OMP.

Toward a value-driven petrochemical supply chain

Introduction

Petrochemical companies are struggling to preserve **a healthy bottom line**. Profitability is threatened by raw material and energy price fluctuations, sudden changes in demand and supply, geopolitical disruption, climate-related challenges, and shifting regulatory frameworks. Investing in green chemistry can also impact short-term profitability, while capacity expansion in China and the Middle East is leading to oversupply and price pressures.

Proactive decision-making informed by advanced supply chain planning is seen as a key driver of revenue and margin growth. What can chief supply chain officers (CSCOs) do to deliver on this promise?

In this Guide for CSCOs, we discuss three key factors that harm profitability in the petrochemical industry and we outline **how innovative digital solutions can be leveraged to achieve a value-driven approach** to supply chain planning. We also discuss real-life cases from major petrochemical companies, revealing the **practical solutions that drive real results**.

3 key challenges of the petrochemical supply chain

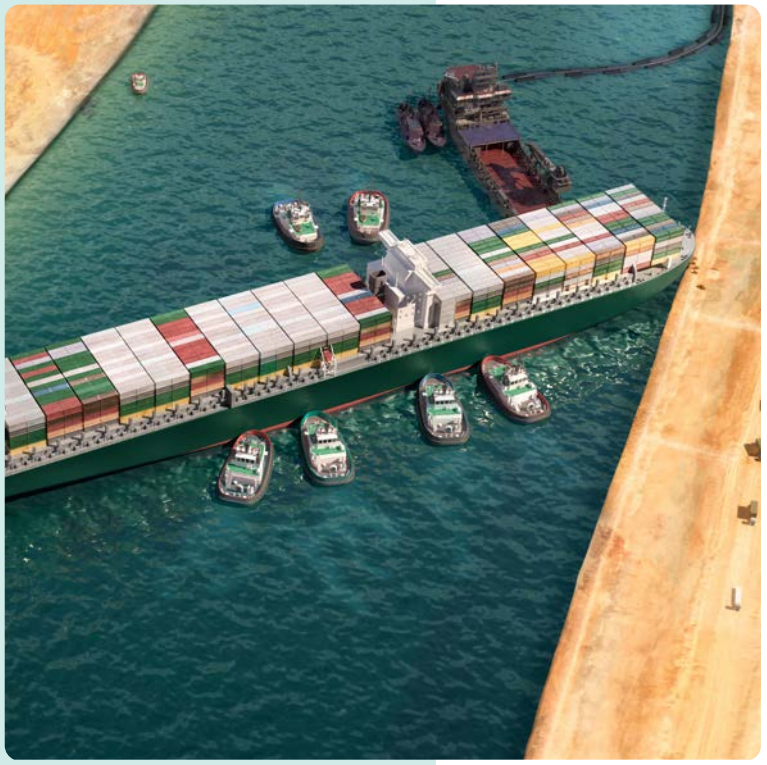
1 Demand volatility and disruptions

The petrochemical industry has seen significant **fluctuation in demand** over the past few years. While the sharp decline in 2020 due to the COVID-19 pandemic was followed by a modest rebound, demand for chemicals has been very unpredictable across the regions since late 2022.

Factors contributing to this unprecedented demand volatility include low growth rates in Europe, inflation in Europe and the United States, lower-than-expected economic growth in China, and over-ordering in previous years leading to destocking. The rapid increase in chemical production capacity in China and the Middle East impacts demand fulfillment flows across the globe. Both these regions are now strategically positioning themselves to capture a larger share of the global chemical market.

Additional uncertainties have arisen due to **geopolitical events** such as the Red Sea conflict, which is disturbing logistics along the Suez Canal. There are also a growing number of events caused by climate change in many regions. The extended periods of drought in Panama disrupting global trade and the low water levels in European waterways disturbing supply are just two examples.

In addition, there has been a cascade of regulatory and economic **policy changes** which is likely to grow even more intense in the years to come. Sustainability regulations will give green chemistry a boost but import tariffs could severely disrupt demand and supply across the globe.



2 Price uncertainties and shortages in materials and labor

A second major problem putting pressure on margins and production planning is **price volatility**. Commodity prices have been fluctuating unpredictably over recent years, and the long-term outlook is very uncertain. Propylene prices, for example, have seen a significant downward trend at the end of 2024 and the beginning of 2025. The evolution of polyethylene prices, however, exhibited a less uniform trend across the globe. This is further impacted by the fact that a significant proportion of the available naphtha is being directed towards the newer production assets in China and the Middle East, creating regional shortages elsewhere. Furthermore, LNG supply continues to be shipped while Russian pipelines to Europe remain shuttered. All this causes unpredictable market dynamics, leading to price and other uncertainties.

Challenges also arise from **labor shortages and costs**, especially in Europe, where the age pyramid is increasingly top-heavy. While the age pyramid is less of an issue in the United States, the increasing war for talent means that less high-profile talent finds its way into the petrochemical business. The United States also face transport-related challenges, with the pipeline network already operating at maximum capacity.

While all this might shed doubt on the business case for major investment projects, it primarily urges companies to **become much more agile**. Petrochemical companies must be able to move quickly and make the right decisions in the face of shortages in raw material, oscillating product prices, and events disrupting transport.

3 Regulatory and sustainability requirements

The **evolving regulatory landscape** presents new challenges for managers in petrochemical enterprises. While some companies focus on the burdens and costs of environmental regulations considering them in both short- and long-term decision-making, others view these regulations as an opportunity to sell products at favorable margins — a significant advantage in this industry. As the transition to a zero-carbon economy continues, more such opportunities are expected to emerge.

What about sustainability and climate change? The United States' climate and energy policies, which include withdrawal from the Paris Agreement and permits issued for new fossil fuel infrastructure, seem to promise the US petrochemical industry its brightest future.

However, the world's transition towards a zero-carbon circular economy is unlikely to come to a complete standstill in the next four years. On the contrary, analysts say that stronger climate action may now be possible through climate conferences without the US at the table, while climate lawsuits against the US government and US corporations are already underway. The European Union, in particular, seems determined to continue its policy of progressively penalizing carbon emissions. The **increasing cost of carbon emissions** will inevitably lead to shortages in the emissions trade market.

What this means for the chemical markets across the globe

The consequences of demand dynamics, price volatility, shortages, and sustainability obligations in the chemical industry expose quite **substantial differences across the globe**. Here's an overview of the situation in **Europe, the United States, the Asia-Pacific, and the Middle East**.

EUROPE

The continuing quest for the most profitable markets

Demand for commodity petrochemicals produced in Europe is in decline, despite the global increase in demand for chemicals since 2022. This is largely due to ongoing production capacity increases in China and the Middle East. In addition, European plants face high energy costs, which further undermines the already tight margins. The **shift towards green chemistry** seems promising if the EU continues its policies in this area. But price uncertainty and shortages in materials and labor will remain an ongoing challenge.

All this means that petrochemical enterprises are **seeking more profitable markets** for at least a proportion of the volume produced by their European petrochemical plants. However, a one-shot reorientation will not be able to address market dynamics. Rather, it will have to be a continuing quest, requiring an extremely agile decision-making process. This is, of course, a challenge in itself, since many companies lack the necessary visibility to rapidly identify and seize valuable market opportunities for their European plants within and beyond the continent and to build guardrails against price fluctuations. In addition, the transition towards green chemistry will become more important with growing regulations and market opportunities.

UNITED STATES

Plants need to become more agile to secure their bottom line

While **margins are not as tight** in the United States as they are in Europe, because of much lower energy costs, the region has too much commodity petrochemical capacity, while China and the Middle East have been boosting theirs. Investing in additional transport infrastructure also has a significant impact, while the trade tariffs imposed by the Trump administration may fundamentally change the playing field. There is a lot of uncertainty about what this will mean, but it is highly likely to cause **additional turbulence** in demand and supply, obliging companies to be agile and well-prepared so that they can quickly change course when needed to secure the bottom line.

ASIA-PACIFIC

Booming capacity will encourage companies to look beyond their borders

With investment in new facilities and technologies, China and other Asia-Pacific countries aim to achieve greater self-sufficiency in petrochemicals. The Asia-Pacific's global market share in petrochemicals is already well beyond 50% and is expected to grow further. Investment is significant but labor and energy costs are low here. On the other hand, it is not clear how stable the economic situation really is.

Margins are still quite comfortable today, but a rapid increase in capacity will definitely put them under pressure in the long term. For example, China's polypropylene production capacity is expected to cover or exceed local demand soon, encouraging companies to look beyond the border. Analysts expect this to happen more and more, which means that many plants in the Asia-Pacific will be undertaking a similar quest for opportunities as their European and American counterparts.

THE MIDDLE EAST

Investment in crude-to-chemicals could change the game

The Middle East is **transferring its focus from refining to petrochemicals**, taking advantage of higher margins and abundant raw material and energy resources at extremely low cost. Saudi Arabia is leading the game with significant investment in crude-to-chemicals projects. For now, it's unclear if vertically integrated companies will emerge soon, potentially leading to a growth in exports to other continents.

In short, **demand is highly unpredictable everywhere**. Price volatility and sustainability obligations add to the complexity. As a consequence, global companies are constantly on the lookout for sales opportunities with sufficiently high margins for all their plants. But how can they do that? **The key lies in a smarter, more value-driven approach to planning,** one that seamlessly integrates strategic insights with operational execution.

Value-driven planning

A powerful strategy in petrochemicals

Value-driven planning offers a smart and effective strategy for the petrochemical industry. It enables companies **to maximize margins while balancing strategic, tactical, and operational constraints**. This approach, central to OMP for Chemicals, helps businesses plan their supply chains by steering products toward the best margins and the right buyers.

Effective implementation requires key enablers, including **full end-to-end supply chain visibility** and the use of a **reality-based digital twin** with optimization capabilities and ultra-fast scenario development and evaluation. Additionally, **integrating sustainability criteria** into this framework ensures that businesses can maintain profitability while meeting environmental commitments, ensuring real results.

Directing products towards the best margins

Value-driven planning in petrochemicals involves **maximizing the value created** throughout the supply chain, from cracker outputs to the derivatives used in everyday products. It basically answers the question: How can we make the most of our cracker outputs?

This is, of course, a constant challenge, given the 20 to 30 thousand metric tons of ethylene that petrochemical crackers produce every day in addition to large volumes of propylene, fuel oils, butadiene, and more.

It is a **complex multi-dimensional and multi-stage challenge**, raising such questions as:

Does it make sense to increase ethylene oxide production and reduce polyethylene production in two of our European plants this week?

What would be the impact on our contracts in case of unexpected ?

Can we safely fulfill this lucrative order if we change the production parameters?

Will we be profitable if we run our unit at minimum throughput?

What additional margin could we gain by increasing run rate?

Multiple constraints are at stake and many issues need to be considered before such questions can be answered with even a minimum level of confidence. But think about the **opportunities lying ahead** if planners have the necessary information at their fingertips.

End-to-end visibility and planning power through a reality-based digital twin

Full end-to-end visibility across the value chain and the power to create a reality-based plan are absolute necessities to plan for value. For petrochemical companies, end-to-end visibility means having a **complete overview of the status, outlook, and challenges of production, distribution, and supply** across a network of plants. This visibility should encompass the entire value chain, from continuous production processes like cracking to single-product and multi-product campaigns as well as make-to-order and make-to-stock batch processes.

Let's look in detail at process specifics and how **OMP for Chemicals** provides the necessary visibility and planning power.

Continuous and semi-continuous production processes

Planners need to have complete visibility and control over cracking processes, including conversion and separation, recycle flows, operational bottlenecks, and detailed product properties.

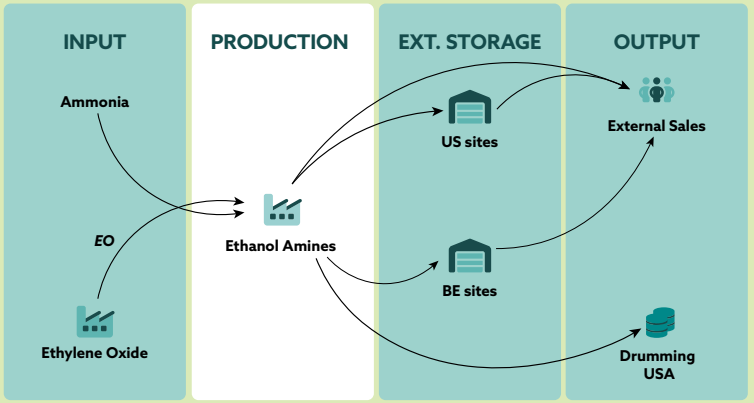
With OMP for Chemicals, planners have a **real-time visual representation** of the continuous and semi-continuous production processes. They can **easily navigate this constantly changing environment to make the right decisions** in line with their company strategies. Planners can interactively adjust continuous production process parameters within the tolerances specified for each plant. Users can, for example, change the reactor temperature and pressure, the production rate, and the split levels. The model then recalculates flows and compositions.

Because the whole model and its flows and outputs are integrated into Unison Planning's end-to-end solution, users can **fine-tune the continuous production process while viewing the effect** any adjustment has on the entire value chain, including downstream processes, allowing them to increase financial margins.

EXAMPLE

Adjusting EOA fractions automatically

A producer of ethylene oxide (EO) derivatives uses OMP for Chemicals to automatically adjust the monoethanolamine (MEA), diethanolamine (DEA), and triethanolamine (TEA) fractions in its US ethanol amines (EOA) production unit, depending on the speed of the EO and ammonia (NH3) raw material flows.



Campaign production

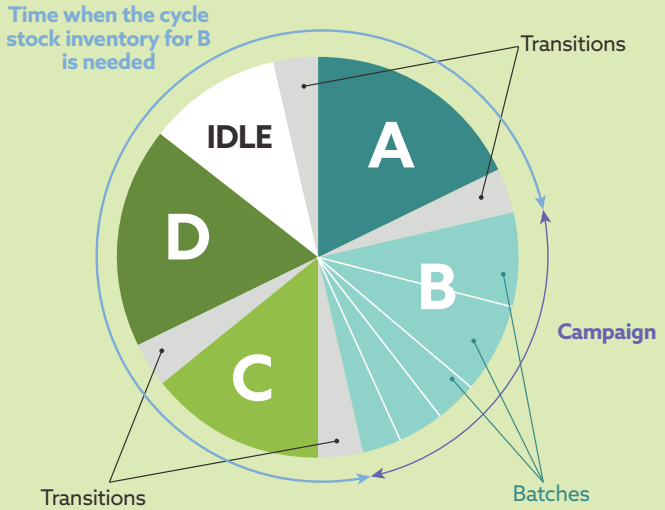
Campaign planning is all about **reconciling conflicting goals**. Sales departments always need sufficient material available for sale. Plant managers, on the other hand, prefer to minimize the number of changeovers to reduce setup times and costs. However, working capital should be kept within reasonable limits. Planners, therefore, need to have **full visibility of the risks and opportunities** involved on both the demand and the supply sides.

OMP for Chemicals provides this through its **reality-based digital twin**, integrating the intricate production characteristics of the chemical industry. With the help of the widest range of mathematical solvers and AI on the market, planners can orchestrate a **carefully balanced trade-off, minimizing changeovers while taking into account market opportunities and industry-specific production constraints**, such as fixed-wheel and flexible-wheel policies, throttling decisions, and the actual performance of catalyst installations. Energy consumption can be optimized taking advantage of variable steam and electricity prices. Decisions can be made to prioritize some of the demands, selling certain volumes on the spot market and reserving others for captive use.

EXAMPLE

Running consistent, regular campaign sequences

A global polymer producer optimizes its product wheel — including campaign and batch sizes — using OMP for Chemicals. Optimization is a multi-step monthly process involving constraints such as demand for main and optional products, capacity requirements, operating modes, and sourcing options to be balanced. It allows the producer to run consistent, regular campaign sequences with reduced off-spec production, while keeping stock levels stable and reasonably low. In addition, the optimization process allows the company to learn continuously, improving sequencing and product allocation to plants.



Batch production

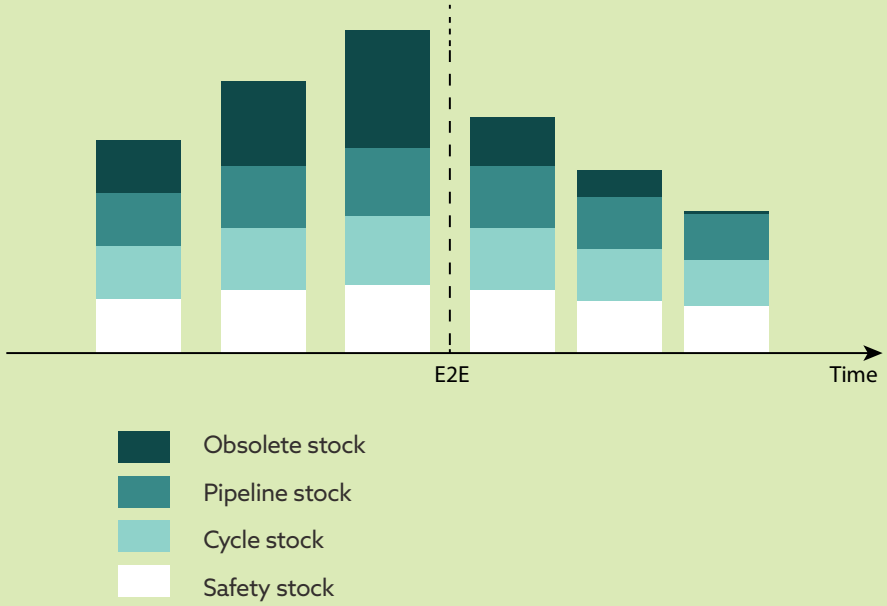
The specialty products market presents its own challenges because it relies on a mix of make-to-order and make-to-stock production strategies. Subject to stringent quality control processes, it involves large networks of subcontractors and distribution channels. Inventory levels need to be carefully tuned while looking out for sales opportunities.

OMP for Chemicals allows users to optimally plan the related batch production processes, **adapt to market signals, and seize opportunities** while monitoring the risks and costs involved.

EXAMPLE

Optimizing batch production processes

A global leader in coatings and paintings made significant savings by optimizing batch production processes. Inventory levels were reduced structurally, with slow-moving and obsolete stock items decreasing by 40%. Planning costs were reduced by 8%.



Digital scenarios to make smart decisions fast where needed

The end-to-end visibility and planning power needs to be embedded in **a truly decision-centric framework**. In the value-driven planning concept, decision-centricity means that the organization should at all times be able to **make the best available decision to increase the company's bottom line**.

How does that materialize in OMP for Chemicals? Decision-centric planning allows users to **assess the impact of events and plans in business value terms prior to making a decision**.

Users can rapidly create and evaluate multiple scenarios based on a wide range of assumptions, which could include:

- *Expected price evolutions*
- *Renewal or declined contract agreements*
- *Material and labor shortages*
- *Events impacting logistic flows*
- *Mergers and acquisitions*

Planners can create many scenarios every day to be evaluated overnight. This leads to a **better understanding of the potential impact and risks** connected to supply chain events and decisions across the value chain, which ultimately affect the bottom line. Planners can then present selected scenarios — along with their expected impact and risks — to the CSCO or the S&OP board.

This, in turn, allows the organization to make the best decision. In addition, decision-centric planning allows ad hoc changes to plans in response to events such as labor shortages, price changes, and logistics disruptions.

Many of these events are, in fact, no longer completely unexpected, because they are anticipated in the scenarios, and the **best course of action has been determined**. Ad hoc rapid scenario development can be used to respond to full-blown unexpected events, such as the war in Ukraine, involving scenarios with varying gas availability and prices.

Driving supply chain sustainability

The chemical industry is very energy-intensive and produces a high rate of carbon emissions. Due to **increasing regulatory and market pressure**, sustainability obligations such as reducing carbon footprint, minimizing waste, and leveraging sustainable material sources are rapidly becoming part of the chemical supply chain optimization challenge.

Innovative chemical enterprises are already **integrating sustainability KPIs into their decision-making** process, especially to keep up with factors such as the rising price of carbon emissions, rapid changes in funding criteria, and opportunities to sell green chemistry products at a premium.

In this way, OMP for Chemicals provides a **Green Planning framework** that allows companies to take lucrative steps in the right direction without the need for big investments. Each step can lead to better sourcing and **optimal production processes for sustainability and profitability**.

EXAMPLE

Financially optimizing the use of recycled materials

A global specialty materials enterprise optimized its use of recycled material financially by integrating parameters for its funding into its OMP for Chemicals digital twin. Since funding prerequisites are expected to become more stringent over time, this encourages the company to always increase the share of recycled material without overshooting.

Conclusion

Value-driven supply chain planning is a powerful way to address petrochemical industry challenges such as demand volatility, disruption, price volatility, shortages in materials and labor, sustainability, and other regulatory obligations. It involves planning the supply chain so that production is directed as much as possible **towards the best margins** and appropriate priority is given to sustainability.

OMP for Chemicals sets this value-driven approach in motion across the entire value chain, optimizing continuous and semi-continuous processes, campaigns, and batch processes. Scenarios allow companies to **make smart decisions fast** when needed. And the **results are real**, as customers are happy to testify.

Submit your case

Want to learn how value-driven planning can boost your company's profitability?

Contact us today

About OMP

OMP helps companies facing complex planning challenges to excel, grow and thrive by offering the best digitized supply chain planning solution on the market.

Its Unison Planning™ concept has a unique approach. It handles all supply chain planning challenges in a unified way. It's full scope and in-depth. Unison Planning™ synchronizes all planning stages, horizons, functions and roles. From source to deliver, from strategic to operational planning. The unique combination of services and technology boosts collaboration throughout your value chain, from forecasters to schedulers, from business leaders to technology experts.

Unison Planning™ is a cloud-based, out-of-the-box solution for industry-specific challenges. Hundreds of customers in consumer goods, life sciences, chemicals, metals and paper & packaging run it to make the right decisions at the heart of their business. Valued as a thought leader by experts as Gartner, OMP invests one out of every three dollars earned into innovation.

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