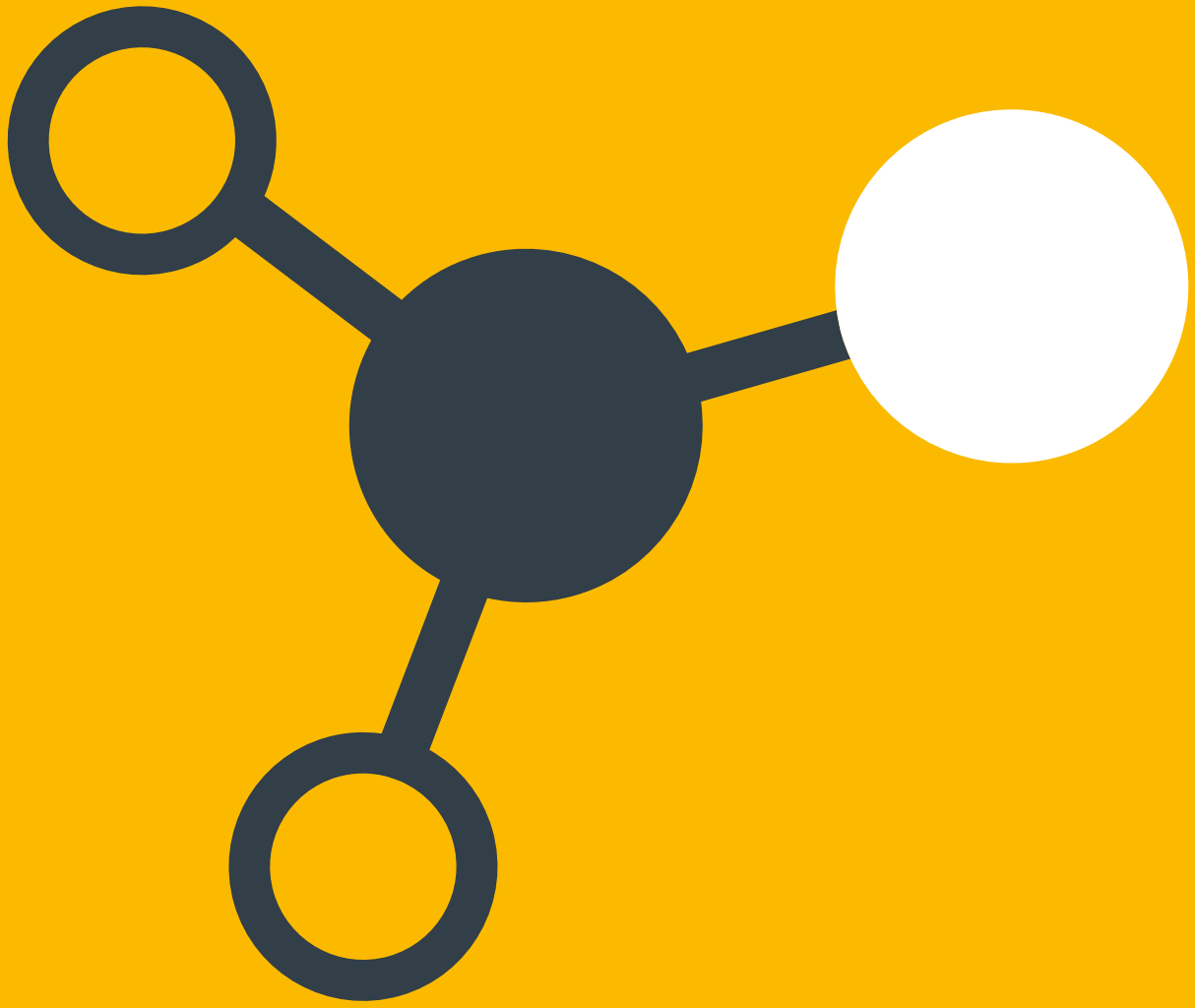
Data-Driven Transformation of the **Chemical Industry**



In an increasingly demanding competitive environment, the chemical industry must increase productivity and reduce costs while ensuring impeccable quality, despite more variable raw materials. **Digitalization** allows moving from reactive to proactive management, creating a single source of truth between DCS, LIMS, ERP and other information systems.

The example of Adisseo concretely illustrates these benefits: decompartmentalization of data, optimization of processes, simplified daily rituals and strengthened international collaboration.

Finally, associated with a **6 Sigma approach**, this data-driven approach reduces the variability of processes and ensures consistent quality. Data has become a «new essential ingredient» for competitiveness in the chemical industry.

Designated as the « industry of industries », The chemical sector provides the essential molecular building blocks for almost every other sector, from smartphone and clothing to medicines and cars. The chemical industry is currently navigating a period of intense transition. Chemical manufacturers are caught between the imperative to maintain competitive margins in a globalized market and the urgent need to adapt to stricter environmental standards and variable feedstock qualities. In this context, operational excellence is no longer just a goal—it is a survival requirement. The ability to capture, contextualize, and act upon industrial data has emerged as the defining differentiator.

Performance Challenges in the Chemical Industry

The chemical industry faces three major challenges: global overcapacity, tightening regulation, and the energy transition. The sector is split between commodity chemicals, weakened by excess supply, and specialty chemicals, which are more resilient because they are harder to replicate and are closely tied to specific applications. In both cases, global competition demands flawless quality and ever-higher operational excellence.

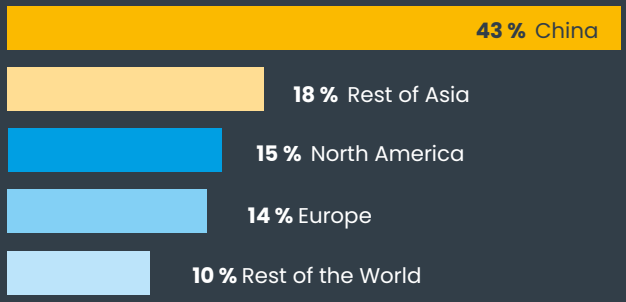
- **Global overcapacity crisis:** the massive investments in Chinese and Indian production have caused a global overcapacity crisis, creating more supply than the actual demand. It also led many plants producing commodity chemicals to run at lower utilization rates. This typically translates into price deflation and margin compression, higher unit costs as fixed costs are spread over fewer tons, inventory build-ups and write-downs, and tighter cash generation as working capital increases—often forcing capex delays, restructuring, or capacity rationalization.

- **Tightening regulation on some chemicals:** the introduction of stricter environmental regulation—often with clear phase-out deadlines—means certain molecules will no longer be authorized or tolerated. Beyond compliance effort, this creates direct financial pressure: costly reformulation and re-qualification cycles, accelerated R&D spending to identify viable substitutes, potential production disruptions, and the risk of stranded inventory or assets if a product line becomes non-compliant. Finding alternatives is tricky and hard, especially when performance, safety, and customer specifications must all be maintained.

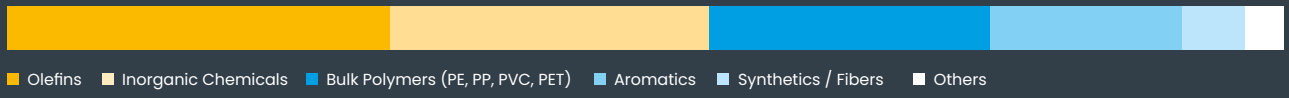
- **Energy transition:** shifting from oil or gas to bio-based or recycled feedstocks often means rebuilding the entire supply chain. These alternative inputs can be more variable in composition, impurities, and physical properties, so producers must be able to adjust processes in near real time—tuning operating conditions, recipes, and control parameters based on incoming feedstock quality (online measurements + lab results). Without this agility, variability propagates through the plant, driving yield losses, off-spec production, higher energy consumption and unstable throughput.

Some data on the chemical industry

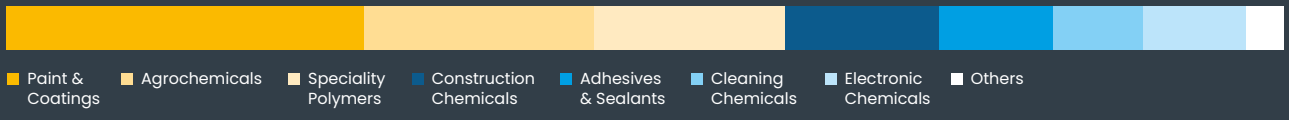
The data mentioned below concern the forecast for 2026 regarding the share of the global chemistry market by region.



Basic chemicals: distribution by family



Specialty chemicals: distribution by family



Digitalization as a lever for responsiveness

Despite the modernization of production equipment, many chemical manufacturers still struggle with outdated processes for managing their most critical asset: data.

- **Data Silos & Fragmentation:** Vital information is often trapped in disparate systems. Process data lives in the Distributed Control System (DCS), quality results in Laboratory Information Systems (LIMS), and financial constraints in ERPs. Consequently, operational teams often rely on spreadsheets to bridge these gaps.
- **Complexity of process and Production:** Without a unified view, it is difficult to identify the root causes of yield losses or energy overconsumption. Identifying a deviation often happens too late—after the batch is compromised or the energy wasted. Also, chemical processes are multivariate. Attempting to optimize a reaction without multi-variate approach leads to suboptimal decision-making.
- **Attracting Young Talent:** The sector must modernize its tools to appeal to younger generations, offering a digital work environment that aligns with their habits and lifestyle.

Digitalization acts as the bridge between these isolated islands of information. It is not merely about displaying curves on a screen, but about creating a «Single Source of Truth» for the entire organization.

- **Unified Data Foundation:** A robust digital platform aggregates data from all layers (sensors, lab, maintenance…), cleaning and contextualizing it in real-time. This ensures that a Field Technician, a Process Engineer, a Plant Manager, and a Financial Controller are all looking at the same reality.
- **Democratization of Analytics:** The goal is to shift analytics from a niche activity performed by data specialists to a daily tool for operational teams. By empowering «citizen data scientists»—the people who know the process best—companies can solve problems faster and more autonomously.
- **Agility and Continuity:** In an era of supply chain volatility, digitalization provides the agility to pivot quickly between cost reduction, yield optimization, or throughput maximization based on immediate market needs, raw material quality change or market price evolution.

The Benefits of **OIAnalytics**

Beyond the balance sheet, the strategic benefits include the standardization of KPIs across multiple sites, a reduction in administrative workload through automated reporting, and the acceleration of AI readiness across the enterprise.

- **Democratizing data:** This platform makes performance data both accessible and immediately understandable to everyone. Operators can visualize the actual state of their production line, make the right decisions, and measure the impact of their actions on quality, energy consumption, or material yield.
- **Paperless:** Switching to tablet-based statements eliminates error-prone and time-consuming manual entry. Information is centralized and available instantly.
- **Team engagement:** By giving employees the tools to better understand and improve their performance, these solutions strengthen engagement and initiative.
- **Process optimization:** This is the core of the reactor. By correlating production parameters (temperature, speed, pressure, etc.) and raw material quality with results (quality, material yield, energy consumption), OIAnalytics uses advanced analysis to identify optimal settings or the root causes of deviation. This capability strikes the right balance, enabling you to deliver high-quality products while minimizing material loss and energy consumption, even as raw material quality changes.

The implementation of an industrial data management and analysis platform generates quick and measurable gains. According to the 'Verified Value Delivery' study conducted in 2025 by Verdantix, chemical manufacturers can achieve a three-year ROI estimated at 455%, thanks to the improvement of production performance and the optimization of resource consumption. (energy, raw materials).

Director of Operations,
Chemical manufacturing

"Thanks to a unified data solution, all factories now work from the same performance indicators (KPI) and information, which has transformed our decision-making process by making it faster, more reliable, and more aligned across the company."

Operations Manager,
Chemical manufacturing

"The real gain comes from scale. Once the solution was implemented, each new use case, from quality to maintenance, allowed for faster returns and measurable savings."

"We avoided the usual pitfalls by combining the right technology with rigorous data governance. Our data team ensured the base was clean and reliable before proceeding with the scaling."

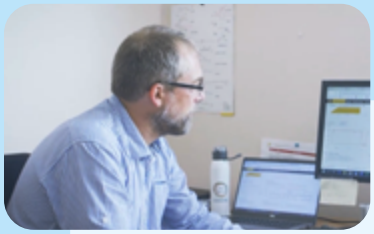
Discover the ROI from OIAnalytics with the Verify Value Delivery study made by Verdantix

Customer Success Story: **Adisseo**

Adisseo, a subsidiary of the Sinochem group, is a worldwide leader in animal nutrition solutions. To maintain its status as a major player and secure its market position, the company faces a permanent challenge: the continuous improvement of competitiveness and the reduction of cost.

The Challenge

The primary need was to «break the glass ceiling» of the control room. Adisseo needed to export data from its different systems and make it accessible to other departments (process engineering, finance, management) to find new sources of optimization that were previously invisible.
The industrial context was complex. Adisseo's production sites, such as **Roches-Roussillon (France), Burgos (Spain), and Nanjing (China)**, generate massive amounts of data. However, this data was largely confined to traditional control systems and LIMS.



Stéphane Chalut-Natal, Group Operations Manager

*"The fact of being able to make all this data available in the same space allows us to combine them to **search for new economic optimums** that we hadn't necessarily identified today."*

The solution

In January 2019, Adisseo launched the **« Display 4.0 »** project. Following a successful Proof of Concept (POC) on a single unit, the OIAnalytics solution was rapidly rolled out across European sites and later extended to facilities in China.

Adisseo's example shows how breaking down data silos with OIAnalytics—by combining process and economic insights—can quickly unlock new optimization opportunities and improve performance, collaboration, and competitiveness across sites.

The results

Today, Adisseo relies on OIAnalytics for its global performance.

- **Combining Process & Economics:** One of the unique advantages identified by Adisseo is the ability to compile very different types of data. They can overlay purely technical process parameters with economic data, such as raw material prices. This allows them to seek a **financial** optimum, not just a technical one.
- **Concrete Process Optimization:** By using the historical analysis capabilities of OIAnalytics, users identified deviations in key parameters. For instance, the analysis of specific process parameter allowed them to pinpoint settings causing unnecessary consumption. Correcting this setting resulted in immediate savings on raw materials.
- **Efficiency in Daily Rituals:** The tool has transformed daily routines. The preparation for the morning production meeting, which used to be time-consuming, is now done in a «few clicks.» The dashboarding provides an instant, shared view of the plant's status, allowing teams to be effective from the moment they arrive on site.
- **Cross-Continental Collaboration:** OIAnalytics serves as a transverse tool that bridges the gap between European and Chinese sites. It facilitates the sharing of analyses and best practices, effectively removing silos between different geographical entities of the group.

François Mailhos,
Industrial Director

*"Above all, **it's a pragmatic, easy-to-implement solution** that delivers results and performance, **improving our competitiveness and reliability.**"*

Discover the complete testimony on our channel YouTube

6 Sigma
in the chemical industry

In the chemical industry, where even 1% deviation in process parameters can lead to off-spec batches, wasted feedstock, six-sigma is not just a « nice to have » management style - it is a survival strategy. While six-sigma was born in discrete manufacturing (like electronics), it adapts to the continuous and batch processing world of chemicals by focusing on reducing variability.

The backbone of Six Sigma is the DMAIC improvement cycle.

D	Define
M	Measure
A	Analyze
I	Improve
C	Control

To illustrate the approach, let's take the example of a chemical plant that encounters problems with variability in the purity of its chemical, leading to material losses and regulatory non-compliance.

Define	M	A	I	C

The objective is to frame the project. The team defines the problem, the objectives, the scope and the expected benefits.

Problem: the purity of the product is unstable leading to high reprocessing rates (10%)

Objective: to reduce the variability of the purity to reduce the reprocessing rate to less than 1% in 6 months.

D | **Measure** | A | I | C

This phase consists of quantifying the current process performance to establish a baseline situation. The key is also to recollect reliable data.

Action: the team will collect all the data. The time of reaction, the quality of raw material and the purity are measured and collected.

Result: the data show a high variability in the purity of the product.

Tools: control maps, process capability analysis.

SPC Analysis

Control processes with a 6 sigma or SPC approach. Analysis workflow that allows you to determine the process capability and determine control limits and alerting rules on key process parameters.

D | M | **Analyze** | | |

The team analyzes the collected data to identify the root causes of variability.

Action: using the right analysis tools, the team looks for correlations between purity variability, raw material quality and other process parameters.

Discovery: the reaction time is different based on the quality of the raw material used and the reaction time is correlated to the purity.

Tools: influence analysis, cause and effect diagram (Ishikawa), 5 Whys.

Influence analysis

Understand and optimize a production process. Analysis workflow to identify the parameters influencing performance and determine their optimal settings.

D | M | A | **Improve** | C

It is about finding, testing and implementing solutions to eliminate root causes.

Solutions: anticipating the perfect reaction time based on the raw material used.

Action: Setting up a test: the operator changes the reaction time depending on the raw material.

Tools: experimental design (DOE), pilot tests, influence analysis.

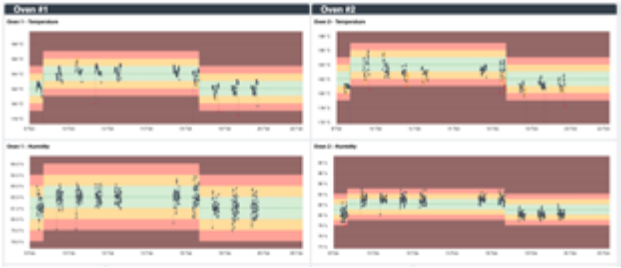
D | M | A | I | **Control**

The last phase aims to sustain the improvements obtained. We need to make sure that the process remains stable and under control over the long term.

Action: the new procedures are formalized, and the operators are trained. Control charts are installed on the production line, allowing operators to monitor the purity in real-time.
Indicators are added to give guidance to the operator to adjust the reaction time depending on the raw material quality and react immediately.

Result: reduction of the variability of the purity. Gains: reprocessing rates is now below 2% (reduction of material losses, customer satisfaction) are monitored and documented.

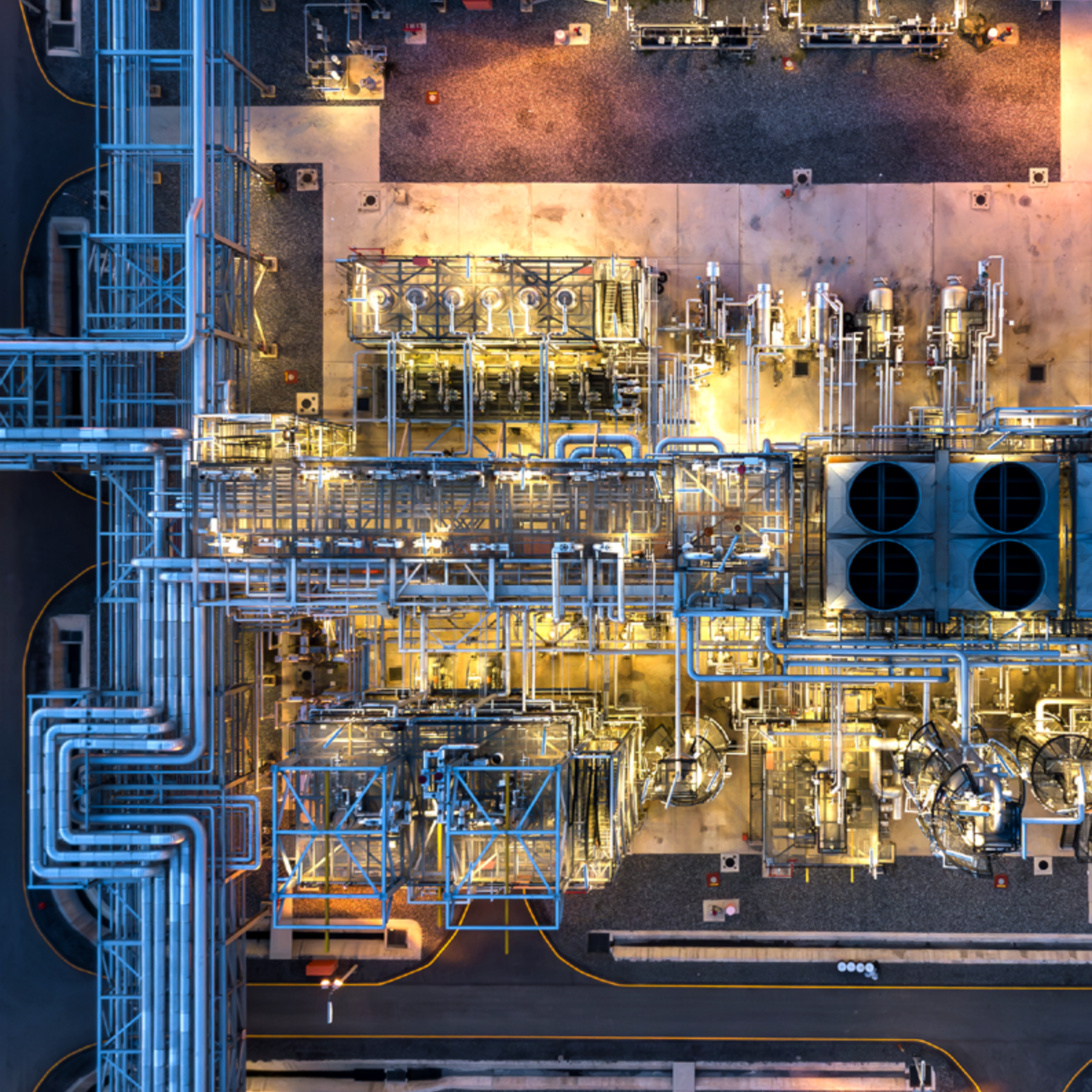
Tools: control plan, Control Charts (SPC), alerts, standardization of procedures, training



Control charts

Automatically manage and implement controls and alerting on key process parameters.

In conclusion, when rigorously applied and supported by digital tools, the 6-Sigma management strategy allows the chemical industry to transform its production challenges into sustainable competitive advantage.



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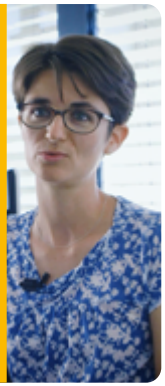

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536 rue Costa de Beauregard
73000 Chambéry - France