

Digital Transformation

Upstream Oil and Gas

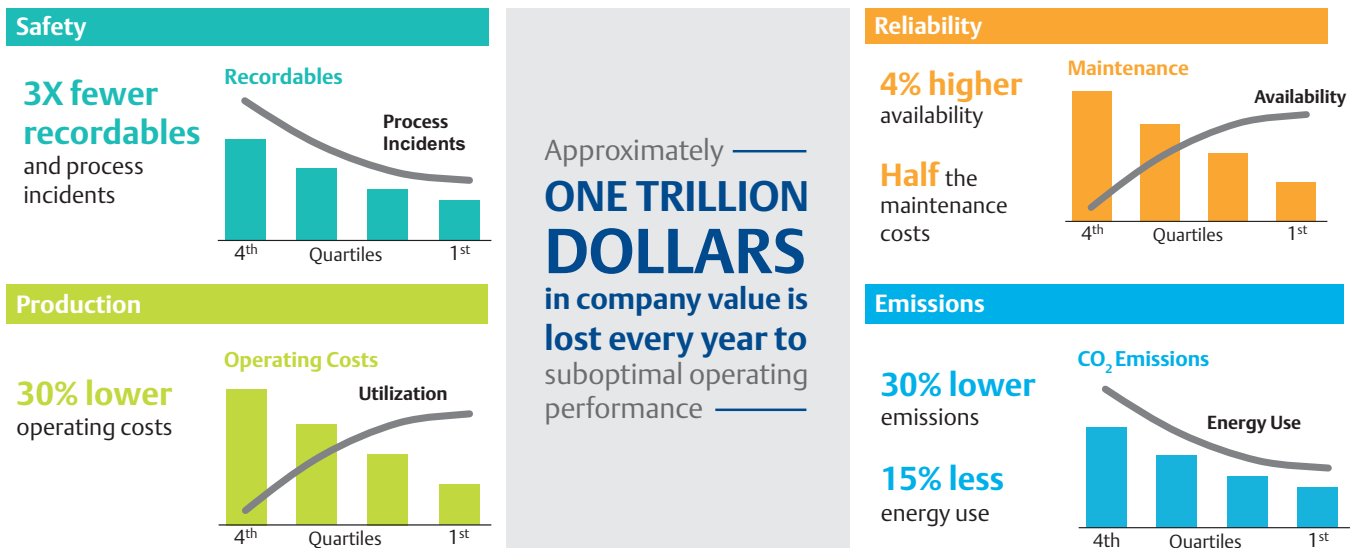


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For the past several years, volatile market prices have been forcing oil and gas companies to rethink the way they do business — sidelining their traditional field development and drilling philosophies for productivity-focused, data-driven analysis. In terms of achieving operational excellence, it's a complete reconsideration of how technologies, processes and personnel play a role in achieving sustainable business success. This paradigm shift has incited a deeper need for the industry to digitally transform itself through widespread adoption and integration of equipment and systems that leverage the Industrial Internet of Things (IIoT) to enhance operational performance and drive profitable results.

For upstream oil and gas operators, the need is more imperative due to the asset intensity of the industry, its remote operations and the hazardous environments in which its workers function. Achieving operational excellence in this sector often requires the elimination of manual processes, siloed decision support tools and inefficient operational practices to maximize production, reduce costs and improve safety.

Of course, it also requires a reversal of the traditional industry-wide mindset of maintaining the status quo, which has fostered a skeptical approach to automation and digitalization where risk-averse companies sometimes eschew operational excellence practices and supporting technologies because they believe they are too difficult to adopt or are not practical for their day to day operations. This leaves many oil and gas operations stuck in a devolutionary cycle of using outdated, unreliable, and completely inefficient systems to perform some of their most common and critical work — thereby costing millions in unrealized revenue and putting them further behind peers in terms of profit margin, operational efficiency and workplace safety.



Digital transformation practices can effectively close the gap between Top Quartile performance and average operating practices, which is estimated to account for more than \$1 trillion of lost productivity.

However, the wave of digital transformation is steadily gaining momentum across the industry, and more companies are seeking digital enhancements to achieve more sustainable business success in parallel with those among the industry's Top Quartile performers—achieving performance within the top 25 percent of peer companies. In the upstream oil and gas sector, these enhancements often include: wireless sensors and remote field intelligence; enhanced connectivity to communicate actionable and timely insight into the performance of fields and field assets; IIoT-based software to gather and manage data; optimized work processes and logistics; and perhaps most of all, guidance and consulting to shepherd them on their transformative journey.

EMERSON'S ROLE IN DIGITAL TRANSFORMATION

Before an upstream oil and gas business can commit to a digital transformation of their operations, they must first determine the areas that can be most impacted by digital technologies and how a transformation would affect the production, cost and safety performance of the business. To perform such an assessment and ensure its accuracy, the company should seek to partner with a solutions provider that not only understands the value of digital technologies and systems but also has the proven ability to help customers leverage their capabilities to achieve results comparable to the leading peer companies across the industry.

With nearly a century of experience in energy production, Emerson offers a multitude of automation and digital technologies, specialized services and IIoT-based solutions that have been proven to drive sustainable success in the oil and gas sector. These offerings are the basis of its programmatic approach to helping customers justify, define and implement pragmatic strategies for achieving Top Quartile performance in the areas of safety, reliability and production—an approach known as Operational Certainty.

Through this methodology, Emerson can leverage its entire portfolio of automation products, services, and solutions to collaboratively instill the operational practices of top industry performers in clients of all sizes. In fact, Emerson's Operational Certainty Consulting practice has proven experience with helping operators elevate performance metrics and sustain that engagement until value is realized from opportunity identification to steady-state operations.

Upstream oil and gas producers can also harness the power of IIoT to expand digital intelligence throughout their operations by integrating Emerson's Plantweb digital ecosystem. Plantweb represents a comprehensive portfolio of interoperable technologies, software and services that allows businesses to access actionable information from data-rich environments and deliver it to relevant personnel in real time for enhanced operational insight. Many of the technologies and applications offered as part of the Plantweb digital ecosystem focus on areas such as pervasive sensing, wireless access, data acquisition and integration, measurement and analysis, cybersecurity, and other areas in which oil and gas producers can enhance their operations and gain measurable success.

But Plantweb represents only part of Emerson's commitment to helping the oil and gas industry realize the benefits of digital transformation. Emerson's vast experience in automation systems and solutions allows them to leverage a wide range of technologies and expertise around sensing, connectivity, advanced computing and analytics, and other areas that can eliminate efficiency barriers and foster digital intelligence across the entire value chain.

OPERATIONAL ENHANCEMENTS TO MAXIMIZE PRODUCTION

Outdated and ineffective equipment, time-consuming manual processes and a lack of reliable and actionable data can hinder decision-making and negatively impact production for upstream oil and gas producers. Where this is most relevant is in oil field production forecasting where upstream operations have typically struggled to rectify well dynamics and flow ratios with the limited geologic data available to them at the time. With digital production modelling systems, such as Emerson's Paradigm™ Production Modelling solution, operators now have

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the ability to quickly and accurately model production in a way that better reflects the realities of the subsurface, without the computational cost and complexity of a full physics fluid simulation. It provides a dependable, high-definition production forecast that asset managers can use to make daily field optimization decisions.

For operations that rely on various forms of artificial lift, there are digital solutions to help them optimize these processes and allocate energy to the most productive wells. Emerson provides a selection of well and lift optimization solutions, like its SmartProcess™ Well Optimizer application, that provide needed insight into the lift methods themselves and allow asset managers to make optimized decisions based upon a real-time comparison of production rates versus targets. For gas lift and electric submersible pump (ESP) systems, Emerson offers a model-based Dynamic Lift Optimization (DLO) solution that automatically allocates lift energy to the most profitable wells while also considering physical and economic constraints in the system.

Since production is also greatly affected by the conditions of the surface or equipment, producers can utilize digital technologies to gain real-time insight into equipment health, and perhaps nowhere is this better realized than in the application of Emerson's Digital Well Pad solution. This comprehensive solution combines the pervasive sensing and pre-engineered automated workflows of Emerson's Automated Production Surveillance system with proven asset management software (AMS) remotely extracting rich diagnostics on every critical component at the well pad to easily optimize its performance. With this combination of digital devices and analytic applications, producers can gain increased visibility into asset health and performance and make faster, more informed decisions to significantly reduce unplanned downtime and maximize production.

IMPROVED ASSET INSIGHT TO REDUCE COSTS

Keeping upstream assets healthy and functioning properly is not only a function of increasing or optimizing production but also of minimizing operational expenses, where maintenance costs have a significant impact. Traditionally, producers relied on occasional manual inspections in often hazardous conditions to determine asset health and performance, and the lack of comprehensive insight typically resulted in a run-to-fail approach that cost exorbitant amounts of time and money to replace assets and restart the operation. Today, producers can employ remote monitoring and diagnostics capabilities as a digital response to excessive maintenance expenses. Pervasive sensing devices provide the type of real-time insight companies have needed to adequately assess and address their assets' health and performance. These capabilities are included in several of Emerson's asset management solutions, and are further realized with aggregated process analytics and predictive maintenance systems that can help asset managers adopt more proactive and less-costly approaches to increasing asset uptime.

Another function of reducing maintenance costs is having the ability to identify the most profitable wells and building a streamlined maintenance program that prioritizes repairs based upon production and efficiency. Emerson's Automated Production Surveillance solution includes a Marginal Well Identification Workflow application that captures all costs on a per-well basis, whether variable (water disposal, chemical injection, artificial lift) or fixed (well operation, field overhead, administrative costs), and prioritizes wells for maintenance activity or a potential shut-in (to shift costs to other wells).

To help customers capitalize on digital solutions for reducing asset downtime and maintenance costs, Emerson's Connected Services provide remote expertise to monitor assets, interpret results and provide actionable information so oil and gas producers can align their maintenance and operational responses with their business strategies. Emerson also reinforces digital solutions for asset health through its Reliability Consulting Services, which helps producers implement best-in-class maintenance processes and procedures while providing accurate

equipment records and risk analysis to determine asset criticality for maintenance cost reduction and work prioritization.

WIRELESS AND IIOT TECHNOLOGIES TO IMPROVE SAFETY

Perhaps the most significant benefit of digitally transforming upstream oil and gas operations is minimizing health, safety and environmental (HSE) risk. Manual reporting systems are rapidly being replaced by digital operator rounds that record data automatically and transmit it to a historian or operator software module. Personnel no longer need to waste time and jeopardize their health and safety by working in remote and often hazardous locations to obtain measurement or performance data that they can now access remotely through wireless sensors and then upload it to an administrative cloud system through an IIoT-based platform. The use of connected Wi-Fi and Bluetooth-enabled smart devices and integrated data management systems around work sites is becoming more prevalent, giving rise to digital mustering and personnel location systems and procedures for more effective workplace safety practices. In short, the speed and efficiency of digital technologies and systems is facilitating a more effective collection, transmission and analysis of workplace data to foster a safer and more productive environment for today's oil and gas personnel.

But this digital transformation is also facilitating a safer environment through early detection of erosion, corrosion, cavitation and other factors that can lead to leaks, ruptures or explosions at well sites and points of transmission. With Emerson's current suite of wireless corrosion and erosion detection solutions, technicians can continuously monitor their assets intrusively or non-intrusively to identify early signs of metal loss and prevent equipment degradation. Emerson also offers a host of digital emission detection and prevention technologies that provide early detection and alarm capabilities to minimize exposure to harmful spills or emissions and promote safe facility operation. Maintenance for safety systems can be addressed proactively with Emerson's Smart Device Diagnostics, which provide early detection of safety valve failure modes without shutting down the entire system.

PREPARING THE DIGITAL WORKFORCE

Aside from all the products and solutions that can impact the digitalization of upstream oil and gas operations, a digital transformation also includes the integration and training of key personnel as well as enhancing processes and procedures to facilitate these changes and ensure an efficient transition for the entire operational culture. With the help of Emerson's Educational Services, oil and gas producers can better equip their personnel by training them to use: automated workflows to eliminate repetitive tasks and streamline standard operations; decision support practices that leverage analytics and embedded expertise to reduce complexity and enable optimal decision-making; and mobile solutions that provide secure, on-demand access to information and expertise regardless of location.

One of the more effective models through which this training is accomplished is the use of a high-fidelity digital twin simulator as part of Emerson's Mimic Simulation Software solution. The digital twin typically provides a virtual platform that allows companies to test proposed adjustments in a risk-free, real-time environment by creating an exact digital replica of the live operation. As part of the Mimic solution, this dynamic simulation can be used in an advanced training module for new or inexperienced operators. By working in a digital, real-time environment, trainees can make decisions and perform advanced modelling and analytics without affecting production of the actual operation. The digital twin model is also used in virtual reality (VR) field operators training for manual task learning, which also integrates with the Mimic process simulation.

Emerson also offers various training programs and workshops, both online and face-to-face, that focus on the development of skills and expertise needed to effectively navigate automation and digital technologies and their

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integration into standard oil and gas operations. Many of these programs highlight the advantages of the “digital oilfield” where operators integrate, interpret and act upon real-time reservoir models and production information to optimize field operations and support increased production.

HOW TO GET STARTED

The digital landscape can be difficult to navigate, and while many producers are still trying to wrap their heads around appropriate first steps toward transformation, there are services available to point them in the right direction. Because developing IIoT-ready operations is neither a plug-and-play proposition nor a one-size-fits-all option for achieving Top Quartile performance, Emerson developed a consulting methodology that starts with a clear business case for Operational Certainty and facilitates a digital transformation across an entire corporate and operational culture.

Emerson’s Operational Certainty consulting practice is specifically designed to put producers on the right digital path for their operations by combining intuitive technologies and automated workflows to reduce complexity and empower more productive digital workers. By applying proven methodologies, Emerson’s Operational Certainty consultants can help producers develop a digital infrastructure that empowers workers with higher-quality, faster decision-making capabilities to accelerate value creation. Beyond the enabling infrastructure, Operational Certainty consultants can also develop a thorough assessment of the organizational changes that are required for full realization of the benefits of digital transformation, ensuring best-in-class behaviors are adopted.

To learn more, visit [Emerson’s Operational Certainty Consulting page](#), or sign up for one of the upcoming Operational Certainty workshops