



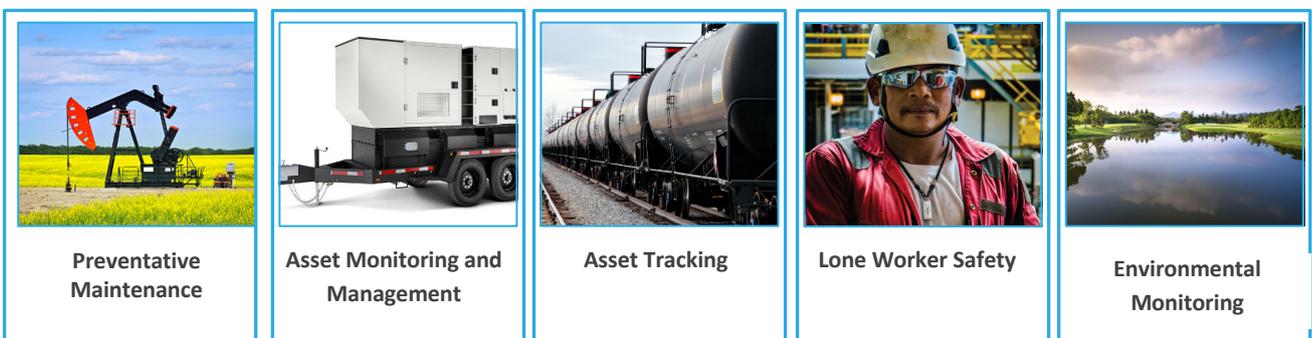
# TEKTELIC

communications

IoT for Oil & Gas

## IoT for Oil & Gas

As an early adopter of digital transformation, the oil and gas industry is no stranger to using digital technologies including SCADA systems to integrate dispersed assets and enhance operational efficiency. With the emergence of the Internet of Things and LoRaWAN®, the industry continues to embrace advanced technology to drive productivity and cost-efficiency while satisfying growing stakeholder demands for greater transparency in occupational safety and environmental accountability. This paper will discuss several key areas where the oil and gas industry can reap tangible benefits from the IoT using LoRaWAN® connectivity:



## LoRaWAN® for Oil and Gas

The Internet of Things (IoT) is predicted to unlock approximately [\\$1 trillion of value](#) for the industry, assisting companies to digitize, optimize, and automate processes for impactful and long-lasting results, including reduced costs and improved safety and reliability of operations. However, obstacles such as the short life span of battery-powered devices, short-range communications, and high deployment costs are hindering companies from achieving this potential. As the breadth of IoT applications in oil and gas continues to evolve, LoRaWAN® is rapidly gaining momentum as the ideal technology to address these constraints with cost-effective and highly reliable long-range, low-power IoT connectivity. For many of the applications outlined in this paper, LoRaWAN® has become preferable over traditional communication protocols such as LTE and 4G cellular due to its significantly lower total cost of ownership and lower cost per device.

LoRaWAN® allows solutions to be deployed that wouldn't be economical in the LTE space due

to the substantial airtime costs associated with establishing cellular connectivity for each end-device in a network. Lower price points are driving mass wireless sensor deployments, enabling large-scale IoT deployments connecting remote sensors and machine data to analytics platforms at scale. LoRaWAN®'s multi-usage capabilities accommodate a high capacity of IoT devices in a single network. A carrier-grade LoRaWAN® collection hub, known as a gateway has the capacity to simultaneously send and receive hundreds of messages every second from the devices deployed in its vicinity. This is ample capacity for most oil and gas applications.

Not only are upfront deployment costs reduced due to higher market adoption and falling chip prices, but as a result of LoRaWAN®'s low power consumption, users also achieve lower operating costs from extended device battery life and reduced servicing costs. One of the primary benefits of LoRaWAN® technology is it has been proven to result in one-tenth of the power usage, or the case of battery-powered devices, 10x the battery life of competing M2M technologies.

LoRaWAN® leverages the unlicensed radio spectrum in the ISM (Industrial, Scientific, Medical) band, and is therefore ideal for enterprises that desire complete control over their networks and devices, allowing oil and gas companies to take ownership of their networks and cut the middleman out.

Overall, it is significantly more cost-effective to deploy a LoRaWAN® network for a multitude of oil and gas applications, including asset tracking of unpowered assets, high-resolution pipeline monitoring, and monitoring of low-value assets like gas wells. LoRaWAN® has a clear advantage over competing communication protocols, with a mature ecosystem of vendors, IoT devices, and end-to-end solutions that are ready for implementation today.

			
<b>Long Range</b>	<b>Maximum Battery Life</b>	<b>Multi Usage</b>	<b>Low Cost</b>
<ul style="list-style-type: none"> <li>• Greater than cellular</li> <li>• Deep indoor coverage</li> <li>• Star topology</li> </ul>	<ul style="list-style-type: none"> <li>• Low power optimized</li> <li>• 10-20yr lifetime</li> <li>• &gt;10x vs cellular M2M</li> </ul>	<ul style="list-style-type: none"> <li>• High capacity</li> <li>• Multi-tenant</li> <li>• Public/Private network</li> </ul>	<ul style="list-style-type: none"> <li>• Minimal infrastructure</li> <li>• Low cost end-node</li> <li>• Open Software</li> <li>• Growing Eco-system</li> </ul>

			
<b>Geolocation</b>	<b>Bi-Directional (FDD)</b>	<b>Global Standard</b>	<b>Secure</b>
<ul style="list-style-type: none"> <li>• In/out door</li> <li>• Accurate</li> <li>• No Battery Impact</li> </ul>	<ul style="list-style-type: none"> <li>• Acknowledge</li> <li>• Scalable Capacity</li> <li>• Broadcast</li> </ul>	<ul style="list-style-type: none"> <li>• Global Standard</li> <li>• True Mobility</li> <li>• Seamless</li> <li>• Roaming</li> </ul>	<ul style="list-style-type: none"> <li>• Unique ID</li> <li>• Application</li> <li>• Network</li> </ul>

**LoRaWAN® Features, Differentiators and Benefits**

Below, we will discuss several key areas where the oil and gas industry can reap tangible benefits from the Internet of Things and LoRaWAN® connectivity.

## Preventative Maintenance

According to research firm Kimberlite, an average financial cost of [\\$49 million](#) is experienced by oil and gas companies due to unplanned downtime. IoT technologies can help streamline asset maintenance by remotely monitoring equipment, tracking maintenance schedules, and detecting malfunctions in real-time. IoT-driven predictive maintenance leverages real-time sensor data (temperature, flow rate, pressure, vibration, sound etc.) from potential failure points in operational equipment to identify signs of deterioration or malfunction and predict maintenance requirements.



Where it was previously only economical to embed a limited number of sensors to monitor only high-value assets, the low capital cost of deploying carrier-grade LoRaWAN® sensors and networks now ensures that it is significantly more economical for oil and gas operators to deploy many more devices to monitor a much wider range of equipment. This serves to optimize equipment reliability and performance and extends the life of critical operational assets. The effective use of IoT technologies to generate a predictive approach based on data analysis can help cut unplanned downtime by [36% and upstream operating costs by 3-5%](#), according to a report by consulting firm McKinsey.

Implementing LoRaWAN® and IoT-driven predictive maintenance solutions provides oil and gas companies with tangible benefits, including:

- Improved asset reliability
- Improved operational efficiency
- Significant maintenance cost savings [\(30%\)](#)
- Reduced equipment downtime [\(45%\)](#)
- Reduced environmental impact
- Improved safety

## Asset Monitoring and Management

Infrastructure such as wellheads, oil rigs and pipelines are often located in harsh, remote, or inaccessible environments with limited cellular coverage. Historically, limited connectivity in these environments leaves few monitoring options such as labor-intensive manual checks or expensive satellite connectivity. IoT-enabled sensors and LoRaWAN® connectivity are enabling significantly more efficient and cost-effective asset monitoring, unlocking a vast amount of data and insights into the structural health and operating conditions of critical infrastructure including pipelines.

IoT sensors are embedded into infrastructure at a wide array of disparate locations to remotely monitor KPIs such as pipe pressure, temperature and flow rate, and transmit alerts for leaks, ruptures and points of failure. This data allows operators to respond in real-time and drastically reduce the risk and impact of downtime.



LoRaWAN® is an ideal technology for asset monitoring and management applications, as it is capable of transmitting over extremely long ranges in rural and remote environments. The bi-directional communication ability of LoRaWAN® enables not only rich data collection and asset monitoring from sensor devices, but also the ability to send messages from an application back down to the device in the field. This is particularly useful in oil and gas operations as it accommodates remote control over assets to handle issues such as emergency shutdowns and remote field operations. Without the adoption of IoT and LoRaWAN® solutions, the speed at which these issues can be identified and addressed in remote field locations is significantly slower.

## Asset Tracking

Asset tracking is another major use case for IoT in the oil and gas industry. GPS is the most widely utilized technology for outdoor asset tracking. Combined with the long-range communication capabilities of LoRaWAN®, this technology is opening new opportunities for automating asset inventories, optimizing supply-chain flows and increasing traceability throughout the value chain.



LoRaWAN® delivers the ubiquitous connectivity necessary for tracking unpowered assets across multiple locations and regions. LoRaWAN® also provides additional features such as TDoA geolocation capabilities, allowing operators to locate valuable assets in the field. This enables oil and gas companies to track a wide range of outdoor, unpowered, and high-value assets including inventory, machinery, vehicles and workers. In an industry as asset-intensive as oil and gas, there is a growing necessity to integrate IoT technology into asset management practices to reduce equipment downtime and costs, while improving inventory control, asset utilization, and meeting legal and regulatory compliances.

TEKTELIC's compact, ruggedized Industrial GPS Asset Tracker is the ideal tracking device for geolocating high-value assets in the field. This device provides GPS-enabled near real-time satellite location tracking for a wide range of outdoor, unpowered, and high-value assets including railcars, shipping containers, shipped crates and parcels, mobile trailers, fleet vehicles, industrial equipment, shipping pallets, and deep storage assets.

## Lone Worker Safety

Within the oil and gas sector, the potential for health and safety incidents is always present. Lone workers are typically the most vulnerable in this sector and face a multitude of occupational hazards, including slips and falls, confined spaces, electrocution, heavy equipment and machinery, and exposure to hazardous or flammable gas. In these cases, fast response time is crucial, but identifying, locating, and securing workers across multiple locations is no easy task. To minimize the risk of serious injury or death, it is essential that lone workers have a reliable line of communication to instantly check-in or signal for assistance in the event of a safety incident. From wearable biometric or environmental sensors to lone worker tracking solutions, the Internet of Things (IoT) is helping create new opportunities for improving the way people work.



Using IoT, safety managers can now access real-time data on each lone worker's exact location and status to respond to safety incidents in real-time. Examples of this technology include connected gas sensors and wearable biometric sensors to alert workers to fatigue and unsafe environmental conditions while instantaneously notifying designated support staff that assistance is needed. Other applications include IoT-enabled panic button devices used to transmit an emergency signal from any location.

Additionally, to address the concerns about safely operating wireless devices in a C1Dx or ATEX environment, TEKTELIC can design custom enclosures that comply with safety standards for the use of LoRaWAN® devices and gateways in potentially hazardous areas.

TEKTELIC's sleek, lightweight and versatile BLE and LoRaWAN® Panic Button is ideal for lone workers to instantly signal for help in an emergency situation. When triggered, this device can instantly activate an alarm or send notifications containing location details to the appropriate parties.

## Environmental Monitoring

Today, consumers and regulators expect greater levels of transparency when it comes to environmental issues. A report by the [World Economic Forum](#) has estimated that over the next decade, IoT technologies will help the oil and gas sector reduce CO<sub>2</sub>-equivalent (CO<sub>2</sub> e) emissions by approximately 1,300 million tonnes, save roughly 800 million gallons of water, and prevent oil spills equivalent to about 230,000 barrels of oil.

IoT sensors can be deployed to remotely monitor environmental conditions and ensure operations are compliant with regulatory standards regarding emissions and waste. Compared to manual inspections, remote field monitoring is significantly more responsive, providing constantly updated data on emissions and spill monitoring for factories and oil and gas pumps.



## Conclusion

While leveraging big data to make informed decisions is not a new concept in the oil and gas industry, the proliferation of IoT and LoRaWAN<sup>®</sup> technologies is enabling previously unprecedented amounts of data to be collected and communicated at a lower cost. From asset management to occupational safety and environmental regulatory compliance, the range of applications for IoT in oil and gas is vast. Creating a truly 'smart' oil and gas industry continues to be an evolving process and TEKTELIC is proud to support enterprises by providing best-in-class end-to-end IoT solutions that can be easily, quickly and cost-effectively deployed to address the most demanding user requirements. A strong commitment to quality, engineering, and service excellence assures clients that TEKTELIC's IoT solutions will meet the current and future needs of their business. TEKTELIC is valued for reducing technology risks, accelerating time to market, and developing cost-optimized products for volume production. For more information, please visit [www.tektelic.com](http://www.tektelic.com).