



Closing the loop

How industrial intelligence drives profitability and circularity throughout the chemicals lifecycle

Table of contents

Industry trends	3
How data visibility drives operational reliability.....	8
Pushing operational limits to achieve performance gains	11
Accelerating engineering with industrial intelligence	13
Conclusion	15



Industry trends

The green energy revolution is reshaping the chemicals industry as we know it. While the industry supports an astounding 75% of all components needed to reach net zero by 2050,¹ chemicals producers face challenges from all sides. As industry insiders know all too well, regulatory mandates, a growing appetite for sustainable production, and the high costs of raw materials and energy have brought about tighter margins and increased operational complexities industry-wide. Achieving equilibrium between capital investments and operational expenditures is an increasingly tall order.

Vital new research provides further evidence to support industry experts' long-held suspicions. Chemicals companies across the value chain—from basic chemical manufacturers to specialized chemical producers—must now navigate a dual imperative: Become more profitable while meeting your sustainability obligations.



Green demand for chemicals

Chemical producers contribute a jaw-dropping three-quarters (75%) of all components necessary for the green energy transition,¹ including battery materials for EVs, refrigerants for heat pumps, epoxy, polyurethane, and lubricants for wind turbines, and solvents for semiconductors.

Among the group surveyed, which comprised 500 executives from companies with at least \$50M in annual revenue, including 120 executives from the chemicals industry, attitudes reflected the difficult tradeoffs facing industry leaders. For example, 58% of executives believe that the new processes required for decarbonization, which take time to implement, are an immediate barrier to success. Even so, largely owing to compliance mandates, 68% of executives indicate their organization will prioritize driving circular processes this year.

68%

will prioritize driving circular processes this year.”²

58%

believe that the new processes required for decarbonization are an immediate barrier to success.”²

Despite these headwinds, many are quickly seizing upon this changing landscape by adopting tools that enable advanced AI-powered analytics and forming new collaborative initiatives—and it’s working. According to recent research from Deloitte, “94% of leaders say AI will be critical to the success of their organization over the next five years.”¹ Industry leaders are increasingly optimistic about the promise of industrial intelligence, a new class of data-sharing solutions, to eliminate these tradeoffs altogether.



Key industry trends



The energy transition and the pressure for green products drives the need for new chemical components and materials.



Raw materials and energy are expensive amid a highly competitive landscape.



Complex supply chains can compromise agility to respond to market demands.



Regulations impose pressure to reduce carbon footprint and increase circularity.

Digitally-enabled goals



Innovate to develop new processes and scale up.



Maximize operational efficiency to ensure margins.



Increase transparency and collaborations across the ecosystem.



Balance improvements of existing installations and accelerate CapEx investments.

- Recent case studies show that forward-thinking chemical companies can achieve this difficult balance by recalibrating their information management practices and aligning their business and compliance KPIs. **Early adopters are notching quick wins by optimizing asset reliability and performance and accelerating engineering cycles**, both in terms of process engineering and engineering new physical plant assets, by integrating digital twins and AI-powered analytics throughout the chemical lifecycle.
- Despite the growing momentum behind digital adoption, however, **86% of chemical companies have yet to fully adopt digital solutions across their entire operations**, even though nearly half of executives (47%) in this sector are actively seeking ways to increase their AI-enabled capabilities.²
- By incorporating data-driven decision-making into their strategic playbook, chemical organizations can better contextualize information, which leads to deeper operational insights and optimized processes—and a sharper competitive edge. In this ebook, you'll find **proactive strategies to immediately improve current operations and prepare for the future, using a holistic digital strategy known as industrial intelligence, in three steps:**





Bridging the labor cliff

With 50% of its plant operators set to retire within the decade, **BASF**, the world's leading chemicals company, deployed an immersive, scalable digital training solution. This platform lets BASF **train 300 operators annually** at its Ludwigshafen site, ensuring they follow critical health, safety, and environmental protocols.

BASF's solution offers an example of a forward-thinking response to the challenges many companies face, as the industry nears an impending labor cliff.



Data-sharing for profitable partnerships

The **International Group, Inc. (IGI)**, a leading wax producer, used a secure data-sharing platform to partner with Lityx. The partners used a secure data warehouse to access and apply AI-powered analytics to real-time historical and lab data in the cloud.

This added data visibility and access allowed IGI to **reduce crude waste by 49%**, which translated to an additional **\$10M in profits in just one year—an initial ROI of 67x**.



Innovative, sustainable solutions

Covestro, a global leader in polymers, implemented an industrial data infrastructure to standardize, visualize, and share energy and production data across its plants. This data-driven approach improved energy efficiency and reduced CO₂ emissions, helping the company to achieve a **30% reduction in energy consumption** and a **39% reduction in emissions** per ton of product.

By gaining end-to-end visibility into its production data, Covestro can confidently meet its current sustainability obligations—and pivot quickly if regulatory mandates tighten in the future.

Seeing clearly: How data visibility drives operational reliability

When you're operating at peak reliability, you know you can meet product quality specifications and maintain safe operating conditions. Ultimately, better operational reliability protects your brand reputation and keeps your operational expenses in check. But without clear visibility into your operational footprint—including any value leaks and how to plug them—reaching your next reliability milestone can be difficult. Simply put, you can't fix problems you can't see.

The latest research supports this: **47% of executives in the chemicals industry cite a lack of visibility across the entire product or process lifecycle as a significant challenge.**² Inconsistent, unreliable data makes it harder to address inefficiencies quickly, thereby increasing the risk of operational misalignments, which, in turn, lead to missed production targets and less safe working conditions—and OpEx cost overruns.

When it comes to data visibility, the chemicals sector significantly lags behind other industries, with **nearly one quarter (22%) of executives reporting that their organization makes key business decisions without access to reliable, real-time data and insights** from colleagues, planning materials, and plants and assets all of the time.² Besides the need to remain profitable and innovate, resistance to change made many chemical organizations slow to expand their digital infrastructure—until now.





Problem

47% lack visibility across the entire product or process lifecycle and 22% make key business decisions without access to reliable, real-time data and insights all of the time.²

Solution

47% believe investing in industrial information will drive growth and 43% see adopting platform-enabled data-sharing tools as an opportunity.²

The fastest, most effective way to improve operational reliability is to integrate real-time data into your operations; when you automate system configurations and deploy real-time monitoring, you can minimize human error and improve overall performance—and profitability. However, while point solutions may seem tempting, they often lead to additional complications in the long run.



“Data is becoming an important feedstock for innovation and operational excellence.”

-Deloitte¹

By creating a unified source of information based on interoperable solutions, chemicals companies can easily gain access to consistent information among all disciplines.

This data infrastructure not only allows them to monitor and control operations reliability, thereby driving safety, consistency, and profitability in the near term, but it also provides an easy-to-scale platform, ensuring smart growth in the long term.

Unifying data to feed the future

Nutrien, one of North America's leading agri-chemical businesses, produces nitrogen, potash, phosphate, and other retail chemicals products that are instrumental in increasing crop yields and ensuring food security. With a large, dispersed operational footprint—comprising 20 major production facilities, 300 distribution plants, and 2,000 retail locations—Nutrien needed to integrate its data to gain visibility and help its teams collaborate better. Nutrien's solution? A unified operations center. The chemicals producer integrated live plant data, empowering its teams to proactively troubleshoot and problem-solve operational challenges.

Pushing operational limits to achieve performance gains

The first step to reduce operating expenses, improve energy efficiency, and minimize waste—all while continuing to meet your production and quality goals—is to maximize your asset reliability and performance.

Industry leadership already recognizes the importance of boosting asset reliability and performance, with **50% of chemical executives indicating that increasing asset reliability and efficiency will be a top priority within the next 12 months.**² While there are many ways to tackle such a broad set of challenges, the quickest path to high-performing, reliable operations follows a two-pronged approach:

Boost asset reliability and performance

Predictive analytics not only decreases unplanned asset downtime—or eliminates it altogether—by identifying maintenance issues before they arise, but it can help you better plan your operational expenditures and balance risk. By continuously monitoring equipment behavior and predicting potential failures, predictive analytics solutions provide early warnings that enable proactive asset maintenance strategies.

This results in improved operational efficiency, reduced maintenance costs, and increased asset longevity. By layering AI-powered analytics over your real-time data, you can plug value leaks and align your asset, operational, and sustainability KPIs.

Optimize asset information management

Clear visibility into your asset performance is at the heart of any high-performing chemical operation. The better you can track your asset performance, the easier it is to optimize your energy and material usage and reduce waste—shaving OpEx costs and moving you closer to your compliance goals. By unifying and structuring data from various sources into a single, easily searchable platform, you provide a centralized hub for operational and engineering data.

This enhances accessibility and visibility across teams, allowing for better decision-making and seamless collaboration. When critical information is readily available, you can optimize human and material resources for every maintenance and operational procedure.

To reach maximum performance, your next step is to put your accessible, real-time data to work. Customizable, real-time, role-specific dashboards empower your teams with the insights they need to adapt to market shifts and disruptions with always up-to-date process data analysis. You can diagnose process delays at their source, monitor and report on inventory levels and quality, and track and improve water, air and energy consumption to cut emissions and minimize waste.

You can also optimize planning and scheduling to meet production goals while reducing emissions. Cloud-based models, tailored to your plant's specifications, provide ideal parameters for profitability and supply chain transparency, lowering costs related to production planning.

100% asset reliability? Why not?

With industrial intelligence, you can attain 100% asset reliability. Take **SCG Chemicals** for example. One of Asia's largest petrochemical companies, the organization deployed predictive analytics and asset performance management solutions to enhance reliability across its operations—and notched some major wins.

100%
asset reliability

9x
ROI

Maintenance costs reduced
by **40%**



Building better, faster, smarter: Accelerating engineering with industrial intelligence

Industrial intelligence, built through digital solutions, is valuable at any stage of the chemical lifecycle—but, when EPCs include a digital twin during the design and build phase of a new CapEx project, chemical companies get additional compounding benefits throughout the asset's lifecycle.

For as long as chemical organizations have undertaken CapEx projects, engineering teams have faced pressure to reduce project risks. Despite their best intentions, disjointed workflows and inconsistent data were common roadblocks—until now. **Collaborative, cloud-based tools allow dispersed teams to work on designs and simulations simultaneously, thereby accelerating engineering cycles, reducing rework, and improving overall project outcomes.**

Especially given the current pressures the chemicals industry is under, the ability to de-risk capital projects and better balance your CapEx and OpEx expenditures is vitally important for smart growth. Even so, **just 19% of executives surveyed indicated their organization has fully adopted digital engineering solutions**,² suggesting that investment in digital engineering solutions represents a significant opportunity for the industry.

However, building new facilities or modernizing existing ones is only part of the story when it comes to improving engineering outcomes. As with new construction CapEx projects, engineering new processes often comes with a good deal of risk for chemical companies. Advanced process engineering tools can likewise help you de-risk new capital projects.

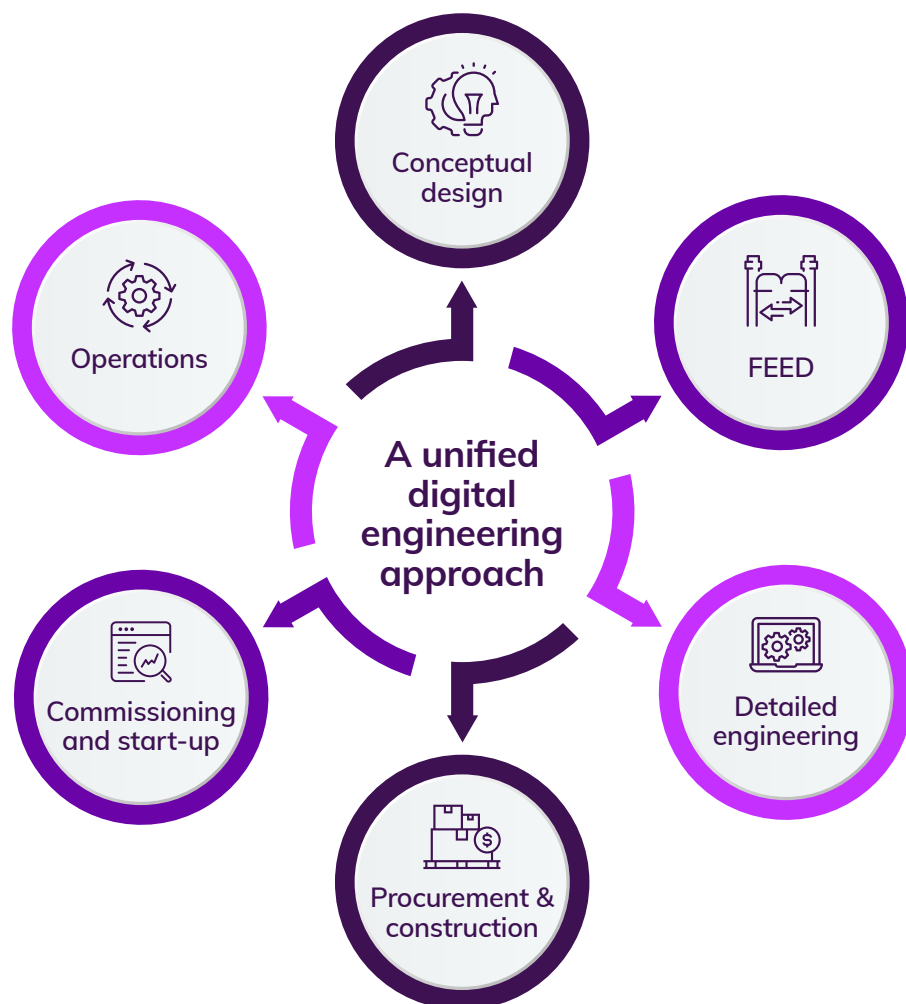
Building faster with less risk

Even after 100 years, German chemicals company **Wacker Chemie** continues to set the bar for innovation. Case in point: By engineering with a digital twin, Wacker Chemie increased its operational efficiency, reduced administrative time and effort, improved project flexibility and scalability, and hardened its IT security with cloud-based data storage.

Lightspeed R&D

Looking to build on the early successes of its industrial data infrastructure, polymer producer **Covestro** used a modern process simulation tool to accelerate the development of new, innovative bio-based polymers.

6 step chart showing project lifecycle



A unified digital engineering approach accelerates process engineering at every stage of the project lifecycle:

Conceptual design—Lay the foundation for the digital twin with process data

FEED—The digital twin embraces data-centric engineering and design tools

Detailed engineering—The digital twin evolves

Procurement and construction—The digital twin incorporates materials and equipment

Commissioning and start-up—The digital twin's commissioning and handover

Operations—The digital twin incorporates real-time data

Conclusion

The chemicals industry is under immense pressure to meet both profitability and decarbonization targets. This complex balancing act requires companies to maximize operational reliability, optimize asset performance, and accelerate engineering efficiency.

Industrial intelligence offers a clear path forward by providing real-time insights, improved visibility, and streamlined workflows that help organizations address both financial and sustainability challenges. It also plays a crucial role in de-risking capital projects and improving process engineering, providing chemical companies with tools that ensure both short-term operational gains and long-term competitive advantages.

With 71% of industry executives planning to prioritize investments in industrial intelligence within the next year,² it's evident that digital solutions are no longer optional—they're essential for success. Leveraging advanced technologies, such as predictive analytics and digital twins, allows companies to better manage asset health, improve operational visibility, and drive significant cost savings through efficiency improvements. As the industry continues to evolve, organizations that embrace these innovations will be better positioned to meet emerging challenges while fostering sustainable, intelligent growth for the future.



What can industrial intelligence do for the chemical industry?

Challenge: 49% of chemical industry leaders struggle with using emerging technology for decarbonization due to lack of best practices.²

Solution: Build data-sharing ecosystems to deepen collaboration and accelerate the development of more processes and new products.²

Citations:

1. Deloitte. "2024 Chemical Industry Outlook."
2. AVEVA Group Limited. "2024 AVEVA Industrial Intelligence Index."
AVEVA-commissioned survey conducted by Wakefield Research.

AVEVA

For more information, please visit:
aveva.com/en/industries/chemicals

 linkedin.com/company/aveva

 [@avevagroup](https://twitter.com/avevagroup)

About AVEVA

AVEVA is a global leader in industrial software, driving digital transformation and sustainability. By connecting the power of information and artificial intelligence with human insight, AVEVA enables teams to use their data to unlock new value. We call this Performance Intelligence. AVEVA's comprehensive portfolio enables more than 20,000 industrial enterprises to engineer smarter, operate better and drive sustainable efficiency. AVEVA supports customers through a trusted ecosystem that includes 5,500 partners and 5,700 certified developers around the world. The company is headquartered in Cambridge, UK, with over 6,500 employees and 90 offices in over 40 countries.

Learn more at www.aveva.com

AVEVA and the AVEVA logo are a trademark or registered trademark of AVEVA Group Limited in the U.S. and other countries.
All product names mentioned are the trademarks of their respective holders.

© 2024 AVEVA Group Limited or its subsidiaries. All rights reserved.

