



**Rockwell
Automation**

The connected chemical plant

Unlock your plant's potential and empower your organization to safely maximize asset utilization and competitive advantage





In addition to aging infrastructures, chemical producers must contend with:

- **Safety** and security risks
- **Increasing** ESG requirements
- **Asset utilization** challenges
- A **diminishing** skilled workforce

MAKE YOUR ASSETS WORK HARDER

Chemical producers who are investing in new plants for the new wave of green chemicals need technologies that help them get the most from their assets. But, they also need help minimizing safety and quality risks. Meanwhile, those companies with decades-old plants must address a wide-range of challenges from their technical debt, including:

OLD AND INFLEXIBLE AUTOMATION TECHNOLOGIES

Aging and obsolete distributed control systems (DCSs), PLCs, and safety systems are prone to failures and high mean time to repair (MTTR). This situation can increase unplanned downtime and support costs. A lack of flexibility and agility can reduce asset utilization and increase costs by limiting your ability to optimize production and accommodate processing changes for new products. Limited visibility into critical-asset performance

LIMITED VISIBILITY INTO CRITICAL-ASSET PERFORMANCE

A lack of insight into critical-asset performance can make it difficult to anticipate problems and mitigate risk, which may lead to increased unplanned downtime and higher cost of goods sold (COGS). It limits operators from optimizing assets and determining variation sources, resulting in lower throughput and quality. And it restricts management's ability to make strategic business decisions around plant-to-plant or site-to-site performance with limited OPEX and CapEx.

ABSENCE OF AUTOMATION STANDARDS AND MULTIYEAR AUTOMATION PLANS

A lack of standards and a multiyear automation plan can make operations, maintenance, and support more complex and costly. It also increases CapEx and time-to-market as designs and standards must be defined and rebuilt on each project. A lack of standards can also make digitalization efforts more costly due to increased data aggregation to overcome the lack of standards.

THE INCREASING RELEVANCE OF SUSTAINABILITY

Environmental, sustainability and governance (ESG) goals are an accepted part of the chemical industry, and most companies have stated goals to address climate change. As green chemistry, circular economy, and decarbonization start to materialize, chemical producers have to adapt their operations to comply or risk getting left behind by competition. This situation leads to incurring costs for compliance, or having negative market perceptions of their brands.

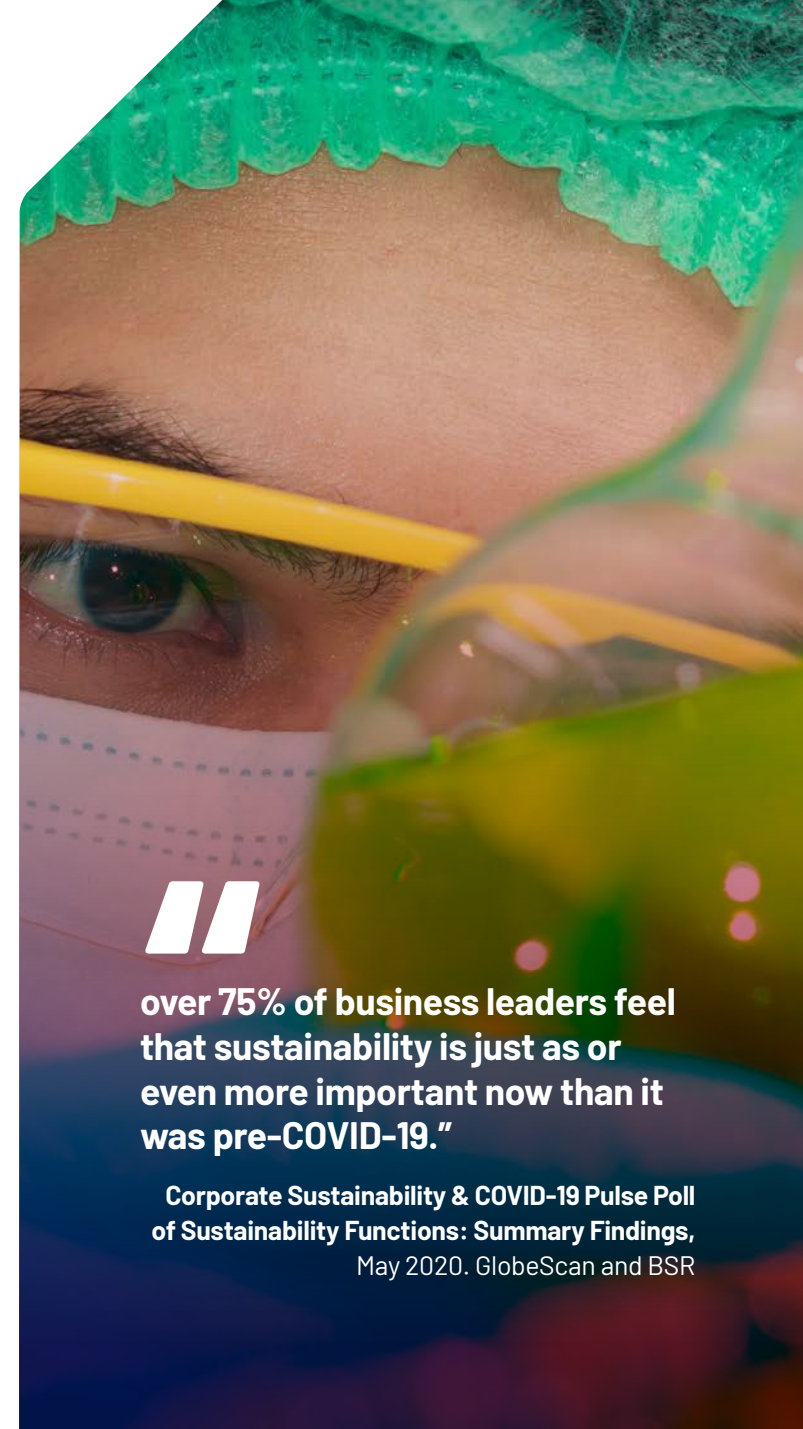
WHAT IS BEING DONE?

1. Setting new sustainability goals

Many chemical companies have greenhouse gas emission reduction targets, with some having ambitious goals of reaching net-zero emissions by 2050. All aspects of the supply chain are under scrutiny. From major processes, to smaller utilities to transportation to formulation and production steps are on the table. But companies won't be able to do this alone. They'll need help with evaluating the technology and partners who can properly scope, justify expenditures, and execute the relevant projects to help make the gains . . . 'sustainable'. As the pace of adoption of these ideas quickens, companies may find they must move even more quickly than first thought.

2. Working with partners to quicken the pace

As the chemical industry witnesses a spate of innovation aligned with sustainability, startups are using new process technologies to develop biodegradable plastics and green hydrogen. But how do they take these new technologies and successfully scale them? Partnering with a company that has more than 100-years of experience helping companies manufacture their products is a good starting point. Rockwell Automation can provide the right solutions and expertise to help these companies be operationally ready on day one, as well as the services to continue to support them as they grow.



over 75% of business leaders feel that sustainability is just as or even more important now than it was pre-COVID-19."

Corporate Sustainability & COVID-19 Pulse Poll of Sustainability Functions: Summary Findings,
May 2020. GlobeScan and BSR

3. Modernizing automation to become more flexible

But we must not overlook existing producers. For example, existing specialty chemical customers can benefit from using modern automation to make their operations more flexible utilizing scalable batch solutions to reduce time to market challenges of new chemistries. As these specialty chemical companies change formulations to be more sustainable, flexible automation becomes the key for their future profitability and success.

THE FIRST STEPS?

To improve operations, it's necessary to measure them. Adopting Manufacturing Operations Management (MOM) systems become vital in helping to meet sustainability goals. These MOMs track and visualize utility (WAGES) usage, emissions, effluents, and other waste streams. Most companies address efficiency first due to the lower investment costs vs. costly process modifications. As a result, the adoption of advanced control and optimization along with inferential sensors can be a successful first step on the road to a more sustainable operation. For example, our portfolio of model predictive control technologies, advanced modeling, and AI/ML has helped petrochemical manufacturers reduce their off-grade material.



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MAXIMIZE PRODUCTION AND MITIGATE RISKS

The technologies used in The Connected Chemical Plant are far superior to what was available just 10 years ago. They can help chemical producers:

- **Merge IT and OT systems** that have historically remained separate to bring data in real-time to the right decision makers.
- **Provide seamless connectivity** across people, processes, and technologies.
- **Transform data** into actionable information that provide unprecedented insights.
- **Bridge the workforce gap** by utilizing technology to contextualize and present information intuitively to the newer generation of operations personnel, and use AR/VR technologies to support them.

This connected, information-driven approach to chemical production is called The Connected Chemical Plant. It presents new, nearly unlimited opportunities to monitor and improve production performance through real-time production performance insights.

FOUR KEY OPPORTUNITIES FOR CHEMICAL PRODUCERS INCLUDE THE FOLLOWING:

- 1** Reducing safety, security and compliance risks
- 2** Maximizing asset utilization
- 3** Improving maintenance and support
- 4** Improving operations flexibility

WHERE TO START?

Many chemical producers are eager to deploy a Connected Chemical Plant, but they struggle with where to begin.

What about the automation and information infrastructure? It only makes up a fraction of a plant's capital investment, but it has a significant impact on your ability to increase competitiveness and meet your business objectives.

A modern DCS, intelligent motor control and information solutions create the foundation for seamless connectivity and real-time information sharing. They allow chemical producers to take advantage of other information-enabled technologies, such as process and maintenance analytics, integrated power control with connectivity to Intelligent Electrical Devices (IEDs), smart instruments, and "smart" skids. Consequently, analytics can then be deployed to further increase asset performance.



The path to a resilient chemical company requires a divergence on how core and support functions are managed . . . To strengthen resilience in the core, chemical companies should focus on investments in automation, remote operations and analytics-based optimization, as well as the intelligent end-to-end integration of their business."

Building Resilience Amid Disruption: Navigating the human and business impact of COVID-19 on the chemical industry,
Accenture, March 2020



It was very hard for the engineers to control the recipes or add new equipment. Indeed, in many cases they would need intervention from the original system supplier to make any significant modifications. What the customer wanted was a more open, user friendly and flexible approach that would give them the ability to own the system – in terms of its development and evolution – and not be held hostage by legacy suppliers.”

Assaf Beckman, Project Manager at Tomatic Ltd, an Israeli SI, on choosing Rockwell Automation PlantPAx Distributed Control System.

INCREASE ASSET UTILIZATION

Optimizing asset utilization begins with being able to measure asset performance and identify production problems in real-time.

A modern DCS integrates all aspects of plant automation and information into one, plant-wide infrastructure, from large-scale continuous, to batch, to discrete operations all with the same set of tools. And because it is based on open communications standards and uses EtherNet/IP™ as its backbone, a modern DCS can provide readily available information across IT/OT served up in a manner that is tailored to the consumer.

This system gives chemical producers access to data from a growing number of Industrial IoT or smart devices, as well as third-party OEM-skid systems, so they can monitor and measure virtually any aspect of their operations.

Integrated power control systems can capture the electrical data from aging production assets to monitor their performance and help minimize unexpected downtime.

Chemical producers can use this data to better understand electrical distribution, power quality, load-shedding and motor-driven asset performance. They can also use the data to schedule repairs or maintenance during planned downtimes or turnarounds, rather than risking a run-to-fail approach or performing unnecessary maintenance out of an abundance of caution.

Once these core capabilities are in place, chemical producers can begin to explore using advanced controls and analytics to increase asset utilization further. For example, self-aware equipment and collaborative skids - like turbines, boilers, compressors or pumps - can act with little human intervention to help prevent incidents and downtime, increase productivity and reduce energy consumption.

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IMPROVE OPERATIONS FLEXIBILITY

Batch producers who rely on disparate control systems and manual processes can experience high cycle times and inconsistent product quality. A Connected Chemical Plant can make batch production more agile and efficient by allowing operators to more easily make changes and bring new products online faster

For example, chemical producers can use a modern DCS with a Manufacturing Execution System (MES) to:

- **Automate the entire process of work order management** from an ERP system, retrieving the right recipes for those orders, and delivering the corresponding work instructions to operations.
- **Significantly reduce the time spent** on manual data-recording processes for accounting and compliance purposes.
- **Help manage quality** for different batches by verifying operator activities and validating that prescribed processes were followed.

Operators using high-performance HMI, historical data collection, KPI monitoring and “golden batch” comparisons can track the flow of raw materials and make real-time decisions. This information can help improve batch cycle-time and quality while reducing costs and waste. Operations management can monitor production performance against production targets and optimize production to future orders.



Previously, if a tank ran out of material during an addition phase, operators had to track how much material was added and calculate the remaining amount needed from the tank. Now, the software automatically calculates the remaining amount of material needed, switches tanks, and adds the required amount of material until it reaches the setpoint.”

Nancy Givens,
automation and process control engineering consultant
for DuPont describing using FactoryTalk Batch to achieve
full recipe control and sequential automation.

REDUCE SAFETY, COMPLIANCE AND SECURITY RISKS

Chemical producers face many operational and regulatory risks, which are more easily understood and managed in a Connected Chemical Plant.

SAFETY

The protection of people, assets, and the environment are the primary goal of any chemical producer. Understanding how to identify hazards, the proper application of layers of protection, and lifecycle management can be challenging. This requires experienced personnel familiar with regulatory requirements and standards, process unit operations, and process control technologies. Whether building a new greenfield facility or modernizing an existing facility, understanding Process Safety Management (PSM) is critical.

Scalable safety instrumented systems (SIS) allow chemical producers to apply the appropriate layer of protection to meet their specific risk mitigation requirements.

Pre-engineered SIS solutions are available to help reduce lead times and ease deployments when replacing aging or noncompliant safety systems. And when the in-house expertise is not available, many chemical producers turn to automation vendors for a full range of safety services, including:

- Risk assessments and compliance-conformity audits
- Safety designs
- Installation and validation support
- Integration and startup support
- Compliance consulting
- Safety-product and safety-standards training
- TÜV certification training



We performed what we felt was a comprehensive review of the current system. But we also wanted room for any additional items to be added to the SIS or requirements for higher levels of protection based on future PHAs.”

Matt Kinsinger,
senior process control engineer, PPG Industries
on selecting the Rockwell Automation AADvance system.

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COMPLIANCE

In addition to complying with safety standards and regulations, chemical operations must meet stringent environmental regulations.

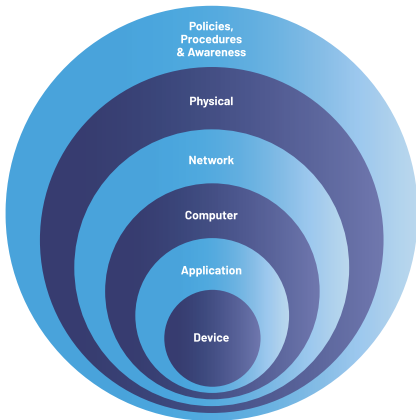
With a modern DCS, virtual sensors and visualization software, operators can track the flow of chemicals and monitor and optimize emissions, such as effluent discharges and releases – even in areas where measurements are challenging. This information can be used to create automated compliance reports and review-by-exception procedures to speed time-to-market. It also can be used to notify regulatory agencies of potential hazardous releases.

SECURITY

While the use of information-enabled devices and the integration of IT and OT is required to compete, these technologies typically increase cybersecurity risks if not properly designed and implemented.

Chemical producers must deploy a comprehensive and layered security approach to help protect their intellectual property, people and assets. A defense in depth approach assumes that any one security measure can and likely will be defeated, and therefore uses multiple fronts of protection.

A defense in depth security strategy targets risks at six levels:



When the in-house expertise is not available, many chemical producers turn to their trusted automation partners to help address their security needs through best practices, security assessments, training and certification, and security monitoring.



Thousands of US chemical facilities rely on badly outdated cybersecurity guidance making them vulnerable to hacking attacks that could not only cause economic damage but also chemical leaks or explosions."

Government Accountability Office (GAO) audit

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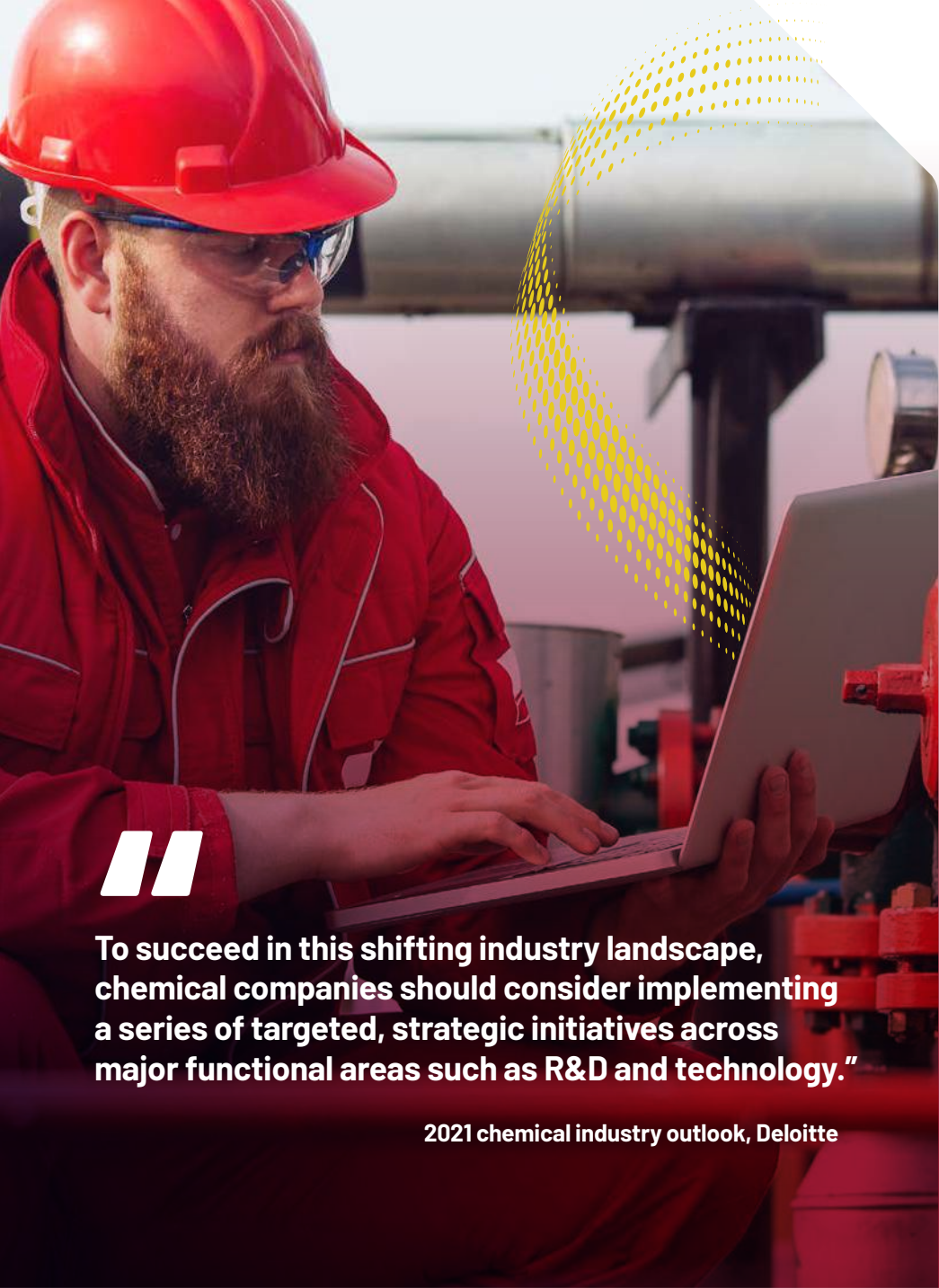
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To succeed in this shifting industry landscape, chemical companies should consider implementing a series of targeted, strategic initiatives across major functional areas such as R&D and technology.”

2021 chemical industry outlook, Deloitte

IMPROVE MAINTENANCE AND SUPPORT

Replacing obsolete automation technology with modern technology reduces the risk associated with limited resources who can work on antiquated equipment and the ability to source replacement parts that are out of production. A Connected Chemical Plant with modern technology offers chemical producers open systems with options for lifecycle management that can reduce risk and OPEX expenditures.

SIMPLIFIED MAINTENANCE

Many producers struggle to support the mix of automation technologies procured from multiple vendors and modified many times over many years. Standardizing or consolidating these technologies when creating a Connected Chemical Plant can help reduce the number of systems with which maintenance technicians and support teams must be familiar. This can help speed up troubleshooting and repairs reducing MTTR, reducing unplanned downtime, and reduce overall training and support costs.

REMOTE SUPPORT

Chemical producers can fundamentally rethink support in a Connected Chemical Plant.

Instead of having experts on-site or sending them to a plant following a failure, producers can use remote access to provide real-time support or use technology like AR/VR based support. This can empower and significantly increase the effectiveness and safety of your limited in-house expertise, which is often geographically dispersed. Some producers with limited resources utilize third-party remote monitoring and support services to track production performance in real-time and alert them if any issues arise.

These capabilities could prove to be especially valuable in the coming years as the chemical industry faces a growing skills shortage.

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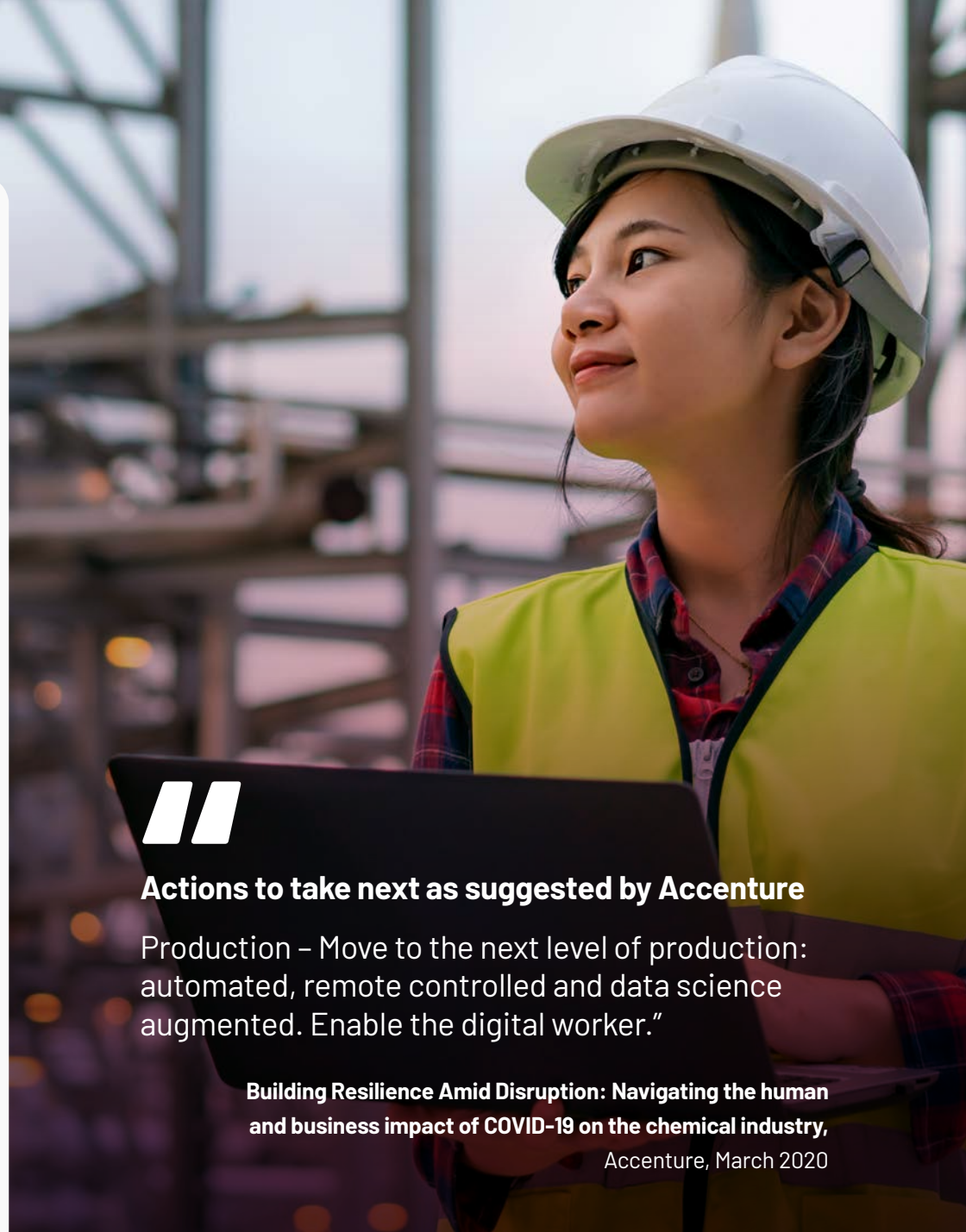
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TRANSFORMING CHEMICAL PRODUCTION

A Connected Chemical Plant presents an entirely new way of doing business. Whether it's a new plant for a unique green chemical or the updating of an existing plant, the Connected Chemical Plant gives chemical producers immediate solutions to the constraints of obsolete equipment. But it also can transform chemical production by providing:

- **Real-time insights** into asset utilization, downtime, product quality and changeover times to drive continuous-improvement efforts.
- **A better understanding** of safety, environmental and quality risks.
- **Simplified troubleshooting and maintenance** to help reduce downtime and lower support costs.
- **More strategic opportunities** to address skills shortages, such as by using AR/VR technologies and remote monitoring and support.
- **New insights** into energy consumption and emissions to drive a more sustainable operation and help achieve environmental goals.

To learn more about creating a Connected Chemical Plant, visit our [Chemical Industry](#) home page or contact your local sales representative.



Actions to take next as suggested by Accenture





Production – Move to the next level of production: automated, remote controlled and data science augmented. Enable the digital worker.”

Building Resilience Amid Disruption: Navigating the human and business impact of COVID-19 on the chemical industry,

Accenture, March 2020

Whether revitalizing an old plant or building a new one, chemical producers must prioritize CapEx and OPEX investments around the technologies that will deliver the best ROI to solve their business challenges. Furthermore, today's "smart" automation technologies require producers to navigate the challenges of integrating their information technology (IT) and operations technology (OT) systems while maintaining protection from cybersecurity threats.

With the need for data-driven operations, technical debt paydowns, and industry transformation, now is the time to review your digital transformation strategy to achieve a connected chemical plant. Deep domain knowledge and expertise in the industry and implementing a digital thread is critical to success. Rockwell Automation has professional services to set companies on the right path to improved profitability across all areas of their operations.

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