governments, corporations and NGOs mobilizing toward a common goal: to close the loop on plastics. A major turning point could be the upcoming U.N. Global Plastics Treaty. Negotiations are underway to establish a legally binding international agreement that addresses the full life cycle of plastics—from production to disposal. According to the U.N. Environment



NATHALIE MORIN | PRESIDENT AND CEO, **POLYSTYVERT**

Our dissolution and purification technology, however, preserves the plastic in its original form, reducing the carbon footprint by up to 90 percent compared to virgin plastic.



COEN VINKE | CEO, **HOLLAND COLOURS**

In packaging, recycling is becoming more prominent, as companies move away from virgin materials. Regulations are pushing for more recycled PET use instead of virgin PET.



MARCELLO BOLDRINI | CEO, **KRATON CORPORATION**

Two of our key innovations that inspire me enable higher recycled content in products like packaging and automotive parts while achieving quality comparable to virgin plastics.



ALOKE LOHIA | FOUNDER & GROUP CEO, **INDORAMA VENTURES**

PET and polyester are the only plastics that can be recycled repeatedly, so we’re in a strong position to lead in managing plastic waste.



CINDY BOITER | EVP & PRESIDENT, **CHEMICALS, MILLIKEN & COMPANY**

We’re particularly proud of reducing energy consumption by up to 10 percent in polypropylene part manufacturing through our additives, which help converters lower their carbon footprints.

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Programme, key proposals include cutting plastic pollution by 80 percent by 2040, setting global design standards, phasing out problematic plastics and enforcing extended producer responsibility. While consensus among 195 nations is no small feat, momentum is building. Duer remains optimistic that a finalized agreement is within reach by year's end.

Innovation is emerging as the linchpin of change. Companies like Encina are rethinking recycling from the ground up. Dave Roesser, CEO, explains: "We take plastics and, in a single step, use a catalyst developed over a decade to convert them directly into specific chemicals." These chemicals—benzene, toluene and xylene—can be reintroduced into the supply chain as feedstock for new plastics. "It skips intermediate steps, making it more efficient and reducing emissions." Traditional pyrolysis, often used to break down plastics, typically requires high heat and produces a mix of oils and gases that need further refinement. Encina's catalytic approach reduces complexity and environmental impact.

Montreal-based Polystyvert is tackling plastics long considered unrecyclable. Nathalie Morin, CEO, describes their solution: "Our dissolution and purification technology ... reduces the carbon footprint by up to 90 percent compared to virgin plastic. It's cost-effective and offers a low-carbon-footprint solution for recycling highly contaminated plastics." By focusing on materials like polystyrene and ABS, they're transforming contaminated waste into high-quality feedstock.

At the same time, companies are beginning to address one of the biggest hidden hurdles in plastic recycling: dark plastics. Though technically recyclable, plastics colored with carbon black evade many infrared sorting systems used in automated recycling facilities. "Around 30–35 percent of all plastics are black or dark, so this technology has tremendous potential, especially as regulations around recycling grow stricter," says Michael Wilson, CEO of Vibrantz Technologies. Companies are now exploring new pigment technologies and additive solutions that allow black plastics to be detected by optical sorters—an important step forward in increasing recyclability at scale.

"Carbon black is everywhere. Black plastic computer frames, keyboard keys and even synthetic fibers in clothing often contain it. Beyond colour, it prevents UV degradation in plastics, making it essential for outdoor materials like black plastic pipes," says Mark Leigh, Tokai Carbon CB. "Recycling carbon black is challenging. During rubber curing, carbon black fully integrates into the material, making extraction in its original form nearly impossible, like trying to remove flour from a baked cake." However, he is not discouraged: "We are working with Bolder Industries, the leading U.S. pyrolysis company, to convert tire pyrolysis oil (TPO) into carbon

black, a process certified by ISCC as sustainable. This allows us to apply a mass balance approach—if 1 percent of our feedstock comes from TPO, 1 percent of our product can be labelled sustainable." Smart packaging may also play a critical role. "These invisible watermarks enhance automated sorting for multilayer packaging ... improving recycling efficiency as well as quality," says Duer, referencing initiatives like HolyGrail 2.0 that use digital watermarking to enhance waste stream identification.

Still, infrastructure and technology alone aren't enough. "Building a plant costs over a billion dollars," Roesser notes. Encina scrapped plans for a \$1.1 billion plant in Pennsylvania due to permitting delays and design complications, pivoting instead to the Gulf Coast, where "the regulatory environment ... supports innovation."

For early stage companies, financial pressure looms even larger. "Securing funding for clean-tech companies, especially in recycling, is challenging," says Morin. "Our primary challenge now is avoiding delays in commercialization." She sees Europe as a bright spot: "Europe has a stronger regulatory focus on sustainability, with specialized investors in recycling."

Altana AG sees greater momentum for sustainability-focused initiatives in Asia than in more established regions like Europe and North America. This is largely attributed to Asia's ongoing economic development and its position at a different stage in that cycle. Altana CEO Martin Babilas believes that this is where the most impactful solutions will be most sought after: "One of our products replaces unrecyclable laminates with a recyclable coating, maintaining the same barrier performance. This makes me confident that investing in sustainability-focused R&D will help us grow." Recycling alone won't solve the plastic crisis. Companies are investing across the value chain—from feedstock innovation and chemical recycling to bio-based materials and circular business models. Success will depend on scalable tech, better infrastructure and, above all, systemic collaboration. The road is long, but no longer uncharted.

Fragrance, Fabric and the Future of Formulation

Fashion, cosmetics and fragrances exist at the crossroads of identity, sensory experience and chemical innovation. From surfactants in cleansers to polymers in fabrics and fixatives in perfumes, these industries rely heavily on chemistry to transform raw materials into everyday essentials. We use them to express ourselves and enhance how we feel — yet increasingly expect them to be "natural," "clean" and "sustainable." Therein lies a paradox: consumers want fewer "chemicals," but still demand the performance, safety and durability only chemistry can provide. As the engine behind lab-grown scents, biodegradable textiles and traceable supply chains, the



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Indorama Ventures, a global sustainable chemicals company and world's leading PET recycler, delivers innovative and sustainable products to serve major household brands in the FMCG, food and beverage, agricultural, lifestyle, and automotive sectors.

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Symrise is a leader in flavors and fragrances, starting in the food and perfume industries 150 years ago. We have expanded into nutritional ingredients and health solutions, focusing on innovation and creating added value through an innovation ecosystem.

DR JEAN-YVES PARISOT | CEO, SYMRISE



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MAURICIO ADADE | PRESIDENT OF LATAM AND GLOBAL MALNUTRITION PARTNERSHIPS AND PROGRAMS, DSM-FIRMENICH

Understanding local consumer preferences is crucial. This is why we have development laboratories in different regions to tailor our products to local needs.



DAVIS WARLICK | COO, PARKDALE MILLS

The biggest change has been in consumer behavior, particularly the shift from natural fibers like cotton to synthetics such as polyester.



EDWARD POLEN | PRESIDENT AND CEO, EMCO CHEMICAL DISTRIBUTORS

Beyond coatings, EMCO supplies raw materials to companies that manufacture personal care products, household and industrial cleaners, car wash products, graphic arts products and pharmaceuticals.

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chemicals industry isn't just supporting these sectors — it's shaping their future. Progress in beauty, fashion and personal care will depend not only on cultural trends but on chemistry's ability to reconcile efficacy with environmental and human health. Fortunately, performance and sustainability no longer need to be at odds — especially in personal care and fragrance, where chemistry is becoming more intelligent, traceable and green. Symrise, a global leader in flavors and fragrances, is helping lead this transformation by blending advanced chemistry, sustainable sourcing and AI-powered product development. "We have a strong background in chemistry, where we operate six chemical plants that help us remain backwards-integrated in specialty fragrance ingredients," explains Dr. Jean-Yves Parisot, CEO of Symrise. When sourcing natural raw materials, the company embeds green chemistry principles into innovation to reduce environmental impact. This approach is further strengthened by digital tools, particularly AI, which guide product development across both personal care and food sectors. "We also use AI for formula simplification, optimizing CO2 footprint and ensuring that we can deliver innovative products efficiently. Our AI tools help our customers create products with specific, tailored characteristics, whether it's a soup in Vietnam or a fragrance in the Middle East." By integrating classical chemistry with modern science and data, companies can use specialty chemical production to enable sustainable innovation at scale.

This blending of nature and science reflects a broader consumer desire for authenticity and transparency but also for high-performing, sensorially rich experiences. Technologies like green chemistry, fermentation and synthetic biology are becoming foundational to this effort, enabling everything from bio-based fragrances to biodegradable beauty formulations. Increasingly, these advances fall under the umbrella of specialty chemicals — a rapidly growing segment of the chemicals industry focused on designing tailored, high-performance ingredients for beauty and personal care. The same tension — between natural appeal and the chemical precision needed to achieve it — also plays out in the fashion and textiles sector. Though often overshadowed by personal care, fashion remains a critical arena

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for chemical innovation, especially around durability, biodegradability and end-of-life impact. Functional additives, specialty polymers and textile coatings are all part of the expanding chemical toolkit reshaping the industry. Davis Warlick, COO of Parkdale Mills, points to one such innovation: “Our patented textile ingredient, Ciclo, allows synthetic fibers and textiles made from polyester and nylon to biodegrade naturally within four-and-a-half years, compared to the centuries these products remain in our environment.” Synthetic fibers dominate global markets due to their low cost and durability. “Polyester, for example, went from a 30 percent market share globally before the 2000s to 65 percent today,” Warlick added. Ciclo exemplifies how chemical modifiers — in this case, functional additives embedded in polymer chains — can alter degradation pathways, offering a new class of materials aligned with circular design principles.

Achieving true textile-to-textile recycling at scale will depend on further chemical breakthroughs: solvent-based fiber separation, chemical depolymerization and advanced catalysts for selective recycling are all areas of active research and commercialization within the sector. Eddie Ingle, CEO of UNIFI, recently launched a program that sources at least 50 percent of its material from recycled textile waste. “The biggest shift is a move toward textile circularity, focusing on recycling textiles into textiles rather than just using recycled bottles. Currently, only about 10 percent of polyester garment production inputs come from bottles, with minimal textiles recycled back into textiles.” Yet true circularity remains elusive. As Christian Schindler, director general of the International Textile Manufacturers Federation (ITMF), explains: “The industry’s current focus is circularity — true textile-to-textile recycling. While recycled PET bottles are commonly used for fibers, actual garment recycling remains below 1 percent.” Ingle agrees: “The biggest challenge lies in building supply chains for recycled textiles. Unlike relatively uniform bottles, textiles vary greatly in material and color.” One potential solution lies in designing for recyclability from the outset. “The key lies in designing for circularity. By creating 100 percent polyester garments that mimic the feel and performance of poly-cotton blends, we can significantly increase the recyclability of textiles,” said Ingle. Here, too, specialty chemicals — from fiber treatments to engineered resins — will be essential to reconciling consumer expectations for comfort, functionality and environmental responsibility.

From Regulation to Resilience

Tensions between regulation and innovation are as old as industry itself, and in the chemicals sector, this dynamic is particularly acute. The long arc of asbestos, from industrial marvel to global health crisis, serves as a reminder of the cost of delayed regulation and the importance of foresight. At the heart of this history lies a nagging dilemma: how can companies earn public trust without stifling the very innovation that drives progress in the first place?

Around the world, regulatory frameworks are shifting, but not in step. Europe is notorious for leading with robust regulations, the U.S. is leaning into deregulation, Latin America wrestles with enforcement and Asia adapts amid rapid industrialization. As Michael Lefenfeld, president and CEO of Hexion Inc., puts it: “Regulatory environments vary significantly worldwide. While Europe leads in sustainability standards, North America follows closely and Asia is catching up. Despite these disparities, the industry’s evolution requires collaboration, regulatory alignment and a willingness to disrupt established practices.”

On one side of the Atlantic Ocean, the European Chemicals Agency (ECHA) has identified over 247 substances of very high concern that need replacing with safer alternatives. Meanwhile, in the U.S., recent policy moves, such as the EPA’s March 2025 initiative to update chemical review processes under the Toxic Substances Control Act, hint at an effort to safeguard health and the environment but without unduly burdening innovation. In this fragmented regulatory landscape, collaboration and strong partnerships will ensure innovation can flourish while public confidence is secured.



Our recent Smartech acquisition shows how we’re integrating technology to disrupt operations and create more sustainable solutions, even if they challenge traditional revenue streams. These systems use fewer chemicals, like resins and waxes, without compromising quality.



MICHAEL LEFENFELD |
PRESIDENT AND CEO, HEXION INC

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This is particularly true in adjacent sectors like hydrogen technologies, which rely heavily on chemical innovations and advanced materials. Håkon Vollidal, CEO of Nel Hydrogen, notes that while policies such as the Inflation Reduction Act initially accelerated momentum, the lack of clear regulatory definitions slowed progress. Reflecting on the need for action, he points out that while subsidies are not a sustainable option in the long run, they are necessary to drive adoption: “Businesses need predictability. I hope subsidies can end soon, but we’re not there yet. We’ll have missed the window if clean hydrogen isn’t widely adopted by 2030. So, I say: spend the money now, not spread it thin over 10 years—frontload it and make it happen.”

That tension between advancing progress and ensuring safety is where industry players are channelling their focus, since well-intentioned policies can create unintended headaches for businesses. Kenneth Lane, CEO, Olin, points to one such example: “The EPA recently banned a small chemical used in furniture finishes, claiming manufacturers couldn’t control employee exposure. Based on the assumption that employees weren’t using protective equipment, this decision ignores OSHA standards and has unintended consequences, such as harming U.S. furniture refinishing businesses.”

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While regulators like the EPA work to streamline reviews, companies are urging for greater clarity and more proportionate enforcement. Eric R. Byer, president and CEO, Alliance for Chemical Distribution, stresses that misallocated resources place unnecessary financial and operational strain on businesses and calls for a more balanced approach: “Over-regulation occurs when enforcement shifts from targeting bad actors to penalizing companies with good safety and compliance records over minor paperwork infractions.” As science leaps ahead, Amber Wellman, chief sustainability officer, Chemours, similarly advocates for greater nuance, pointing out that, by some definitions, PFAS could include thousands of different compounds that vary significantly in properties, uses and safety profiles: “Unfortunately, some regulatory discussions often fail to account for these differences and lump these compounds together. Such a broad approach is not scientifically sound and would be like regulating olive oil and gasoline the same way because both are hydrocarbons.”

These challenges are particularly cumbersome for midsize and growing companies, which, though not necessarily the intended targets of such policies, given the consolidated nature of the sector, often must contend with fewer resources despite having disproportionate potential for innovation. “Regulation has increased significantly. Running a business today is much more complex and expensive. As companies grow, they face more scrutiny. Regulators focus on bigger players rather than smaller ones, making compliance more demanding as we expand,” comments Edward Polen, CEO, EMCO Chemical Distributors.

Ultimately, when shaped by sound science, mutual trust and a willingness to adapt, regulation and innovation can move forward together. The road ahead won't be simple, but it offers true catalysts for doing better: making chemicals safer, processes cleaner and partnerships stronger.

This is where resilience matters: not just withstanding pressure but responding with clarity and intent. The chemical industry has always been about transformation; now it's time to show that real change, much like good chemistry, starts with the right reactions.



CLAUS SAUTER | CEO, VERBIO

Regulatory challenges are growing, particularly with the rise of fraudulent practices in the biofuels market. We've raised this with the European Commission, but proving fraud is difficult.



MANUEL DIAZ | DIRECTOR GENERAL, THE LATIN AMERICAN PETROCHEMICAL AND CHEMICAL ASSOCIATION (APLA)

Each country must address challenges like feedstock supply and trade policies to maintain its position in the regional market.



SHARON MCGUINNESS | EXECUTIVE DIRECTOR, ECHA

Later in 2025, we will publish a chemicals industry package to boost the competitiveness of the EU chemicals industry and support production and innovation in Europe.



STEFAN P. BUTZ | CEO, DKSH

The competitive landscape is very fragmented, offering consolidation opportunities. Therefore, accelerating our M&A execution will be key in 2025.

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