How to Optimize Upstream Oil & Gas Operations with Enhanced Private Network Connections

SPONSORED BY

Offshore®

verizon business

Introduction

The quickly changing operating landscape for oil and gas companies requires new strategies to adopt digitalization and automation. As such, exploration, extraction, and production increasingly depend on a strong network connection — provided through solutions such as private 5G networks — and harnessing the power of the Internet of Things (IoT).

Upstream activities take place over vast, usually isolated areas both on land and offshore. These companies also deploy a complex array of machines and people in oil and gas fields and drill sites to bring their products to the market. These are challenging conditions for conventional connectivity solutions, such as Wi-Fi, at a time when connectivity is increasingly critical to driving down costs and improving operational efficiency.

This white paper explores why private 5G networks are emerging as a solution for upstream oil and gas companies to connect their critical infrastructure and people at onshore and offshore operations. Read it to learn:

- The top challenges upstream oil and gas businesses encounter due to inadequate networks and connectivity
- The leading benefits of a fully connected oil and gas infrastructure ecosystem
- Use cases that showcase the value of fully connected infrastructure and workers

Inadequately Connected Infrastructure and Workers Limit Success

Upstream oil and gas companies know the benefits of connected workers and infrastructure, and hence the need for effective networks across their operations. They've aggressively pursued automation by connecting networks of programmable logic controllers, remote terminal units, smart monitors and controls, and distributed energy resources.

However, they've also faced high costs and inadequate connectivity with conventional wired or Wi-Fi network solutions. The large footprints and need for pervasive connectivity at terrestrial and offshore drilling sites can result in spotty coverage, unreliable service quality and a high total cost of ownership. Upstream oil and gas companies know too well the consequences of such connectivity limitations:

- Limited visibility into asset performance and status, as well as a limited ability to track and locate mobile assets, inventory and workers
- Lack of data insights needed to optimize production, increase field worker productivity and mitigate risks
- Unplanned downtime and unscheduled reactive maintenance
- Cyberattacks can cause many issues, including financial impacts, business disruption, regulatory fines, and reputational damage
- Inadequate ability to connect field workers to specialized knowledge and support resources when and where needed
- High reliance on manual processes, leading to worker and operational inefficiency
- More field worker-related challenges, such as difficulty filling open positions, high employee turnover and less efficient field training

- Greater difficulty meeting regulatory requirements, sustainability targets and other regulations

E&P companies have invested heavily in electrification, digitization, and the deployment of smart devices that can turn oil and gas plays into a well-orchestrated IoT symphony. Connectivity limitations aren't tenable in a highly competitive market that demands increased efficiency.

Private Cellular Networks Meet Unique Upstream Needs for Secure Connection

In a typical field, drilling rigs at well sites extract oil and gas through a complex web of components ranging from chokes, pipes and Christmas trees to manifolds and flowlines. This infrastructure is constantly monitored, inspected and controlled by an array of devices. In turn, the operations require oil field service operators, truck drivers, rig managers, mechanics and engineers on site to ensure it all runs smoothly. It's no different at offshore sites, where fixed or floating platforms, subsea trees, risers, offloading vessels and offshore technicians define unique but equally complex operations.

Operating these sites truly is a symphony, and they are orchestrated to peak performance when empowered by a network that adequately connects people and infrastructure anywhere, at any time. Upstream companies can achieve optimal orchestration by making three strategic decisions.

1. **Deploy a private 5G network.** A private network establishes a dedicated, secure, low-latency communication backbone for a reliable coverage area with pervasive connectivity and enhanced security compared to Wi-Fi. These networks support the high-bandwidth demands of real-time data transmission from thousands of connected devices, people and machines. Private 5G networks can also be built in remote locations, on land or offshore, using licensed spectrum — not just where coverage is available today.

2. **Build out an upstream Internet of Things.** Deploying smart devices to perform monitoring, inspection, control and other functions across the upstream network of oil and gas wells, Christmas trees, pipelines, vehicles and workers allows operations to gather real-time data and perform real-time communication.

3. **Establish a secure network ecosystem to operate and protect the field.** Oil and gas companies are targets for bad actors, and any attack can disrupt operations, including causing extraction stoppages and other costly delays. A private 5G network gives upstream operations increased security that improves their resilience to attacks.

Benefits in Focus

When the right network and IoT devices are deployed to enable anywhere, reliable connectivity across the oil and gas field, upstream companies open the door to truly optimized operations, delivering:

- **Efficiency:** Cost reductions occur thanks to reduced equipment downtime, optimized and preventive maintenance, and improved resource allocation. The organization can see gains in productivity, performance, faster decision-making in the field and worker retention.

- **Safety and security:** Real-time warnings and alerts and other forms of proactive risk mitigation help upstream companies improve emergency response and provide robust security across their operations.

- **Environmental sustainability:** Improved leak detection, asset optimization and efficient resource allocation all combine to reduce the environmental impact of operations.

- **Production:** The agility and efficiency enabled by connectivity is a competitive advantage that can lead to extraction becoming economic at previously unattractive sites. As time goes on, real-time data and analytics inform strategic planning and innovation that drive revenue growth.

Use Cases for Robust Connectivity in the Field and on the Open Sea

Increased efficiency, safety, security, sustainability and production are the goal of any business. Adequate connectivity and reliable access to data are the digital tools to unlock those benefits. For the

upstream oil and gas sector, how the robust connectivity provided by a private wireless network can deliver benefits across the business can best be shown through use cases.

1. **Increased overall equipment effectiveness**

   At each well, upstream operations must manage countless processes, from controlling volume flowrates of product to measuring temperature and pressure and maintaining it within safe bounds. Real-time monitoring allows for safer and smoother operation of infrastructure that results in reduced downtime. Real-time data leads to analytics that identifies equipment operating at a suboptimal level or in need of repair, allowing potential issues to be addressed through predictive maintenance and scheduled repair before production is negatively impacted.

   Real-time communication and control increase the automation of processes such as temperature, pressure and flowrate control, thus reducing manual labor and leading to greater efficiency.

2. **Increased employee effectiveness and satisfaction**

   Enhanced remote collaboration allows field technicians to connect with remote subject matter experts for help with rapid troubleshooting and guidance when and where needed. This allows them to resolve issues faster and reduce equipment downtime.

   Private wireless networks enable immersive, realistic training simulations for improved knowledge retention. They also open the door to AI-powered training programs that personalize learning and adapt to individual learning styles. Smarter, enhanced training powered by digital tools leads to reduced training costs and reduced training time.

   Lastly, field workers rely on devices such as cellular laptops to do their work. By eliminating connectivity dead zones, these workers always have the tools and data the operation needs to solve problems.

3. **Enhanced operational security**

   With a sophisticated cyberattack like the one faced by the Colonial Pipeline in 2021, intrusion detection and prevention continue to

become more and more critical for the oil and gas industry. Private networks can provide enhanced security through a dedicated and isolated network environment, separating sensitive data and operations from the public internet and reducing exposure to external threats.

Remote access control is a critical capability for managing and securing access to upstream infrastructure. Connectivity provided by a private 5G network ensures E&P companies remain in control when they need to take action quickly and remotely.

4. Improved worker safety

Real-time monitoring of temperature, pressure, leaks and other hazards using connected sensors allows upstream operations to know where personnel are located and if they are facing a threat. Instant warnings and alerts can help them get out of harm's way quickly. When an incident does occur, sensors and real-time communication capabilities allow faster emergency response.

Connected devices also provide data that reveal potential hazards and enable proactive, preventative action before incidents occur.

5. Future readiness for emerging technologies

While many upstream companies dove headfirst into electrification and digital transformation years ago, the process is ongoing as new technologies and capabilities emerge. Reaching the ultimate potential of AI and machine learning across oil fields must start with the right network and connected infrastructure to collect and transport data insights for predictive analytics and automation.

Digital twins of offshore platforms, drilling rig configurations and pipeline networks are enabling virtual simulations to test innovations and optimize operations. Augmented and virtual reality (AR/VR) tools are improving remote collaboration and training. Smart energy controls and distributed energy resources allow E&P companies to build onsite microgrids that efficiently meet energy needs in remote locations. Wherever technology heads next, a strong network solution offering robust connectivity is the foundation to be future-ready.

Conclusion

Upstream oil and gas companies have embraced the digital revolution to improve efficiency and optimize operations. To meet the growing demand for oil and gas and compete in an increasingly high-tech, high-efficiency business, it is imperative for upstream operators to solve network and connectivity limitations in even the most remote, vast oil and gas plays.

By connecting infrastructure and field workers with a private 5G wireless network and gathering real-time data from IoT sensors, upstream oil and gas companies can unlock improved efficiency, production, safety, security and sustainability. Just as important, taking action now positions operations to adopt the innovations needed to compete in the future.

Verizon Wireless is a trusted partner to oil and gas companies, helping them design, build and manage network solutions tailored to their operational needs.

For more information about Verizon's Energy and Utilities solutions visit, **https://www.verizon.com/business/solutions/industry/energy-and-utilities/**.