



As organisations strive to improve sustainability and performance in tandem, the most successful will rely on innovation built on a longstanding history of process industry expertise. **Claudio Fayad, Emerson**, explains.

UNLOCKING THE NEXT GENERATION OF AUTOMATION

The last few decades have seen a whirlwind of automation innovation that has significantly impacted the hydrocarbon industry. Consider decades ago, when operators were astounded as their control functions moved from dedicated operator stations to commercial, off-the-shelf components. That move reduced the cost of hardware and accelerated innovation. Suddenly, teams could adopt and develop technologies faster by leveraging standard components.

A move to commercially available components was just the start, however, as just over the horizon was electronic marshalling, a technology that redefined how teams execute projects. Software-defined marshalling was a game changer. As I/O systems moved to the field and physical marshalling was no longer necessary, engineering and installation of field equipment became faster and easier. Project teams eliminated 90% of required I/O footprint, while decoupling hardware and software to provide more flexibility.

The move to software continued with virtualisation. Teams eliminated the need for multiple workstations, ultimately reducing footprint and simplifying installation, while simultaneously providing more redundancy and faster disaster recovery. And as virtualisation was gaining traction, so, too,

was the rise of the internet and cloud computing in operational technology (OT) – unlocking capabilities such as virtual factory acceptance testing and cloud-based engineering. These technologies dramatically reduced capital engineering timelines and costs, and they were also critical to helping companies navigate project execution throughout the complications of a global pandemic.

It would be reasonable for modern hydrocarbon operations personnel to assume nothing will ever match those changes of the last few decades, but they would be mistaken. In just the last five years, innovation has only increased, including acceleration toward more remote and autonomous operations. Cloud and edge technologies, artificial intelligence (AI), and machine learning (ML) are all maturing, with more innovations on the horizon. Through all that change, one thing will remain true for automation professionals: pragmatic innovation will continue to win the day.

Modern process manufacturing driven by innovation

There has never been a better environment than today for innovation because the automation industry is at an inflection point driven by rapid change in the process

manufacturing landscape. The convergence of information technology (IT) and OT has brought new technologies to operations, but it has created new complexities. Dealing with this complexity is driving a need for increased, fit-for-purpose cybersecurity solutions, as well as a need to better integrate the field, edge, and cloud to drive more optimisation (Figure 1).

Further driving the need for innovation, all these changes have arrived just as a combination of new technologies and a variety of changing end user needs are acting as a catalyst to more complex and broad operations.

To meet the changing needs of a new era of process manufacturing, automation suppliers will need to begin shifting their focus to help hydrocarbon manufacturers better understand and embrace this new landscape. Successfully navigating emerging needs – including improved sustainability, lower energy use, increased productivity, secure operation, supply chain stability, flexible manufacturing, and more – will require innovation. However, that innovation cannot happen overnight if it is to deliver value across the lifecycle of new operations. Instead, it must be built on decades of expertise to narrow or eliminate the existing gaps that make it difficult for operators to close the loop across their plants, and even the enterprise (Figure 2).

Reaching these goals requires innovation to enhance operations holistically, driven by a boundless automation vision of seamless connectivity from the intelligent field, through the edge, and into the cloud. Automation suppliers can help users more easily navigate the coming era of more efficient, sustainable process manufacturing, but only if they focus on the holistic solutions that liberate data so teams can lean into the new technologies that will drive the future of process automation.

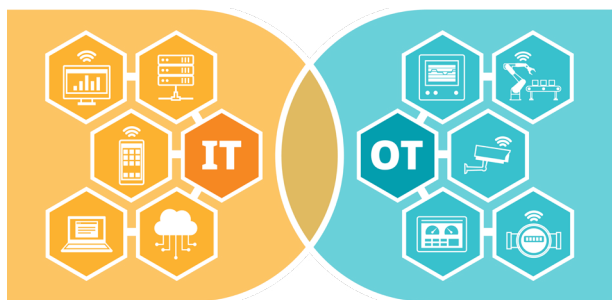


Figure 1. The IT/OT convergence has dramatically increased the need for automation innovation in the last decade.

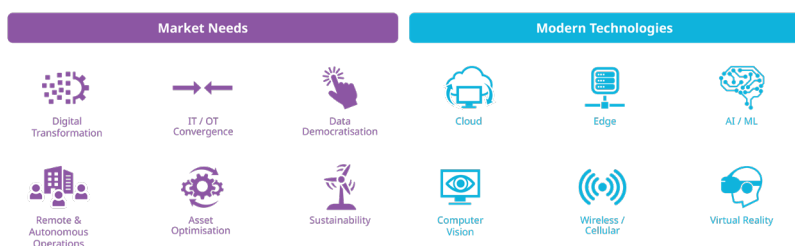


Figure 2. Emerging market needs are driving a need for a wide variety of innovative new technologies.

Building a superhighway for democratised data

As automation suppliers are innovating to help operations teams accomplish the optimisation necessary to meet their goals, they will need to shift the way they evolve their solutions. It is no longer sufficient to simply identify a problem in an industry and develop standalone technology to solve it. Modern OT teams will instead need more comprehensive, holistic solutions grounded in decades of industry expertise.

In response, forward-thinking automation suppliers are beginning to move away from isolated solutions to an integrated automation platform to break down data silos and democratise data. As more layers of automation become seamlessly integrated through a unifying data fabric, data becomes easily accessible anytime and anywhere, not just within the plant, but across the enterprise. Ultimately, the distributed control system is not disappearing – it is simply becoming part of a much bigger, seamless ecosystem.

The resulting data democratisation will assist OT personnel in developing their own innovations to drive increased production, in tandem with more sustainable operation. For example, in refining, where new regulations and incentives have increased focus on reducing emissions along with increasing throughput, today's teams have different goals than they did just five years ago. Those new goals, such as reducing emissions without impacting production, require many technologies – control, planning, optimisation, analytics, simulation, and more – all working side-by-side. Such deeply interconnected operation is impossible without seamless mobility of data among software solutions.

If data gets siloed in any one place, end-to-end visibility and context evaporates, taking improvement with it. Conversely, if data is free to move among automation domains in a standard format without losing context, teams across the enterprise can use it to track and trend performance, and to make the operational and business decisions necessary to improve sustainability without impacting performance, and vice versa.

However, data democratisation innovation does not stop with people. In the last few years, a new player has arrived that is changing the game. With the rise of generative AI comes another shift in focus. Automation suppliers are democratising data not only for people, but also for use in the AI engines reshaping the face of automation. That data will still need reliable context from the control layer for AI tools to successfully use it to make critical decisions.

As companies and automation suppliers innovate, the distributed control system will evolve into a larger automation ecosystem that seamlessly incorporates control with reliability, analytics, business systems, and more, capitalising on the rise of AI and ML to drive higher-level insights, while continuing movement toward self-optimising operations.

Unlocking a more flexible field

Consider a refinery changing operations to use a much wider variety of feedstocks, including bio-based products. Teams making such a shift

undergo a long list of changes to their operations that require innovation. Not only will the operations team have to manage pressure and flow changes, but they will also need to increase vigilance for leaks, corrosion monitoring, and more, as well as managing the changes necessary in equipment to keep the processes working well.

Navigating these changes successfully requires technologies to bring copious amounts of data into the automation platform seamlessly, which in turn relies on a strong support for standardisation. Forward-thinking automation suppliers are already focused on building a strong foundation of open protocols to help break down data silos. True innovation is built around support for open protocols such as OPC UA, HART IP, and MTP to foster a wider spectrum of idea generation and eliminate limitations that complicate digital transformation.

Moreover, as teams increase the complexity of their operations, they will need simpler and faster connection and configuration capabilities, as well as the increased bandwidth and intrinsically safe connectivity of Ethernet Advanced Physical Layer (APL). To meet that need, automation suppliers are developing solutions that enable APL across a wide variety of protocols, including Profinet, OPC UA, and HART IP. These technologies will make it easier for operations teams to bring a multitude of new assets and devices into the fold, while preserving the context of the data they generate, empowering cross-functional teams to make better business decisions (Figure 3).

Increasing value at the edge

As process manufacturers strive to be more energy efficient, edge solutions and data management software will play an increasingly important role in the improvements that help them optimise operations across the entire value chain. First and foremost, hydrocarbon manufacturers are looking toward controlling scope one emissions, requiring operations teams to monitor an increasingly wide spectrum of variables across all their operations areas.

The automation suppliers providing them the most value will be those that can help them collate and standardise that data throughout the industrial edge – without losing context – and storing the contextualised data where it can be equally accessed by data scientists, and by analytics, enterprise resource planning, scheduling, and other critical systems.

Hydrocarbon organisations will have a wide array of options to choose from, but not all will work together easily.

Prioritising solutions that integrate seamlessly through open protocols will help maintain the flexibility to not only change alongside the market, but to also scale rapidly as projects demonstrate success.

Shifting toward software-defined solutions

The journey to net-zero, secure, efficient operations is inherently defined by flexibility. As specialty chemical manufacturers rapidly shift production to meet ever-changing customer needs, or as oil and gas companies transition to support more carbon capture technologies and new fuel sources like hydrogen, they cannot be limited by choices made early in project design. These teams need more flexible architectures and business models to help them transition quickly to meet end user, corporate, and regulatory requirements.

To meet these needs, automation suppliers are innovating solutions that provide the same powerful control capabilities in more flexible subscription-based packages. New controller technologies will leverage modern, software-defined solutions to unlock flexible capacity, empowering users to subscribe for only what they need, and to add functionality as they grow and scale.


Innovation-driven partnerships

As the need for innovation increases in the coming decades, so will the need for creativity and discovery from a wide array of innovators. Filtering the many available solutions to find the right combination is likely to be one of the biggest challenges facing process manufacturers in coming years.

Fortunately, as innovation continues to thrive, the most experienced automation solution providers are moving away from a contentious outlook towards innovators and are instead embracing strategic partnerships with successful start-ups. These partnerships combine the cutting-edge technology innovation of small, nimble software companies with the longstanding expertise and wide industry knowledge of established automation providers. The result for process manufacturers is quicker access to the technologies they need without the increased complexity of trying to integrate many disparate, proprietary solutions.

Innovation has arrived

The ability to compete in a growing global marketplace focused on sustainability in coming decades will likely drive unprecedented innovation. Fortunately, forward-thinking automation suppliers are anticipating these changes as they plan for the future, and they are developing seamlessly integrated technology solutions to meet growing challenges.

Much of the technology for a boundless automation vision is still over the horizon, but the earliest technologies to democratise data as part of that vision are available today, empowering operations teams to begin building the foundation for the flexibility and sustainability that will be market differentiators. 

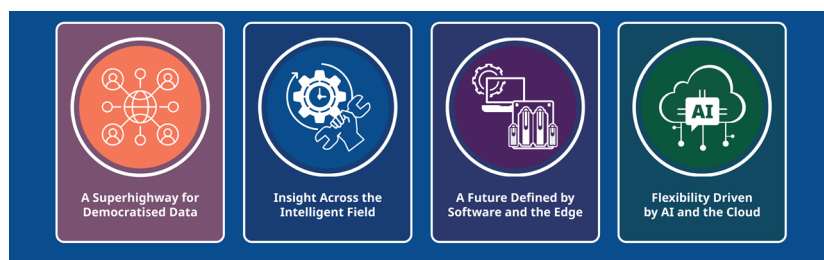


Figure 3. A boundless automation vision focused on seamless data mobility will help organisations get the most out of the technology driving the future of their operations.