YOKOGAWA

Co-innovating tomorrow™

OpreX™ Measurement

Solutions for Chemical Operations Leaders

Sustainability and Enterprise Transformation.

BU-S-20230814-02

Navigating the Key Trends in the Chemical Industry Today

Amid mounting environmental concerns and the imperative of sustainable progress, chemical enterprises are increasingly directing their efforts towards cultivating eco-conscious practices. The path forward entails embracing renewable energy, curtailing waste and emissions, and introducing processes that are less ecologically harmful. In this pursuit, companies that champion **sustainability** stand not only to resonate with environmentally aware consumers but also to secure a competitive edge within the fiercely competitive market.

With Industry 4.0, digital transformation has emerged as an indispensable facet of operational strategy. Chemical firms are urged to embrace digital technologies to streamline production, fortify supply chain management, and refine overall performance. Successful integration of these technologies translates to heightened efficiency, cost reduction, and the ability to adeptly cater to customer demands. Furthermore, data-driven insights arising from **digital transformation** empower strategic decision-making.

Championing a circular economy, chemical companies wield substantial influence in the drive to maximize resource utilization, curtail waste, and bolster recycling efforts. By adopting circular business models, these enterprises curtail their environmental footprint while also ushering in fresh avenues of revenue generation.

Promoting the well-being of employees, customers, and communities stands as another paramount priority for chemical companies. The underpinning of robust health and safety measures, comprehensive training, and a culture steeped in **safety** excellence is imperative.

Innovation remains the lifeblood of the chemical sector. Companies are compelled to continually invest in research and development to keep pace with evolving customer expectations and remain competitive. This quest for innovation propels the exploration of novel materials, technologies, and processes that promise heightened efficiency, cost reduction, and a more sustainable future.

“The U.S. chemicals industry is maturing and optimizing its business portfolio for more competitive global markets.“

- U.S. Department of Energy

“Ammonia is the 4th most energy consuming chemical based on a bandwidth study (TBtu/year)”

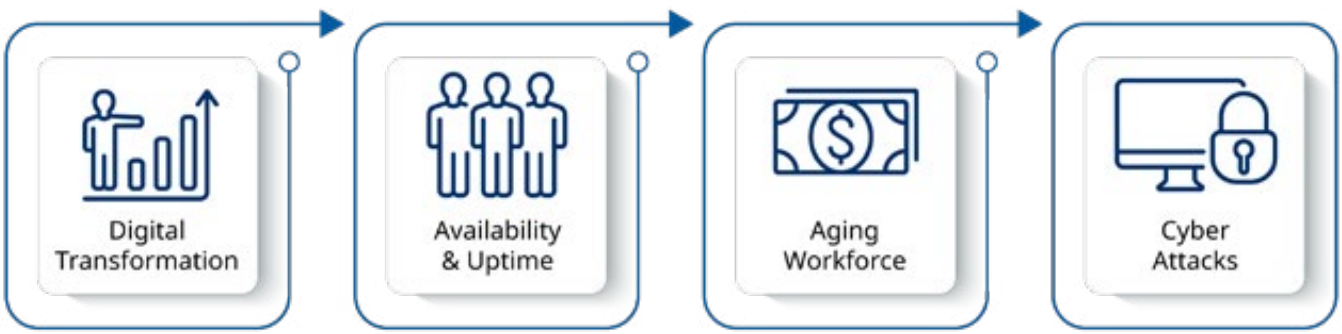
- U.S. Department of Energy

“Energy savings opportunities for individual chemicals and for 15 subsectors of chemicals manufacturing are based on technologies currently in use or under development; these potential savings are then extrapolated to estimate sector-wide energy savings opportunity.”

- U.S. Department of Energy

Continuing Challenges in the Chemical Industry

The rapid expansion of the chemical industry in recent years has created new challenges for chemical plants. In order to adapt to the demand of the growing chemical market, industry executives must utilize new technologies, resources, and solutions to remain competitive, save energy, and improve processes. In response to this growth, Yokogawa has identified four key factors that remain to be true for the chemical industry and offers solutions for companies to achieve success in this evolving market.



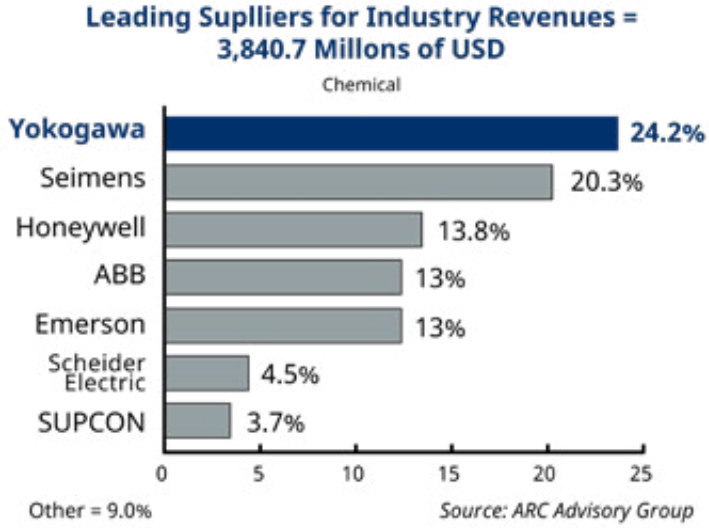
The Potential of Digital Transformation Opportunities Await

The remarkable pace of technology is creating significant changes and opportunities in the business environment. Yet industry surveys show that less than 5% of chemical companies have successfully executed a digital transformation. Business leaders are eager to unlock the value of digital but are unclear about how to approach and execute.

Solutions:

Organizational strategy is built with business improvement objectives and outcomes that are implemented through a combination of people, process, and technology.

Digital transformation is a journey that integrates a wide variety of applications, technologies, and business processes in line with a company's aims with a wide variety of applications, technologies, and business processes falling in line with a company's aims.



Yokogawa Delivers Value With Multiple Benefits

- **Identifying where businesses are in the digital transformation journey**
- **Defining multiple potential value creation opportunities**
- **Assembling a team of professionals with deep chemical domain knowledge**
- **Deploying solutions that maximize efficiency and increase profits**

Yokogawa delivers value to the process industry by focusing on smart manufacturing; optimizing the supply chain; improving the decision-making process; changing the culture, organization, and mindset; creating new business models, and generating further revenue.

Maximizing Uptime and Reducing Costs in the Chemical Industry

In the dynamic landscape of the chemical industry, the challenge of unplanned shutdowns and outages remains a persistent disruptor to efficient operations. These interruptions lead to production losses, energy wastage, and financial inefficiencies, often stemming from equipment aging, insufficient maintenance workflows, and a shortage of skilled personnel. Chemical enterprises are proactively addressing this by pursuing optimal asset integrity and availability, all while driving down the total cost of ownership (TCO).

In the pursuit of comprehensive solutions, Yokogawa embodies the core values of plant safety, availability, cost efficiency, and operational excellence. These principles are seamlessly integrated into our products, services, mindset, and corporate culture. Our approach melds global best practices with a focus on human performance, empowered by cutting-edge technology deployment throughout the organization. From process control systems to instruments, analyzers, and beyond, Yokogawa stands as a strategic partner in enhancing reliability and maintenance across the chemical industry.

Achieving Net Zero while Maintaining Profitability

Industry Challenge: Companies in the chemical industry are now pursuing environmental sustainability goals (ESGs). They are reducing waste, reducing their environmental footprints, and finding ways to enable a circular economy. The more they can do with less, the better. This requires them to streamline processes and use existing assets to increase yields. However, at the same time, they must increase their agility and resilience to thrive in the “next normal” business ecosystem.

Solutions: Most companies realize that they must transform from their current automated operations to autonomous operations, which possess learning and adaptive capabilities that enable responses with minimal human interaction. Yokogawa is setting a course for transformation from industrial automation to industrial autonomy, “IA2IA.” Yokogawa is driving this to empower customers to achieve breakthrough results and thrive in markets that continually present new challenges. To enable a Net Zero, circular economy, autonomous operations allow companies to maximize efficiency. In a rapidly changing environment, autonomous operations provide the high responsiveness required to adapt and move quickly—even with disruptions in the market and supply chain.

15

15 of the largest chemical companies count on Yokogawa for control and automation solutions helping them to get better control and better outcomes

Addressing Workforce Transition in Chemical Operations

The challenge of an aging workforce is becoming increasingly evident within plant operations. A notable chemical company discovered that a staggering 75% of their operating staff is about to retire, underscoring the urgency of this issue.

Yokogawa offers pragmatic solutions such as Modular Procedural Automation (MPA) and Operator Training Simulators (OTS) to counteract the effects of retiring operators. With seasoned personnel leaving, manual intervention-based processes are at risk of being lost. Introducing modular automation and providing training solutions to reshape the new workforce becomes pivotal in risk mitigation. Yokogawa's solutions replicate genuine plant behaviors for realistic operational training. This virtual plant training equips clients with the skills to adeptly respond to emergencies, resulting in time and cost savings, bolstered control strategies, and heightened productivity and efficiency.

Elevated Vulnerability to Cybersecurity Incidents

Industry Challenge: In today's increasingly interconnected landscape, industrial producers worldwide confront a mounting risk of cyber threats that undermine safety and system stability. The absence of a robust cybersecurity solution exposes plants and corporate networks to potential breaches by malicious hackers.

Solutions: In collaboration with Cisco, Yokogawa offers the pioneering cybersecurity services to the chemical sector. These services empower customers to deploy robust security solutions within their plants, safeguarding operations and mitigating risks. Embracing a holistic cybersecurity strategy, this approach not only enhances operational security but also fosters heightened business flexibility, risk awareness, reduced operational expenses, and minimized downtime.

Yokogawa control solutions are deployed at over

7300

chemical facilities around the world

Success Stories

"Yokogawa's CENTUM Batch is used to automate a wide range of Reichhold's batch processes and multiproduct/ multipath processes, thereby demonstrating ease of use, outstanding reliability, and sophisticated functionality. Using the CENTUM Batch package, Reichhold has reduced lifecycle engineering costs, shortened time to market, improved plant performance, and kept unexpected control failures to a minimum. Reichhold has now standardized all of its process control systems in the U.S. with Yokogawa's CENTUM system because of its high reliability. Yokogawa hardware is very reliable. The availability of more than 99.99% is really amazing."

Roja Challa,
Process Control System Advisor, Reichhold

"The Iowa Fertilizer Company would like to recognize all the hard work and continuous efforts of the Yokogawa team to get an OTS system ready for use at IFCo. We want to especially commend the dedicated time to get the system to a point where our IFCo team can test as it is being engineered. Also, IFCo commends the Yokogawa team for implementing an enormous amount of DCS-ESD (Emergency Shutdown) items that were not in the initial scope of the project, but were made to IFCo's specifications. This will help IFCo continue making forward progress to fulfill the mission effectively. It has also allowed DCS-ESD designers to review and change all of the findings discovered through the OTS, leading to an important saving of time on the future DCS-ESD SAT tasks to be performed."

Shawn Rana,
President, Iowa Fertilizer Company

ESG Criteria and Compliance

As chemical manufacturers digitally transform to achieve autonomous operations, criteria for environmental, social, and governance as well as compliance have risen to the forefront. While Yokogawa transforms our own business practices toward achieving a sustainable society, we find our goals are completely aligned with those of our customers. Our solutions not only remove burdens presented by sustainable development goals and compliance, they synergistically present additional opportunities.

For example, compliance can be achieved while simultaneously reducing energy costs. Hazardous waste can be managed in a way that reduces the impact to local populations and ecosystems while converting waste byproducts into revenue for distributed energy markets. Users are also finding that migrating to new technology platforms is not only smart, but also critical to meeting regulatory compliance and revolutionizing workforce enablement for the future. By embracing the latest technology, efficiency and productivity rise while the potential for compliance failure risks are dramatically reduced.

ABOUT YOKOGAWA

Yokogawa provides advanced technologies and services in the areas of measurement, control, and information to customers across a broad range of industries, including energy, chemicals, materials, pharmaceuticals, food, and water. Yokogawa addresses customer issues regarding increasingly complex production, operations management, and the optimization of assets, energy, and the supply chain with digitally enabled smart manufacturing, enabling the transition to autonomous operations. To learn more visit:

www.yokogawa.com/us

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