

How to Optimize Midstream Oil & Gas Operations with Private Wireless Networks



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**OIL & GAS
JOURNAL**

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Introduction

Midstream oil and gas operations have entered an age of digital transformation, compelled by the imperative to increase revenue and operational efficiency, lower costs, improve safety and security, and better manage commodity market risks. This transformation relies on reliable, secure network connections — provided through solutions such as private 5G networks — and harnessing the power of the Internet of Things (IoT).

However, midstream operations are complex. Oil and gas storage and processing facilities, oil refineries and petrochemical manufacturing sites are often large and dispersed across broad campuses. These facilities employ a complex array of machines and people to receive oil and gas from well sites and ready it for timely delivery to downstream markets. These are challenging conditions for conventional connectivity solutions at a time when connectivity is growing more critical for success.

This white paper explores why private wireless networks are emerging as a solution for midstream companies to connect their critical infrastructure and people across storage and processing operations. Read it to learn:

- The top challenges midstream oil and gas businesses encounter due to inadequate networks and connectivity
- The leading benefits of a fully connected infrastructure ecosystem
- Use cases that demonstrate the return on investment of connected infrastructure and the value of connecting workers to productivity-enhancing data and insights

Inadequate Connectivity Holds Midstream Operations Back

Increasingly, midstream companies need effective and reliable networks across their operations to support real-time data collection from equipment that is part of an industrial IoT. As products ranging from oil to natural gas to natural gas liquids (NGLs) move through gathering, treating, stabilization and distillation processes into pipelines, trucks, rail cars and vessels — and then ultimately to storage and processing facilities — there are countless opportunities for more effective digital solutions to transform operations.

The large footprint of storage campuses, oil refineries and petrochemical factories can result in spotty wireless coverage, unreliable service quality, and a high total cost of ownership when

Wi-Fi or wired networks are deployed. The consequences of these limitations can be severe for an industry that must be able to respond quickly to changes in upstream supply, downstream demand, extreme weather and commodity price fluctuations. They include:

- 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 product management, worker productivity and risk mitigation
- Unplanned, 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 employee-related challenges, such as difficulty filling open positions, high employee turnover and less efficient field training
- Greater difficulty meeting regulatory requirements and sustainability targets

Midstream companies need their diverse physical infrastructure to function as a single operation to respond to quickly shifting conditions as well as threats to safety and security. Connectivity limitations aren't tenable in a highly competitive market that demands increased efficiency and automated decision-making.

Private Cellular Networks: A Tailored Solution to Connect Midstream Operations

Midstream assets must be able to perform numerous complex processes and provide the flexibility to nimbly respond to shifts in production and demand. For pipelines and storage facilities, physical and leak detection and prevention are key. Pipes, vessels, trucks and rail cars must be orchestrated carefully to manage storage constraints at oil and liquefied natural gas (LNG) terminals and other storage facilities. Processing plants remove contaminants through treatment and dehydration processes, and fractionation separates mixed fuels into unique product streams such as natural gas and NGLs.

The infrastructure used to conduct these activities is increasingly monitored, inspected and controlled by an array of connected devices. Collectively, devices from remote meters and monitors to SCADA systems enable automation across pipeline and transportation processes, pipeline network management and optimization, and storage and refining operations. These capabilities are the foundation of improvements in product measurement, leak detection, gate and access management, network planning, scheduling and transaction management.

Midstream operations truly are a symphony, and they are orchestrated to peak performance when empowered by a network that adequately connects people and infrastructure anywhere, at any time. Midstream 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 be built in remote locations using licensed spectrum — not just where wireless coverage is available today.
- 2. Build out a midstream Internet of Things.** Deploying smart devices to perform monitoring, inspection, control and other functions across midstream operations allows companies to gather real-time data and perform real-time communication. These devices are the building blocks that unlock the benefits of digital transformation.
- 3. Establish a secure network ecosystem to operate and protect pipes and plants.** Midstream oil and gas infrastructure is a target for bad actors, and any attack can disrupt operations, including causing transportation and processing stoppages as well as other costly delays. A private 5G network gives midstream operations increased security that improves their resilience to attacks.

Benefits in Focus

When the right connectivity and IoT devices are deployed, it enables anywhere, all-the-time connectivity across the gathering, transportation and storage ecosystem. This opens the door for midstream companies to achieve truly optimized operations built to respond to the rapid shifts in supply, demand and commodity prices that can make every day very different from the last. Key benefits include:

- **Efficiency:** Cost reductions and increased productivity occur thanks to reduced equipment downtime, optimized and preventive maintenance, and improved management of transportation networks and storage constraints. Workers see gains in productivity, performance and retention.
- **Safety and security:** Real-time warnings and alerts and other forms of proactive risk mitigation help midstream companies improve emergency response and provide robust security across their operations.
- **Environmental sustainability:** Improved leak detection, asset optimization and efficient network management all combine to reduce the environmental impact of operations.
- **Profitability:** The agility and efficiency enabled by the right connectivity is a competitive advantage that allows midstream companies to respond to quickly changing market dynamics, thus creating opportunities to boost revenue. As time goes on, real-time data and analytics inform strategic planning and innovation that drive growth.



How Robust Connectivity Provides Value from Gathering to Storage to Delivery

Five industry-specific use cases demonstrate the ways in which the robust connectivity delivered by private cellular networks benefits midstream facilities.

1. Increased overall equipment effectiveness

How product throughput and the rate of other processes following upstream extraction are managed have major knock-on effects for storage, processing and transportation

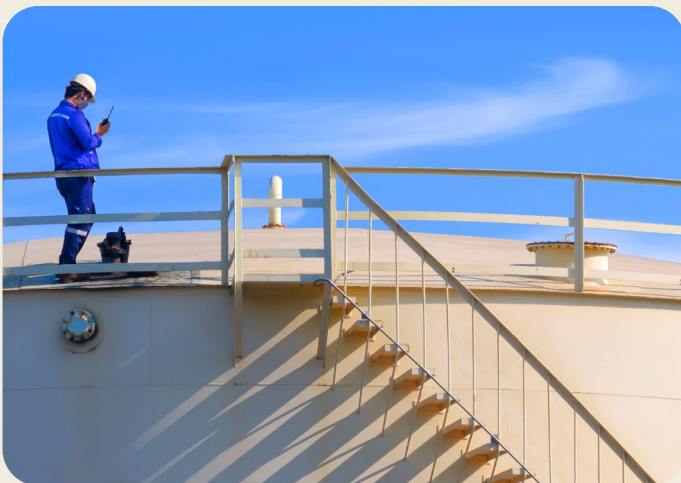
capacity. It's a challenge to coordinate on a normal day, much less when extreme weather or a market-moving event occurs. Real-time monitoring allows for safer and smoother operation of infrastructure, resulting in less product loss and improved product measurement and management. The collection of real-time data allows for analytics that can identify equipment and asset performance issues, providing the intelligence leaders need to get more from existing assets and solve system bottlenecks. Analytics also unlocks the power of predictive maintenance for scheduled repairs and reduced downtime.

Real-time communication and control increase the automation of processes such as leak detection, infrastructure inspection, and storage and transportation network management — thus reducing manual labor and leading to increased productivity. Real-time analytics and control facilitate improved customer satisfaction by increasing the ability to respond quickly to customer needs when markets shift or supply chain issues arise.

2. Increased employee effectiveness and satisfaction

Robust connectivity enhances remote collaboration by allowing facility staff to connect with remote and on-site subject-matter experts when and where they are needed. Rather than wait hours or days for a specialist to arrive, on-site staff and specialists can quickly troubleshoot issues together. A leaner, nimbler team resolves problems faster and reduces equipment downtime.

Technicians, equipment operators, mechanics, engineers and drivers rely on cellular-connected devices such as tablets, laptops and smartphones. By eliminating connectivity dead zones, these workers always have the tools and data the operation needs to solve problems.



Lastly, the best facility workers benefitted from effective training. Private 5G networks enable immersive, realistic training simulations for improved knowledge retention. They also open the door to AI- and augmented reality-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 training time.

3. Enhanced operational security

With a cyberattack like the one faced by the Colonial Pipeline in 2021, intrusion detection and prevention are critical for midstream companies today. 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. These features help maintain business continuity and protect against bad actors.

4. Improved worker safety

Real-time monitoring of temperature, pressure, leaks and other hazards using connected sensors and computer vision allows midstream 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

Midstream oil and gas infrastructure links a massive amount of supply from often remote and extreme environments across vast distances to the population centers where it is needed. But this aging infrastructure is also part of a system that wasn't built for the extreme weather and rapid market shifts seen today. AI and machine learning have the potential to optimize the existing system for today's needs at a fraction of the cost of building new infrastructure. While this vision won't be realized immediately, the first steps can be taken today by deploying the right networks and by connecting infrastructure to collect data insights for predictive analytics and automation.

Those steps create capabilities like digital twins of storage assets and equipment used for treating, fractionation or water disposal processes. Digital twins and predictive analytics allow midstream companies to run virtual simulations to test



innovations and optimize operations. Augmented and virtual reality (AR/VR) tools will improve remote collaboration and training. These are just a few of the connectivity-powered tools that will help midstream companies solve the unique challenges they face — balancing the supply chain between the disjointed push of upstream producers and pull of downstream end users.

Oil Refineries Use Verizon Private Wireless Networks to Improve Operations

A global oil and gas company faced a number of business challenges due to inadequate network connectivity across numerous large, remote refineries. The connectivity challenges resulted in health and safety concerns for employees and wasted time collecting data in dead zones. The company needed a partner to solve its immediate issues and help it make a broader digital transformation a reality.

The company chose Verizon's private wireless network solution with Celona and a selection of managed services. Verizon was able to provide reliable connectivity for a wide range of outdoor operations, for connected devices that are critical to increased worker productivity and safety, and for real-time data analysis anywhere on the refinery campuses. Today, the networks are enabling improved decision-making and supporting the company's aspirations to unlock more digital transformation and automation.

Conclusion

Midstream companies are racing to improve efficiency, optimize performance, and secure their equipment and networks. To compete in an increasingly high-tech, high-efficiency business that demands agility, it is imperative for midstream asset operators to solve network and connectivity limitations across storage and refining campuses.

By connecting infrastructure and workers with a private 5G wireless network and gathering real-time data from IoT sensors, midstream 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.

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