



CONNECTED OIL AND GAS

HOW SATELLITE COMMUNICATIONS ARE SUPPORTING INDUSTRY
EFFICIENCIES AT A TIME OF CHANGE



THE ROLE OF CONNECTIVITY IN THE OIL AND GAS INDUSTRY

The oil and gas industry is under increasing pressure to reduce expenditure as profits are squeezed and the world attempts to shift energy use from hydrocarbons to sustainable alternatives. As the industry looks for long-term solutions, a clear route to significant cost saving opportunities lies within the development of digital technology, enabled by satellite communications.

Satellite connectivity is enabling a new level of digitalisation for the industry, offering affordable and secure solutions to some of the industry's biggest challenges. From efficiency and safety monitoring of assets using machine to machine (M2M) solutions, to predictive maintenance, safety alerts and communications for remote employees, Inmarsat's reliable, and global satellite connectivity is helping the extractive industries adapt and succeed.



THE STATE OF THE MARKET

The impact of COVID-19 on the oil and gas industry is undeniable. As the world's economies shut down to combat the virus through lockdown measures, the global consumption of oil and gas dropped by 30%. As demand for oil all but dried up, with airlines grounded and fewer cars on the roads, the price of U.S. oil turned negative for the first time in history.

This dramatic fall was exacerbated by a price war between Saudi Arabia and Russia which began in March 2020. In response to the steep drop in demand, Saudi Arabia and other OPEC countries cut back production by as much as 1.5 million barrels a day but failed to convince Russia to follow suit. This prompted Saudi Arabia to increase supply and slash its export prices to try to re-establish its position as the world's largest oil producer, causing a 30% reduction in oil prices.

AN INDUSTRY UNDER PRESSURE

Before the pandemic, the world energy market was already under increasing pressure to make long-term structural changes to reduce global oil demand as the drive for decarbonisation continues and the price of renewable energy sources drop. The goal of the Paris Agreement on climate change is to hold "the increase in global average temperatures to well below 2°C above pre-industrial levels" and meeting this goal requires rapid action if global oil consumption is to drop significantly.

Add to this the growing awareness of the fossil fuel industry's negative impact on air pollution, and it is easy to see the huge challenges the industry faces. This awareness is heightened by the pandemic's positive impact on air quality with cleaner air being registered in large cities around the world as carbon-emitting traffic came to a halt. There may now be a more powerful drive than ever for cleaner air, further

accelerating the drive to reduce consumption of oil and gas.

FUTURE OUTLOOK

The result of all of this change on the oil and gas industry is that the short to medium-term outlook is more challenging than ever for producers, particularly high-cost producers, small operators and those with high levels of debt.

Already, the larger oil and gas companies are cutting both capital and operational expenditure which will have a knock-on effect on the wider industry, affecting suppliers and oilfield service providers. As businesses throughout the industry shape near-term strategies, they will be focused on retaining and retraining skilled workers, guaranteeing the safety of their employees, ensuring their assets operate as efficiently as possible with minimal downtime and diversifying into renewables.



ENSURING SAFETY AND MAXIMISING EFFICIENCY

Given the importance of reducing costs and improving efficiency, oil and gas companies are increasingly focused on strategically applying new technology and how to use digitalisation.

One of the key areas of focus for new technology is to reduce costs through production efficiency and increased uptime of equipment, using online remote monitoring and diagnostics tools and services. This allows timely delivery of critical information, negating

the requirement for employees to make frequent and costly onsite visits, and providing the ability to diagnose problems online before any production time is lost and costly breakdowns occur.

Access to some remote sites has been severely hindered by the pandemic, making remote monitoring even more urgent. However, the drive to reduce costs and boost efficiency goes beyond a short-term response to COVID-19.

Oil and gas companies have long had motivations to drive future profitability in an increasingly expenditure-intensive industry, whilst also meeting environmental demands for the oil and gas industry to minimise its environmental footprint. Satellite communications can support all of these goals.



DIGITALISATION FOR OPERATIONAL IMPROVEMENTS AND COST SAVINGS

Using satellite communications to provide connectivity on remote sites allows for the collection, analysis, and utilisation of huge amounts of data. These can bring substantial operational improvements to the field through the use of sensors, analytics, robotics and sophisticated equipment and control systems.

The positive impact of digitalisation and connectivity runs across multiple areas, from better usage of labour, to keeping overheads low, minimising waste and making sure throughput targets are met to ensure equipment is fit for purpose and runs at full capacity.

According to a report by McKinsey & Company in November 2020, it is estimated that "advanced connectivity to optimise drilling and production throughput and improve maintenance and field operations could add up to \$250 billion of value to the industry's upstream operations by 2030".

The report goes on to say that between \$160 and \$180 billion of that value could be realised with existing infrastructure, while an additional \$70 billion could be unlocked with satellites and next-generation 5G technologies. There's no doubt that satellite communications hold impressive cost saving opportunities for the sector.

OPTIMISATION AND AUTOMATION

Connected performance-boosting technology could transform the production of oil and gas by enabling new levels of optimisation and automation. Firstly, optimisation is possible when valuable data collected is used to inform decision-making around the management and maintenance of assets. The amount of data collected and the speed at which it can be processed is dependent not only on the number of sensors installed to collect data but also on the available bandwidth.

Secondly, automation uses automatic or semi-automatic machines to inspect and maintain equipment in high-risk operating environments used in drilling and production, meaning that people don't have to. The machines monitor these environments and share important data so that assets can be managed remotely using satellite connectivity.

MAXIMISING OPERATIONAL EFFICIENCY WITH SATCOM

With the oil and gas industry's unshakeable focus on maximising operational efficiency, reducing well and pipeline downtime has always been a priority. Connectivity can play a significant role in achieving this goal.

Whether it's voice and data connectivity for remote workers, tracking of high value assets or machine to machine (M2M) solutions for monitoring, controlling, automation and optimisation of important assets, Inmarsat offers reliable, affordable and secure solutions.

Connectivity technologies are nothing new in the oil and gas sector, with radio and cellular networks used for decades. These networks can be problematic, however, as large areas of these networks contain coverage deficiencies and can be prone to congestion, failing to provide the resilience required from a communications solution that needs to be reliable and secure.

That's where Inmarsat's global and reliable satellite network comes in. Satellite connectivity not only eliminates coverage and congestion issues, but it can do so in a cost-effective manner, providing 'always-on' connectivity at affordable prices with guaranteed service-level agreements (SLA).

As Inmarsat owns and operates global networks that deliver award-winning L-band services, such as BGAN, we enable oil and gas companies to standardise their communications and equipment across their entire production and distribution

operations regardless of location. This level of global reach is not available via cellular networks which often need contract renegotiation (roaming agreements) established in each country of operation.

Addressing the industry's need to keep a close eye on efficiency, digitalisation can provide tangible results when operated with satellite-based technology for oil and gas companies and service providers.

CHOOSING THE RIGHT SATELLITE CONNECTIVITY PARTNER

Satellite connectivity is not a new concept in the management of oil and gas production, but the level of sophistication of services has dramatically improved. It is important to underscore the fact that not all satellite services are the same. Due to the unique nature of the requirements of the oil and gas industry, understanding the differences and limitations of different satellite services is crucial.

In particular, the adoption of VSAT satellite systems occurred in the sector in the recent past, but there are notable limitations to this approach. VSAT systems rely on a high-power draw which means they can cease working in the event of a power outage, with solar power often not an option. Furthermore, VSAT is prone to rain-fade, a

phenomena that hampers performance in certain conditions. VSAT also requires more specific placement to connect with satellites, meaning they often lose connection if wind or other environmental factors move the terminal.

This not only impacts the continuity of service, but also means trained technicians often need to be redeployed to re-align terminal, which adds significant costs to an operation.

Finally, VSAT works with bulky terminals, which look like typical satellite dishes, making them an obvious target for theft or vandalism, which can also add to costs.

So, while the VSAT service may appear to be less expensive in terms of ongoing airtime cost, their suitability causes issues

often making the overall Total Cost of Ownership (TCO) high. In contrast, Inmarsat's BGAN M2M service is providing oil and gas companies with the reliable and proven satellite connectivity needed to remotely monitor and control important assets across the world.

The BGAN M2M service operates on Inmarsat's L-band network, which was created for mission-critical military and safety-of-life applications and is ultra-reliable, secure and available on demand. L-band is the ideal satellite network for enabling centralised artificial lift, wellhead and pipeline monitoring and control in particular, as it provides up to 99.9% uptime even in the most extreme weather conditions where other satellite services may fail.

The BGAN M2M service features robust and compact terminals, such as the Hughes BGAN 9502. This terminal is about the size of a small laptop/tablet, is easy to install, and can withstand hostile environmental conditions with a lifespan up to ten years or greater. With low monthly data pricing and long lifespan of the hardware, the TCO for the service is low compared to the cost of dispatching technicians to resolve issues and achieves a higher continuity of service.



USE CASES: HOW INMARSAT BGAN M2M IMPROVES EFFICIENCY, PROVIDES CRITICAL INFORMATION AND REDUCES COSTS

To illustrate how satellite communications can improve an oil and gas company's daily operations and further extend the reach of relevant applications, let's look at the role of BGAN M2M in three use cases that utilise sensing and monitoring devices and command and control technologies which

require two-way high-speed communications.

Here we focus on how satcom contributes to improving the efficiency of upstream operations (artificial lift and wellhead monitoring) and midstream operations (pipeline monitoring).





ARTIFICIAL LIFT

critical information minimises downtime and predicts maintenance

Many of our customers have installed BGAN M2M terminals to their artificial lift equipment in remote locations. These terminals are designed to be energy efficient and managed remotely, they are also set up to detect anomalies.

This means that if the terminal ever loses connectivity, it automatically re-establishes connectivity with the network to continue providing service to the customer. The BGAN M2M terminals are manageable remotely, making it easy and secure to do configuration changes, upgrade firmware for added functionality as well as check the terminal status and GPS positioning.

This data assures operators that the asset is fully operational and producing efficiently, whilst reporting on the safety systems and monitoring the asset for any issues. If any problems are detected that present a safety or environmental risk, the operators have the ability to shut down the production remotely.

As part of this assessment of operational status of the asset, customers can also compare actual performance to trend data, allowing them to adjust operations further and ensure optimal performance over the life of the well. Finally, this insight allows for the use of predictive analytics, which provides insight into upcoming maintenance requirements.

Our terminals are specifically designed with the safety standards of the oil fields in mind, with C1D2 rating. These certified terminals allow our customers to safely deploy connectivity over IP networks using our global satellite network, and in the instance of failure with potential flammable hazards, they do not represent risk to ignite.



WELLHEAD MONITORING

instant information and employee safety

In a similar way to the artificial lift monitoring, wellhead monitoring allows flow rates to be assessed, ensuring optimum efficiency of wells whilst also providing insight into by-product levels. Removing the requirement to manually capture and measure by-products, our terminals can be connected to devices that are able to directly calculate by-product percentages, saving operators from making field trips.

Wellhead monitoring also connects multiple safety systems so that several points can be constantly observed, ensuring any alerts or shutdowns are picked up immediately and the issue can be isolated. This means problems can be prioritised and addressed according to their urgency which can prevent damages, extended shut in times, loss of production and escalating costs. The BGAN M2M connection makes it possible to monitor numerous devices on location, gathering data and making requests to any of those devices.

Another important process that can be required of wellhead operators is to provide information on hydrocarbon production that is required by national governments in the form of custody transfer reports. Traditionally, this information was captured manually by an employee who needed to travel to the wellhead site to pull the data and enter it into the system. With connected terminals, these reports can be retrieved over BGAN M2M and sent to relevant regulatory bodies, saving costly and sometimes hazardous travel.



PIPELINE MONITORING

critical information for improved efficiency

Monitoring and controlling the flow of product through an oil or gas pipeline is just as vital as monitoring well production. Strict communication requirements can apply to oil and gas pipelines, so multiple valve stations are installed along the pipeline along with numerous sensors and flow metres that are connected via BGAN M2M. These communication points allow operators to monitor and control the status of the product in the pipeline.

If a reduced flow rate is picked up by flow metres, operators can identify at which point the flow rate changes and pinpoint the area where the problem is occurring. The flow metres and sensors also pick up on any changes in pressure, sending an alert so that the cause can be investigated and mitigated.

The sensors and flow metres are connected to a central point, which is configured to send an alert when certain factors occur within the information that is being automatically pulled from the pipeline. Once an alert is triggered at this central data gathering point, it uses BGAN M2M to push this data through to the operator at a central office.

CONCLUSION

The oil and gas industry remains one of the world's most vital industries as it plays a strategic role in every economy around the globe. Energy consultant Enerdata indicates that oil accounted for 31% of the world's total production of power sources in 2019. This is more than any other power source, and, despite the increasing pressure to replace hydrocarbon use with renewable energy sources, the transition needs to be managed carefully.

With increasingly volatile pricing and pressure to reduce production in the long-term, the industry's focus on cutting CAPEX and OPEX is unlikely to shift. Digitalisation provides clear direction for improving operational efficiency, providing instant and enhanced data gathering, improving

retention of employees who can gain new skills and therefore job security, as well as improving safety across the sector.

This level of digitalisation needs a flexible, stable, resilient and secure satellite communications backbone. Advancements in satellite communications enable the oil and gas industry to address its ongoing challenges, while enjoying the benefits of reliability, ease of deployment, and network reach. Whether it is providing efficiency monitoring, predictive maintenance or safety alerts, satellite-based solutions provide the most cost-effective and reliable communications solution to improve industry efficiency at a time of continuing change.



ABOUT INMARSAT

Inmarsat is the leading provider of global mobile satellite communications services. Since 1979, Inmarsat has been providing reliable voice and high-speed data communications to governments, enterprises and other organisations, with a range of services that can be used on land, at sea or in the air. Inmarsat operates around the world, with a presence in the major ports and centres of commerce on every continent. For more information, please visit www.inmarsat.com

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