



Building resilience in the petrochemical industry

Strengthening the European petrochemical industry during ongoing transformation in a constantly changing world

In the petrochemical industry, resilience is the ability to maintain competitiveness and profitability in the face of disruptions.

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1 Executive summary

The European petrochemical industry is undergoing a profound transformation. Shifting market dynamics, geopolitical developments, sustainability requirements and evolving customer expectations are reshaping the environment in which companies operate. At the same time, Europe continues to benefit from unique strengths: highly integrated production networks, decades of process expertise, a highly skilled workforce, strong innovation capabilities and close collaboration across value chains. Together, these strengths provide a solid foundation for building resilience and creating long-term value in an increasingly dynamic world.

This paper explores how resilience can be strengthened through actions that are largely within the industry's own sphere of influence. In the petrochemical industry, resilience is the ability to maintain competitiveness and profitability despite disruptions. Long-term success depends on how effectively companies adapt, innovate and continuously improve their operations, technologies and business models. However, realizing this potential requires a supportive political environment. Competitive energy prices, efficient permitting processes, targeted investment incentives and constructive dialogue between industry and policymakers all play an important role in enabling growth and innovation. Lasting competitiveness is built through the combined efforts of industry and policymakers, with companies driving innovation and operational excellence while framework conditions support investment, growth and long-term success.

Many factors that drive resilience are already deeply embedded in the petrochemical industry. Continuous improvements in operational efficiency help companies make better use of energy, feedstocks and assets, strengthening both competitiveness and sustainability. Innovation translates scientific knowledge and process expertise into productivity gains, new technologies and future business opportunities. Integrated value chains, long-standing partnerships and regional production networks enhance flexibility and reliability, particularly in times of uncertainty. At the same time, diversified portfolios and broad market access create options that enable companies to respond to changing customer needs and evolving market trends. Underpinning all of these factors are the people whose expertise, experience and commitment to continuous learning ensure that knowledge is transferred, applied and expanded over time.

Companies that continuously strengthen these capabilities enhance their competitiveness, expand their opportunities and create long-term value. At the same time, they contribute to the stability and competitiveness of Europe's wider industrial ecosystem. In this sense, resilience is a foundation for sustainable growth, industrial strength and long-term value creation.

At Oxeno, resilience is built through a combination of operational excellence, innovation, people and partnership. As an integrated C4 specialist operating across Marl, Germany and Antwerp, Belgium, Oxeno connects feedstock flexibility, advanced process technology, digital decision-making and long-standing value-chain relationships into a resilient industrial network. By upgrading variable C4 streams into high-value products, continuously improving asset performance and collaborating closely with suppliers and customers, Oxeno strengthens both its own competitiveness and the resilience of the wider European petrochemical ecosystem.

2 Where the European petrochemical industry stands

Oxeno's [first white paper](#) described the structural transformation of the European petrochemical industry: a sector shifting from a growth-centric past towards a future increasingly defined by resilience, competitiveness and carbon efficiency. This transformation continues against a backdrop of persistent cost pressure, strict carbon regulation and aging cracker infrastructure. This chapter summarizes where the industry stands today and identifies the key levers that influence its competitiveness and resilience.



White Paper No. 1

The levers, and their impact

Four groups of levers define the industry's current situation. According to Cefic's competitiveness analysis, energy and feedstock costs, together with environmental and regulatory costs have the largest impact on the European cost position; they should therefore be addressed with priority. The remaining lever groups also play an important role, although their overall impact is lower.

- **Energy and feedstock costs.** European gas prices were around three times the United States level through 2025 (Cefic, Chemical Trends). Roughly half of the announced plant closures in Europe name energy cost competitiveness as the primary driver (Cefic, Closures Radar 2026). The Draghi report reaches the same conclusion at the level of the whole economy: European industry pays a structural energy cost premium that is not faced by competitors in the United States and the Middle East.
- **Regulatory and administrative burden.** The bureaucratic load has grown substantially over the past decade (Draghi, 2024). The European Commission itself has acknowledged the point: its 2025 Chemicals Industry Action Plan and the accompanying simplification packages aim to cut administrative burden and accelerate permitting for industrial sites. Implementation has begun: the first Omnibus simplification packages were adopted in 2025, the Industrial Accelerator Act followed in March 2026 with accelerated permitting for strategic industrial projects, and the chemicals-specific measures are scheduled to take effect through 2026 and 2027 (European Commission). However, the broader process of regulatory simplification remains gradual, and meaningful changes to major frameworks such as CBAM and the EU ETS¹ are likely to take several years to materialize.
- **Global overcapacity, above all in Asia.** European producers' share of the world chemical market has declined to around 13 percent of global chemical sales value, down from 21 percent in 2009 (Cefic, Facts & Figures). At the same time, China now accounts for approximately 46 percent of global sales in 2024 and has become the EU's leading source of chemical imports (Cefic). New capacity continues to come on stream in China, the United States and the Middle East (Deloitte, 2026), maintaining significant price pressure on commodity chemicals. The COVID-19 pandemic played a key role here: although demand stalled, global production capacity continued to increase. Since then, overcapacity has been driven to a large part by industry-friendly government policy measures in China aimed at creating overcapacity and securing a dominant position in global markets.
- **Market uncertainty driven by geopolitical conflicts and trade tensions.** Geopolitical conflicts, tariffs and trade disruptions continue to create uncertainty for industrial investment and economic growth in Europe. At the same time, customer confidence has recovered more slowly than expected following the

¹ **CBAM** (Carbon Border Adjustment Mechanism) is the EU's carbon pricing system for certain imported goods, designed to prevent carbon leakage by aligning carbon costs between EU and non-EU producers. **EU ETS** (European Union Emissions Trading System) is the EU's cap-and-trade system that places a price on greenhouse gas emissions from energy-intensive industries and power generation.

pandemic. In response to this increasingly volatile and complex economic environment, the German Chemical Industry Association (VCI) outlines five possible scenarios for the industry's future development rather than a single forecast for 2026 (VCI, Deutschland 2045: Szenarien für das Innovationsumfeld, Foresight-Studie; VCI, Quarterly Report Q1 2026).

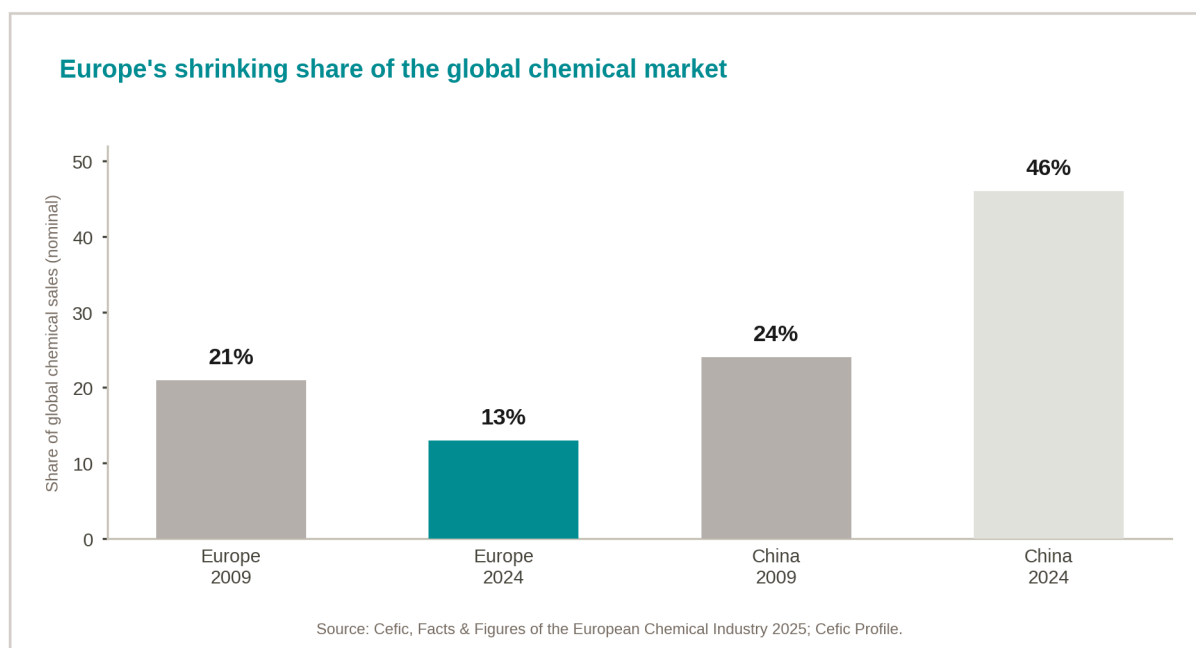


Figure 1: Share of global chemical sales, nominal (value). Europe declined from 21% (2009) to 13% (2024); China grew from 24% (2009) to 46% (2024). Source: Cefic, Facts & Figures 2025.

The cumulative effect of these challenges is clearly visible in industry operating data. Capacity utilization in the EU27 chemical sector stood at 74 percent, 9.5 percent points below the pre-crisis average of 2014-2019, and has remained below its long-term average since Q2 2022 (Cefic, Chemical Trends). While these figures cover the EU27 chemical sector as a whole, Cefic notes that the pressure is most acute in commodity products and petrochemicals, where the cost disadvantages weigh most heavily. Plant closures have surged roughly sixfold since 2022, reaching a cumulative 37 million tons of chemical production capacity, equivalent to around 9 percent of European output, and resulting in the loss of approximately 20,000 direct jobs (Cefic, Closures Radar, January 2026). Within petrochemicals specifically, announced closures amount to around 17.8 million tons, roughly 14 percent of European petrochemical capacity (market analysis based on Cefic data). Eight of the world's ten largest chemical companies are scaling back or reassessing their European operations (Oxford Economics / INEOS, Tipping Point, 2025). The implications extend beyond Europe. At the ACC's GlobalChem conference in February 2026, senior US executives cited the European closure figures as a warning signal in discussions about competitiveness and future regulatory developments in the United States.

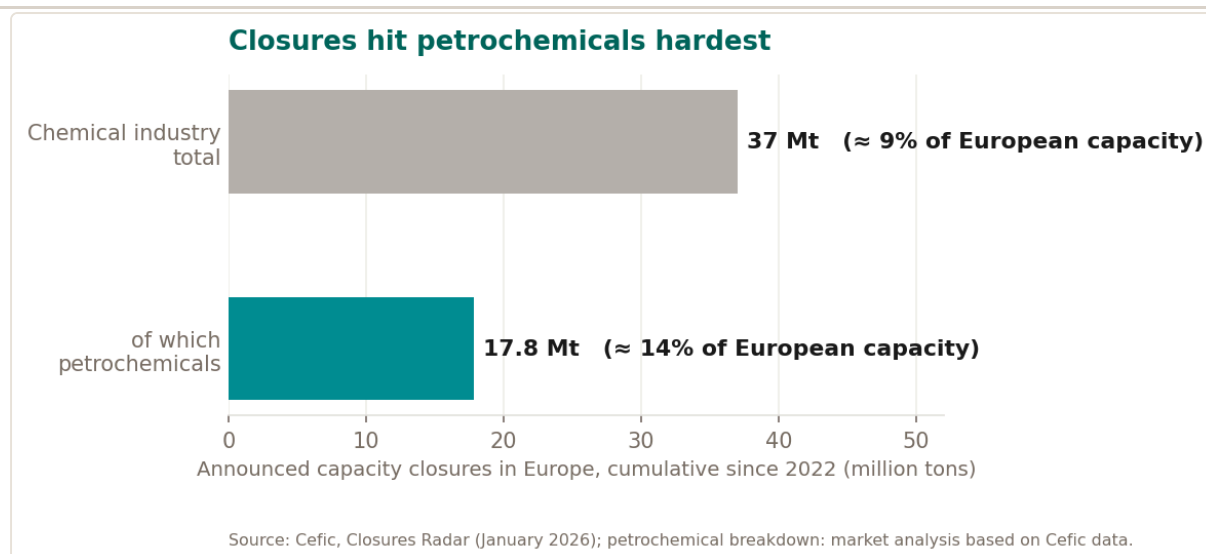


Figure 2: Announced capacity closures in Europe, cumulative since 2022. Petrochemicals carry a disproportionate share. Source: Cefic, Closures Radar 2026; petrochemical split: market analysis.

Recent developments: volatility with two faces

The most significant development since the first white paper is geopolitical. Since early 2026, the war in the Middle East and the resulting pressure on shipping routes have disrupted global flows of products, feedstock and energy. Published assessments describe the effects. In Germany, nine out of ten industrial companies report that their business has been affected, with higher energy prices cited as the most common impact (ifo Institute, 2026). At the same time, Asian producers are more directly exposed to disruptions in Gulf feedstock supplies. As deliveries from some Asian competitors became less reliable, import pressure on Europe eased. Around a quarter of German chemical companies report a positive demand effect, as due to supply disruptions Asian competitors that were unable to deliver. Because of these additional business opportunities production and revenue rose modestly in early 2026, partly on precautionary ordering (VCI, Q1 2026). Rainer Seele, CEO of ADNOC XRG and Covestro's chairman of the supervisory board, summarized the paradox in a widely read interview, noting that parts of the European chemical industry are currently better placed in relative terms (paraphrased; WELT, May 2026).

Published sources are equally clear about the character of this development. The VCI describes it as a breathing space and expects familiar structural pressures to return once the conflict eases. This paper treats the episode accordingly: as a further, unpredictable source of volatility affecting both current and future market behavior, which in this particular case has, temporarily improved the industry's relative competitive position. Work on the levers within the industry's own control remains urgent under every scenario. The VCI's half-year report of July 15, 2026 confirms the broader pattern. Production in the German chemical-pharmaceutical industry remained around 3 percent below the previous year's level during the first half of 2026, while revenues declined 1 percent to 106 billion euros. Investment in fixed assets fell for the third consecutive year and now stands around 15 percent below the 2023 level.

A shift toward regionalization

Globalization remains a defining characteristic of the chemical industry and, by extension, of the petrochemical sector. At the same time tariffs, geopolitical conflicts and other disruptions have exposed vulnerabilities in highly interconnected global supply and value chains. Where such disruptions occur, companies must be able to respond flexibly, while Europe needs to strengthen the resilience of its own industrial ecosystem. The objective

is not to replace globalization, but to reduce risk by diversifying raw material sources, expanding sales channels and strengthening regional supply and value chains. This includes shorter transport routes, greater supply chain transparency and a reassessment of the customer supplier portfolios. In some cases, companies may accept higher costs and lower revenues in exchange for greater supply security, lower disruption risk and improved operational reliability (VCI, 2026; Deloitte, Chemical Industry Outlook 2026). Increasingly, procurement decisions are not only influenced by purchase price, but also by security of supply, reliability, lead times, regulatory compliance and documentation quality as part of the overall value proposition (Deloitte, Supply Chain Strategy, June 2026). For European producers, whose strengths lie precisely in these areas, this development brings the advantages of regional proximity and strong customer relationships more clearly into focus.

3 Building resilience: acting on the factors within the industry's control

The industry's room for action lies in several key resilience factors: in how much energy a plant consumes, how efficiently processes run, how reliably supply and value chains are organized, how quickly innovation converts process understanding into advancement and how well critical expertise is developed and retained. These factors determine how efficiently plants operate, how effectively resources are utilized, how resilient value chains are to disruption and how quickly new process insights are translated into competitive advantage. Each section follows the same pattern: outlining the challenge facing the petrochemical industry, highlighting available solutions and, where appropriate, illustrating their practical application through examples from producers like Oxeno.

3.1 Energy efficiency and sustainability

Energy as a cost driver for European producers will remain a decisive competitiveness factor. While producers cannot directly influence energy market prices, they can continuously improve the energy efficiency of their production plants. Although, efficiency improvements cannot fully offset Europe's structural energy cost disadvantage, they can significantly help to reduce its impact. At the same time, maintaining a competitive industrial base will require an energy policy framework in Europe that supports both sustainably and internationally competitive energy prices.

The sector-wide toolbox is well established and ranges from incremental improvements to existing assets to larger structural investments in electrification and battery storage. The lever is substantial: the European chemical industry has improved its energy efficiency by 40 percent since 1990 (Cefic, Facts & Figures 2025). Process optimization and heat integration reduce specific energy consumption and operating costs. Electrification of process heat, combined with on-site storage, can further improve flexibility by allowing companies to make better use of fluctuating power markets.

TotalEnergies' integrated platform in Antwerp, for example combines process electrification with a 25 MW battery storage system, the company's largest in Europe, helping both to decarbonize operations and to balance the Belgian and European grid stability (TotalEnergies, 2025). Digital technologies are becoming equally important. Advanced process control, open process automation and digital twins are moving from pilot projects into standard industrial practice across refining and petrochemicals. Industry publications describe broad adoption of AI-based solutions, ranging from optimization of individual process units through advanced process control and distillation systems to plant-wide digital twins that improve performance across entire production complexes (PTQ, Q1 2026; Hydrocarbon Processing/IRPC). Deloitte reaches a similar conclusion:

identifying efficiency programs and the scaling of intelligent applications core priorities as the five decisive levers for chemical companies navigating the downturn alongside profit improvement, supply chain resilience, end market demand and innovation among (Deloitte, Chemical Industry Outlook 2026).

Many of these measures require substantial investment and depend on a deeper understanding of chemical processes and plant operations.

APC as one answer for reducing energy consumption

Oxeno pursues efficiency and sustainability through a combination of Advanced Process Control (APC), automation and digital operations across its integrated C4-Verbund. Advanced Process Control systems are deployed throughout the production network, combining process models with the practical expertise of plant operators. By continuously predicting and optimizing operating conditions, APC enables lower steam consumption while maintaining stable product quality under changing conditions. The result is improved resource efficiency, reduced energy consumption and a lower product carbon footprint.

Process automation further supports operational excellence. Automated start-up systems replace repetitive manual procedures, reducing variability, minimizing operational errors and enabling plant personnel to focus on higher-value tasks. Repeatable and optimized start-up and shutdown sequences improve both efficiency and reliability.

These benefits are supported by a strong Operational Technology (OT) security framework. As digitalization and data exchange increase, maintaining a high level of cybersecurity is essential to safeguarding plant availability and operational continuity. Together, process optimization, automation and secure digital infrastructure demonstrate how efficiency improvements can simultaneously strengthen competitiveness, sustainability and resilience.

Sustainability as a strengthening factor

When efficiency and sustainability align, they become a powerful resilience factor. Lower energy consumption per ton helps to lower the carbon footprint. Avoidance or at least efficient use of by-product streams reduces resource consumption and improves the environmental balance. Viewed in this way, sustainability strengthens resilience not only in the company but also for the partners. It helps them to meet their sustainability objectives.

One example is Oxeno's early adoption of sustainability certifications for the use of alternative feedstocks and portfolio-wide life-cycle assessment. Since November 2021, Oxeno's production sites in Marl and Antwerp have been ISCC Plus and ISCC EU certified, providing traceability of sustainable raw materials throughout the supply chain. This enables customers to market their end products as ISCC-certified. In addition, an externally certified life-cycle-assessment model covering the entire portfolio, combined with systematic sustainability data management provides customers with audited documentation of lower product carbon footprints. This supports the Scope 3 emissions documentation that customers increasingly require for their own sustainability reporting.

At the same time, sustainability initiatives compete with other business priorities for resources and investment. Resilient companies therefore focus on sustainability measures that deliver clear business benefits in the short-term while maintaining their long-term sustainability ambitions and preparing for future regulatory and market requirements.

3.2 Innovation and AI

Innovation strengthens resilience when it translates into operational improvements, competitive products or new business opportunities. It deepens process understanding even further, and greater process understanding

helps reduce costs, increases output and creates new product opportunities. The industry-wide evidence is consistent. Deloitte identifies innovation, alongside efficiency and AI adoption, as one of the key factors shaping competitiveness during the current downturn. It notes that chemical companies continue to innovate products, processes and business models precisely because innovation builds resilience in challenging markets (Deloitte, Chemical Industry Outlook 2026). The technology agenda is visible across the refining and petrochemical industries, where process intensification, AI-supported process models and digitalized R&D pipelines feature prominently in industry publications (PTQ; Hydrocarbon Processing). Major producers underline the same direction: TotalEnergies has concentrated its research activities in six strategic technology programs and has launched a joint AI innovation lab with Mistral AI serving more than 1,000 researchers (TotalEnergies, 2025; TotalEnergies, VivaTech: Data & AI in Support of TotalEnergies' Transition Strategy, June 2026).

Innovation performance in the petrochemical industry can be assessed through complementary indicators: research intensity as tracked by Cefic, patent activity in the portfolios of energy and chemical majors (LexisNexis Innovation Momentum, 2026), the deployment of new technologies documented in industries publications and the maturity with which process innovations are translated into commercial implementation. All of these indicators point in the same direction: the strength of resilient producers lies in consistently converting research into commercial and operational outcomes. Research efforts focused on areas with clear short- and medium-term business potential are most likely to create sustainable value.

Advanced technology to accelerate performance improvements

Process optimization delivers incremental improvements along the C4 value chain. It typically leads to rapid performance gains while requiring little or no capital investment for implementation. The time needed for R&D work and implementation is relatively short, usually ranging from one to three years. Success depends on the close integration of technology, data and people within interdisciplinary teams.

The holistic optimization of integrated production systems leverages large volumes of data from production plants to identify relationships using artificial intelligence and to develop process models. Through data aggregation, correlation analysis, and visualization, key influencing factors can be identified and continuously monitored. Based on these insights, plant operating conditions can be predicted and optimized, improving both efficiency and stability. By taking an integrated approach across the entire value chain, this enables sustainable system-wide optimization rather than isolated improvements in individual production units.

Advanced AI models for chemical processes improvements

By applying so-called surrogate AI approaches, Oxeno has developed and implemented new methods for data-driven process optimization. The surrogate approach refers to the use of simplified, data-driven models to approximate complex physical and chemical relationships in industrial processes. In particular, AI-based methods such as neural networks are used to efficiently represent nonlinear relationships between process parameters. These models are based on available data from simulations and real plant operations and can complement or replace computationally intensive first-principles models. Their objective is to provide fast and sufficiently accurate predictions of process behavior, enabling more effective process optimization. Within the first months of deployment, these surrogate models have already delivered measurable reductions in energy consumption and CO₂ emissions at Oxeno.

Resilience is not built overnight. It requires continuous investment in people and technology. The ability to achieve short-term in the past, while today's innovation projects lay the foundation for Oxeno's long-term resilience and competitiveness.

One example is methoxycarbonylation, a proprietary technology platform that Oxeno has continuously expanded. Through an in-house catalyst system combined with organic solvent nanofiltration for energy-efficient catalyst separation, the company has extended the process to a broad range of olefins while building a strong patent portfolio around the technology.

A second example is the heterogenized hydroformylation, a challenge chemists tried to tackle since hydroformylation was first discovered in 1938. Within the publicly funded MACBETH project, Oxeno has come close to solving this long-standing challenge. The company successfully demonstrated continuous heterogenized hydroformylation under production conditions, marking an important step toward industrial application.

3.3 Reliability of supply and value chains

Europe's petrochemical strength rests on clusters that have developed over decades, including the ARA region (Amsterdam, Rotterdam, Antwerp in the Netherlands and Belgium) and the northern Ruhr area in Germany. Within these clusters, refineries, crackers, and downstream producers sit close together, linked logistically and connected through pipelines, shared infrastructure and utilities. Long-standing, partnership-based planning helps stabilize costs, product quality and security of supply for all participants. The resilience value of integrated clusters arises not only from geographical proximity, but also from the ability of companies to coordinate planning and respond collectively to disruptions. The success of this model has made it an example for industrial clusters around the world.

The European petrochemical industry depends on competent, reliable and flexible partners capable of processing all material streams with changing qualities and volumes. For cracker operators, the focus is on producing ethylene and propylene, while C4 streams are often treated as a by-product that require reliable and continuous utilization. Partnerships of this kind transform a network of individual transactions into a resilient industrial system. They also reflect the regionalization trend described in chapter 2, strengthening regional value chains while reducing vulnerability in global markets.

Recent months have highlighted the value of this regional Verbund approach between different companies. Amid global supply disruptions, German chemical producers reported customers increasingly turning to regional suppliers to improve security of supply, with around a quarter of companies recording a positive demand effect (VCI, Q1 2026). Similar conclusions can be found elsewhere. TotalEnergies also highlights the same resilience benefits of integrated industrial platforms in Antwerp (TotalEnergies, Antwerp platform press release, April 2025; TotalEnergies, 2025 Results & 2026 Objectives, February 2026). The Port of Rotterdam similarly emphasizes that collaboration, strong logistics connections and integrated infrastructure are decisive for building resilient chemical supply chains (Port of Rotterdam, 2025). The Verbund concept has proven its worth precisely under crisis conditions.

Anticipating risks and opportunities

A key element of resilience is the ability to anticipate change before it becomes disruption. This requires a continuous assessment of the factors shaping the petrochemical industry and its market environment. Tools such as Double Materiality Analysis can help companies to identify emerging risks, opportunities and potential impacts at an early stage. While such approaches improve preparedness and support informed decision-making, they cannot completely shield businesses from major disruptions or structural challenges.

Integrated production and logistics networks as a foundation for resilience

As a leading global supplier of a broad and diversified portfolio of C4-based products, Oxeno combines long-standing supplier and customer relationships with an integrated production and logistics network spanning Marl, Germany, in the northern Ruhr cluster and Antwerp, Belgium, in the ARA region. As an essential partner within the European C4 value chain, Oxeno serves as a one-stop solution for C4 feedstock producers, providing reliable off-take for the majority of C4 streams generated by steam crackers. At the same time, the company offers short-term flexibility in managing changing feedstock volumes and qualities, preventing bottlenecks and supporting operational continuity for its partners.

Managed as a single Verbund, the two world-scale sites can respond rapidly to changing feedstock availability, demand patterns and market conditions. Supported by decision-centric, scenario-based planning tools and integrated cross-site production capabilities, Oxeno helps secure stable value chains for suppliers and customers alike. Built on decades of cooperation and mutual trust, this approach reflects a simple principle: resilience is strongest when value-chain partners progress together rather than individually.

3.4 Scale, scope and portfolio diversification

Scale, scope and the breadth and depth of value creation as well as the size of plants, are resilience factors in their own right. A producer with the ability to convert a feedstock through multiple parallel (breadth) or consecutive (depth) stages of monetization is not only better protected against a price fall of a single product, but also benefits from value creation at each stage.

Breadth and depth are most effective when combined with a diverse application and product portfolio. Such diversification spreads exposure across end markets that follow different business cycles, from construction and mobility to consumer goods and industrial applications. Companies can also adapt their portfolios to address identifiable market trends, including evolving regulatory requirements. However, in the case of major industry-specific or cross-industry disruptions, such as tariffs that can affect broad segments of the economy, a broad and diversified positioning can mitigate the impacts but cannot eliminate them entirely.

A strong integrated production network can also support smaller business opportunities that may not be economically viable on a stand-alone basis. Within this integrated setup, however, such opportunities can complement the broader portfolio while simultaneously enhancing its overall value.

Capitalizing on these opportunities, however generally requires sufficient production scale and material throughput. In addition, certain petrochemical processes benefit from economies of scale, helping to improve resource efficiency, lower energy consumption and labor costs while simultaneously maximizing production.

From a variety of C4 feedstocks to diverse end markets

Oxeno, with a processing capacity of approximately 2 million tons of C4 feedstocks from a variety of sources, converts these streams into a broad portfolio of products that serve diverse industries and applications, ranging from automotive and transportation to pharmaceuticals. Alongside commodity products such as Butadiene, MTBE, Isononanol (INA) and INA-based plasticizers, specialty products such as DRIVERON® S, ELUCARE® TD and DRIVOSOL® provide access to markets that are typically less cyclical and less volatile. This diversification helps balance demand fluctuations across the portfolio and reduces exposure to individual market cycles. Supported by more than 50 years of industry experience, reliable product quality and long-standing customer relationships, Oxeno combines process expertise with market diversification to build a resilient business model across changing market conditions.

3.5 Keeping close contact with internal and external stakeholders: securing and sharing knowledge

A specialized workforce not only supports the safe and reliable operation of complex production plants but also drives their continuous optimization. Workforce stability helps to preserve valuable operational knowledge, while ongoing training and development ensure that expertise evolves in line with new technologies, processes and the latest business requirements.

Beyond knowledge retention and development, there are broader workforce trends shaping the future of the industry. McKinsey's State of Organizations 2026 identifies the infusion of technology, intensifying economic and geopolitical disruption and evolving employee expectations as key forces reshaping organizations; Deloitte's Human Capital Trends 2026 similarly places the productive combination of people and AI as a central factor in future organizational success. Recent German labor-market research adds a warning about underinvestment in training and skills development (McKinsey HR-Monitor, cited by Tagesspiegel, 2026).

Knowledge Transfer in Practice

Oxeno's operations rely on highly qualified employees, supported by well-established vocational training systems in Belgium and Germany, as well as continuous professional development throughout their careers. The development and implementation of the surrogate AI models described in chapter 3.2 illustrate this approach in practice. Developed by Oxeno's innovation team together with the engineering department, the models were created in close collaboration with the plant operators who use them in day-to-day operations. Their practical experience provided essential operational input for the development of the models and dashboards, while intensive training ensured a smooth introduction into routine plant operations. By involving employees from the outset, digitalization builds on existing expertise rather than replacing it, fostering both acceptance and continuous improvement.

Close cooperation with research institutes and universities further supports the transfer of new knowledge from academia into industrial practice.

Building awareness for a better understanding

Resilience is built both internally and externally. Open dialogue with external stakeholders, communities, policymakers, industry associations and value-chain partners can strengthen trust, improve mutual understanding and contribute to framework conditions that support investment and innovation. Communicating the role of the chemical and petrochemical industry is therefore an important part of building resilience. While the sector often operates out of public view, its products are embedded in countless aspects of daily life, from housing, mobility and healthcare to renewable energy technologies. Raising awareness of these contributions can help foster informed discussion about the role of industry in society's climate-neutral transformation.

At the same time, a competitive petrochemical industry is a prerequisite for maintaining Europe's broader industrial resilience, economic sovereignty and strategic readiness (Draghi, 2024; European Commission, Defence Readiness package, 2026). These are the main conditions Europe needs for competitive equivalence:

- **Competitive industrial energy prices.** Energy costs remain one of the most significant factors affecting Europe's industrial competitiveness. Measures outlined in the EU's Affordable Energy Action Plan are an important first step toward improving the cost position of European industry; its swift and full implementation is the industry's first request.

- **Less bureaucracy, faster permitting.** The Commission's simplification initiatives and the Industrial Accelerator Act (March 2026) move in the right direction by aiming to accelerate investment decisions by creating more predictable and efficient approval processes on whether investment lands in Europe.
- **Support for transformation investment.** Funding instruments such as the Innovation Fund, which committed 2.7 billion Euros to 54 clean-industry projects including chemicals in early 2026, the planned Industrial Decarbonization Bank and the EU Chemicals Innovation Hubs can help improve the business case for industrial transformation projects and low-carbon technologies and should be continued.
- **Lead markets for sustainable products.** Market incentives and procurement criteria that reward low-carbon and certified products can help create demand for sustainable solutions and support investment in innovation.
- **Recognition and prioritization of the petrochemical base as systemically relevant, critical infrastructure.** Designation of critical chemical sites, safeguarding of essential productions and priority for the sector's energy and feedstock supply in crisis planning.

The Antwerp Declaration for a European Industrial Deal, signed by over a thousand organizations from 25 sectors, carries this agenda at European level; the Chemicals Industry Action Plan suggests that the message has been heard.

4 Successful together

Europe's petrochemical industry supplies the materials that underpin everyday life, supplies the value chains of virtually every industrial sector and contributes to the continent's capacity to act independently. In doing so, it helps to ensure security of supply for downstream industries and strengthens Europe's overall economic resilience.

The European chemical industry employs more than 1.2 million people directly and supports an estimated 3.6 to 6 million additional jobs indirectly (Cefic, Facts & Figures of the European Chemical Industry, 2025). Within the petrochemical sector alone, approximately 250,000 to 300,000 people are employed directly across Europe. When upstream and downstream activities, including suppliers, logistics providers and service companies, are taken into account, more than one million jobs depend on the petrochemical industry.

The sector's contribution extends far beyond employment. The chemical industry accounts for approximately 1 to 2 percent to EU GDP directly and including indirect effects across supply chains and further processing activities, contributes around 5 to 7 percent of Europe's economic output. Petrochemicals represent roughly one quarter of total European chemical industry revenues, with the chemical industry generating approximately €635 billion Euros in revenue in 2025.

Each job in the industry strengthens regional purchasing power and contributes to local economic activity. At the same time, the sector generates tax revenues for municipalities, regions such as North Rhine Westphalia and Flanders, national governments including Germany and Belgium in the case of Oxeno and ultimately the European Union. In this way, petrochemicals help sustain regional value creation and strengthen industrial value chains across Europe.

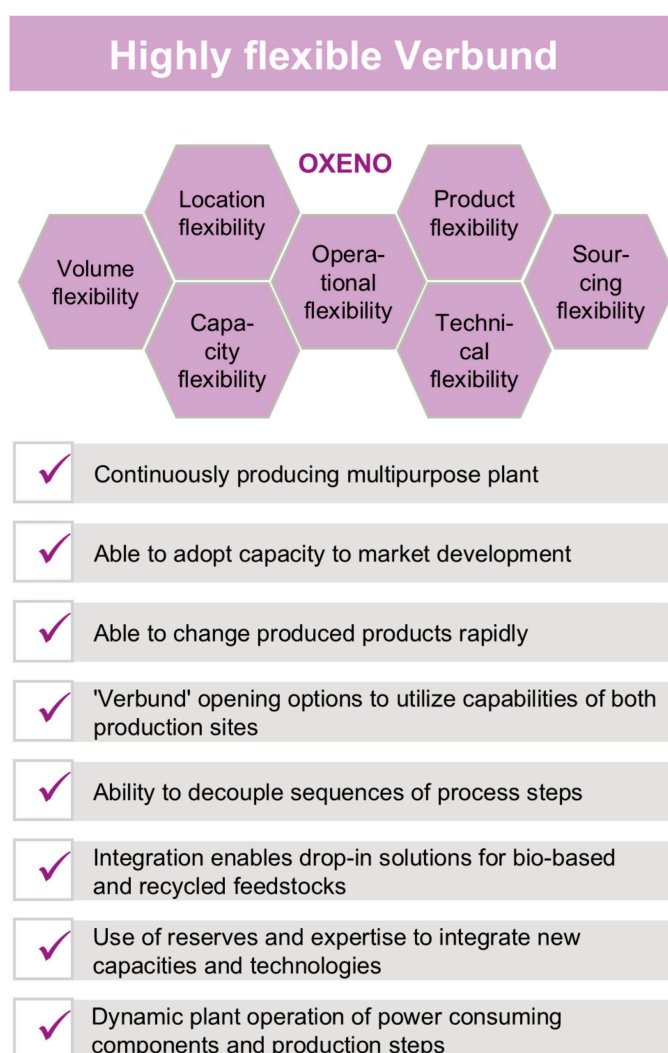
Beyond its economic contribution, the chemical and petrochemical industry enables the functioning of critical infrastructure. Transportation, energy supply, healthcare, food production and water treatment all depend on a reliable supply of materials and intermediates originating from petrochemical value chains.

Critical infrastructure is not only essential for the stability and prosperity of society; it is also a prerequisite for Europe's strategic autonomy and readiness to defend itself. A functioning European petrochemical supply chain helps ensure the availability of fuels and materials required for a wide range of critical products and applications. A reliable and resilient petrochemical industry is therefore an important component of Europe's broader industrial and strategic resilience.

At the same time, a strong and competitive European petrochemical industry is essential to achieving the continent's climate ambitions. By producing under some of the world's most stringent environmental standards and continuing to invest in innovation, efficiency and circular solutions, the industry can contribute to reducing both global emissions and resource consumption while supporting sustainable growth.

The implications are clear: Europe needs its (petro-)chemical industry. It remains an important foundation of industrial competitiveness, economic resilience and societal prosperity. European policymakers should come to the same conclusions and act accordingly. The industry is delivering its part. "Successful together" is more than a slogan; it is the operating model that will carry the European petrochemical industry through this transformation.

With C4 chemistry serving as a key integrating element in petrochemical value chains, and with companies such as Oxeno committed to reliability, expertise and long-term partnership, the industry has every foundation to remain resilient, competitive and relevant in the decades to come.



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Sources and references

1. Cefic, Facts & Figures of the European Chemical Industry 2025 (Marktanteil-Historie, Beschäftigung, Energieeffizienz); Cefic, Chemical Trends Report / Growth and Competitiveness (capacity utilization 74.0%; gas prices ~3x US Jan-Sep 2025; world market share ~13% (EU27) vs. ~46% (China) in 2024).
2. Cefic, European Chemical Closures & Investments Radar 2022-2025 (January 2026): closures up sixfold since 2022, ~37 Mt, ~9% of capacity, 20,000 direct jobs.
3. Cefic / Advancy, The Competitiveness of the European Chemical Industry (2025): weighting of competitiveness factors.
4. European Commission: Chemicals Industry Action Plan (July 2025); Critical Chemicals Alliance (October 2025); Clean Industrial Deal incl. Affordable Energy Action Plan, Industrial Accelerator Act (March 2026), Innovation Fund (EUR 2.7 bn, 54 projects, 2026); Defence Readiness package.
5. Mario Draghi, The Future of European Competitiveness (September 2024).
6. VCI, Quartalsbericht Q1 2026; VCI, Halbjahresbilanz der chemisch-pharmazeutischen Industrie, 15. Juli 2026; VCI Foresight-Studie Deutschland 2045 (2026).
7. ifo Institute, surveys on the impact of the Middle East conflict on German industry (2026).
8. WELT, interview Rainer Seele (May 2026).
9. Deloitte, 2026 Chemical Industry Outlook; Deloitte, Supply Chain Strategy (June 2026); Deloitte Human Capital Trends 2026.
10. McKinsey, The State of Organizations 2026; McKinsey HR-Monitor (via Tagesspiegel, April 2026).
11. Oliver Wyman, Chemical Industry Outlook 2026 (December 2025).
12. Oxford Economics / INEOS, Tipping Point: Threats to Jobs and Growth in Europe's Chemical Sector (2025); INEOS open letters and statements (2025-2026).
13. TotalEnergies, Antwerp platform press release (April 2025); Innovation & R&T programs incl. Mistral AI partnership (2025); TotalEnergies, 2025 Results & 2026 Objectives (February 2026); TotalEnergies, VivaTech: Data & AI in Support of TotalEnergies' Transition Strategy (June 2026).
14. PTQ (Petroleum Technology Quarterly), Q1 2026; Hydrocarbon Processing / IRPC; BIC Magazine (2025).
15. LexisNexis, Innovation Momentum Report 2026.
16. American Chemistry Council / C&EN, US industry outlook and GlobalChem conference reporting (2026).
17. Antwerp Declaration for a European Industrial Deal (2024).
18. Oxeno, Input for White Paper No. 2 (internal, released); Oxeno/Evonik public company information; Oxeno White Paper No. 1 (2025).
19. Port of Rotterdam, *Resilient chain vital for chemical sector* (2025); on collaboration, logistics connectivity and integrated infrastructure in resilient chemical supply chains.



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