Achieving Optimal Returns from Wellhead Operations

Increasing Production Uptime and Asset Performance While Also Lowering Total Cost of Ownership
Introduction

With rapidly growing global demand for energy resources, oil and gas exploration & production (E&P) companies face mounting pressure to maximize supply and increase the rate of discovery for new energy sources. Increasingly operating in more remote locations and investing heavily in equipment and facilities, companies face greater financial and operational risks than ever before.

Focusing on wellhead control in both new and existing fields can increase uptime and productivity while reducing total cost of ownership—and the key is to achieve this without compromising human, environmental and equipment safety and performance. It is imperative for companies to quickly get production wells operating and to maintain reliability and tight control throughout ongoing wellhead operations for optimal oil and gas recovery.

This white paper discusses how oil and gas companies can leverage the latest technology solutions to optimize wellhead control for increased production uptime, increased asset performance, and lower total cost of ownership. Integrating wellhead automation to deliver actionable information for high performance, today’s solutions for E&P activities can help companies maximize well production and yield for increased profitability and a strategic competitive advantage.

Intelligent wellhead control can help companies increase uptime and productivity without compromising human, environmental, and equipment safety and performance.
Finally, increasing costs and intense shareholder pressure for maximized return on investment require E&P companies to be vigilant of their total cost of ownership. Costs can get exorbitantly high, which not only reduces profitability but takes away from investing in other growth areas. Thus, it is critical that solutions help reduce overall costs without compromising safety and performance to provide a strategic advantage—enabling a level of operational and financial performance that allows companies to move ahead of their competition.

**Reliable control and safety on a common platform**

To optimize the performance of wellhead controls for increased uptime and productivity, integrated control and safety systems such as GE’s PAC8000 SafetyNet, offer a distinct advantage. They help companies monitor, diagnose and maintain wellhead control assets and activities for utmost reliability, productivity and lower costs while ensuring safety—all through a common platform.

These integrated systems include measurements for tubing pressure, differential pressure/flow, and temperature, and analytic capability at the central control room to determine overall well integrity—and provide features such as built-in intrinsic safety and remote diagnostics capabilities. They are also SIL2-certified by TÜV Rheinland, an independent agency, meeting the needs of most safety requirements.

Challenges in wellhead environments

Manned and unmanned wellheads play a critical role in exploration and production, which make system reliability and uptime evermore crucial. If an RTU fails, resources need to be deployed to remote locations at the wellhead to replace hardware and to bring the unit back online—resulting in production loss as well as high mobilization costs, increased safety risk, and greater overall compliance costs.

The critical and complex nature of E&P operations calls for technology solutions that ensure reliability and safety for intelligent wellhead monitoring and control—delivering ultra-dependable production, accurate measurement, and fault-tolerant communications between production assets. These solutions must also withstand harsh environmental challenges and address the need for exploration and production from increasingly distant fields.

Secondly, reliable information is at the heart of optimized performance. Companies that lack accurate, timely and integrated information cannot adequately control and optimize well production, leverage a centralized repository of data for real-time and historical analysis, or monitor and enhance field production strategies—leading to sub-optimal performance.

Solutions need to provide continuous monitoring and control of pressures, temperatures, flow rates and other critical production characteristics—ensuring efficient flow of oil and/or gas out of a well as well as mitigating risks. Effectively leveraging information enables companies to quickly address pending asset and production issues, maximize asset performance, and reduce expensive trips to the field.
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Optimizing uptime, performance and costs

The following section discusses how an integrated system can deliver on four key areas that are integral to maximizing production uptime and asset performance while also lowering total cost of ownership as they relate to wellhead control operations.

• Preventing equipment failures for increased production uptime

As unplanned downtime disrupts production plans and hurts the bottom line, the need for continuous monitoring and control is vital in E&P operations. Take for instance, a well that produces 10,000 barrels of oil per day at an oil price of $75 USD per barrel; one day of downtime would equate to a loss of $750,000 USD. What is more, this cost increases exponentially for offshore rigs due to the high cost of sending out maintenance crew.

Integrated solutions with redundant controllers are critical to preventing failures, whereby the redundant controller pair operates in parallel, checking status multiple times through the processing loop and enabling the backup controller to continuously monitor the health of the master controller. Rapid and bumpless transfer to the standby controller also helps maintain operations on a continuous basis.

Furthermore, solutions that offer network redundancy in addition to high availability for the controllers can further minimize downtime events. For example, with two high-speed Ethernet ports to provide communication redundancy, each port can be connected to an independent LAN, which is continuously monitored for its integrity. If the primary port detects a network failure, traffic can immediately switch to the other LAN to maintain full communication—ensuring greater availability and higher productivity.

• Leveraging advanced diagnostics for increased asset performance

The availability and use of accurate, reliable and timely data is a powerful tool that can enhance asset performance. Integrated solutions that offer advanced diagnostics can help companies manage their wellhead control assets more effectively, alerting operators about potential problems to enable quick response to issues and even prevent problems before they occur.

Access to timely and accurate mission-critical information from the oil and gas wells helps identify issues and eliminate critical gaps in oil and gas operations. The information provides valuable insight that helps boost asset performance. For example, effective analytic systems can preempt alarm and failure events based on historical modeling, enabling “active avoidance” to minimize asset downtime and hence increase yields.

Coupled with offline tools that identify causes of production problems and present the opportunity to prevent issues in the future, operators can visualize process upsets and their causes. Such insight enables companies to proactively maintain assets and control costs with better predictability for improved planning. It also reduces the need for unnecessary trips to the field.
by resolving issues that can be addressed remotely as well as enabling the right knowledge and tools.

Furthermore, advanced and comprehensive diagnostics are critical enablers for extending asset life by delivering insight into areas such as predictive maintenance to help estimate when and what parts to replace with better precision and timing. The use of analytical process models and advanced diagnostics can help companies enhance asset performance for maximum productivity and avoid costly maintenance, which is typically much higher after a breakdown occurs.

- **Reducing solar panel use for lower total cost of ownership**
  The use of solar panels for power at wellhead operation sites drive significant installation and maintenance costs, coupled with expenses for associated batteries, redundant power supplies, charging systems, and related hardware. Solar panels often have to be installed in remote locations where wide temperature ranges and harsh environments are typical, which also drive up complexity and costs. The need for power to remain operational 24/7 is imperative, challenging companies to implement solutions that enable lower consumption.

  Companies need to compare the overall power consumption of their wellhead systems in operating conditions and consider how it impacts costs; those that consume less power without compromising performance and reliability can significantly reduce expenses by decreasing the number of solar panels required for operations. For example, GE’s purpose-fit wellhead integrated control and safety systems are designed for lower power consumption than general-purpose systems, whereby the difference can be up to 8%.

  Using fewer solar panels for the same level of performance has a significant financial impact by enabling lower costs for installation, ongoing maintenance, and associated batteries, all of which play an integral role in driving down the total cost of ownership.

- **Minimizing time to production for lower total cost of ownership**
  Time is of the essence—from initial discovery and startup through production. The sooner companies can automate a well once drilling is complete, the faster it can start produc-

**Integrating wellhead automation as part of the overall process with a pre-configured solution enables rapid implementation—saving significant time and costs for discovery and startup.**

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**Purpose-fit wellhead integrated control and safety systems can consume up to 8% less power than general-purpose systems.**
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Key areas integral for optimized performance of wellhead controls

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<td>Prevent equipment failures</td>
<td>Leverage advanced diagnostics</td>
<td>Reduce solar panel use</td>
<td>Minimize time to production</td>
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<td>Field mount in harshest environmental conditions; robust controller and network redundancy</td>
<td>Analytical process models, predictive maintenance, and alarming capabilities</td>
<td>Purpose-fit integrated control and safety systems that consume less power – 5 Watts per controller</td>
<td>Pre-configured solution with common development environment</td>
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<td>Benefit</td>
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<td>Ensure system integrity and reliability</td>
<td>Predict impending issues, extend asset life</td>
<td>Install fewer panels, maintain fewer batteries</td>
<td>Save costs for engineering, equipment and overhead</td>
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<td>Value</td>
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<td>Increase asset performance</td>
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Conclusion

More than ever, E&P companies are under intense pressure to maximize productivity, reliability, and efficiency while addressing increasing cost and profitability pressures. Significantly high financial and operational stakes in oil and gas recovery production, coupled with sophisticated processes in extremely harsh environments, calls for renewed focus on the criticality of wellhead operations.

The latest technology solutions that integrate safety and control onto a single platform enable companies to achieve more reliable, efficient wellhead operations. Such solutions deliver continuous monitoring and precise control in a wide range of situations—onshore and offshore—delivering increased production uptime and asset performance, and lower total cost of ownership.

As oil and gas wells are being drilled to greater depths and distributed over further and wider areas with higher associated risks and greater upfront investments, high performance is imperative for companies to succeed. Companies that focus on optimizing wellhead operations while ensuring safety and reliability can begin their path toward capturing greater profitability in upstream production for long-term growth.