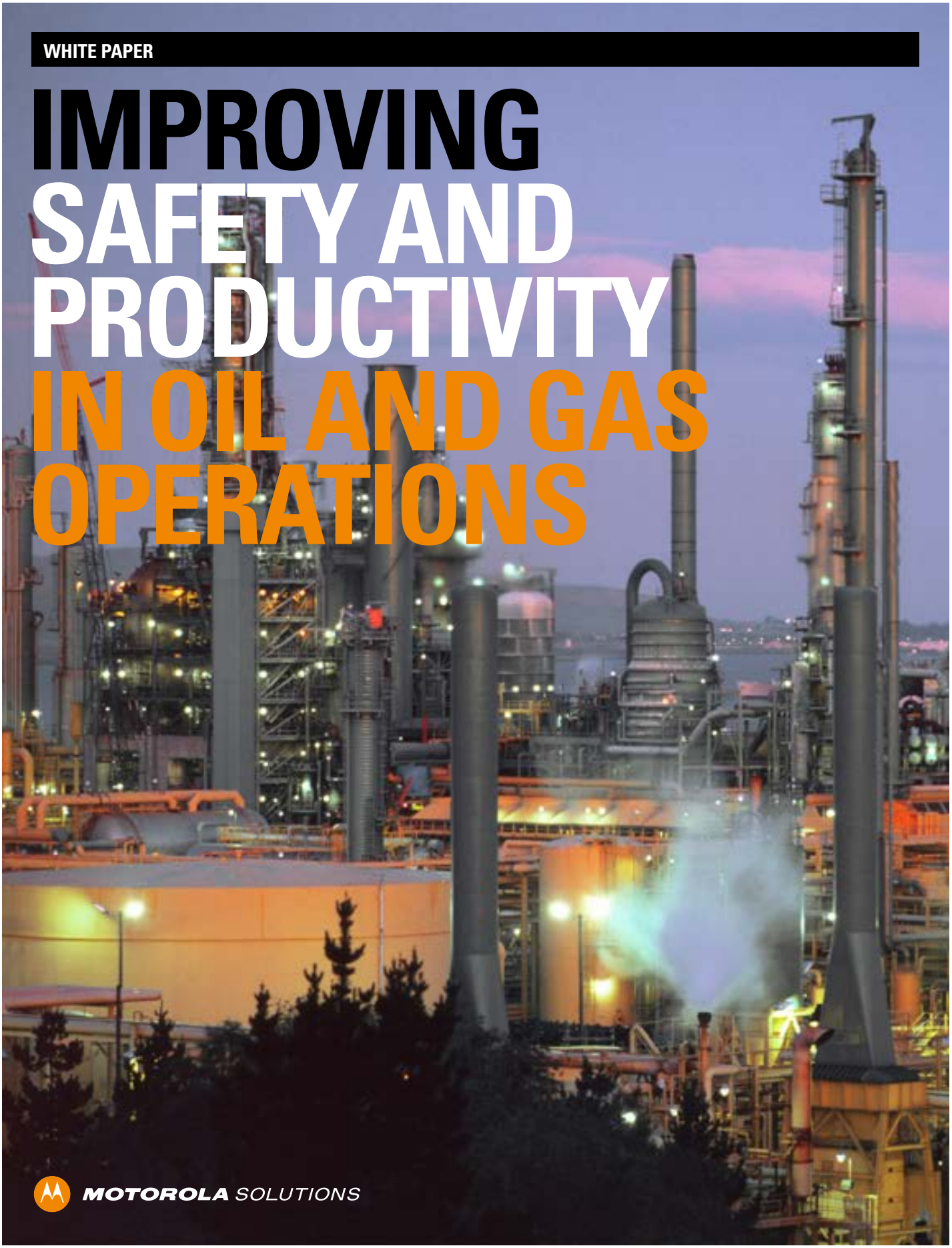
WHITE PAPER

IMPROVING SAFETY AND PRODUCTIVITY IN OIL AND GAS OPERATIONS



MOTOROLA SOLUTIONS

With today's energy-hungry way of life, the need for oil is at an all-time high. Global oil demand is predicted to increase by more than a third by 2035.[1] With this surge in energy demand, the oil and gas industry is being challenged to improve production efficiencies and to maintain a growth trajectory in its crude oil and natural gas resources. Indeed, oil exploration and production is being ramped up: recent trends indicate crude oil production increasing by as much as 790,000 barrels per day over a single year in the United States alone.[2] The ability of the industry to address a number of operational challenges will be critical in ensuring that future demand is met with adequate supply.

STRONG SAFETY CULTURE

Though reducing time to first oil is a top priority, health, safety and the environment remain non-negotiable imperatives. The oil and gas industry has undertaken extensive actions to enhance process safety and recent statistics point to an improving safety trend over the last 10 years.[3, 4] As the industry's focus turns to new remote and deep frontiers in the search for hydrocarbons, equipment suppliers will need to ensure that their tools reliably support work tasks conducted in these challenging environments. Mission critical communication tools such as two-way radios are essential to enabling real time collaboration and will need to perform optimally in severe environments to meet the exacting safety standards of the oil & gas industry.

MORE REMOTE AND CHALLENGING LOCATIONS

As large oil reserves are becoming depleted and the discovery of new large reserves is few and far between, oil and gas companies are trying to compensate by exploring for deposits in remote, harsh locations such as the Arctic, offshore deep under the ocean, hot deserts and fields in which High-Pressure High-Temperature (HPHT) wells are developed.

OFFSHORE/ONSHORE COMMUNICATION DIFFICULTIES

The amount of data flooding through an oil or gas company's system is ever growing. And with the number of operations stakeholders, both onshore and offshore, whose job it is to maintain visibility, communication and compliance – especially during emergencies – it is crucial that this data can flow smoothly under all circumstances. Shortfalls in legacy communications systems can arise when they're not optimized to be used together.

THE GREAT CREW CHANGE

For the Baby Boom generation of professionals, retirement is right around the corner. By 2018, 50% of all engineers and geophysicists will be eligible for retirement from the industry.[5] This sets the stage for the most dramatic demographic shift in the industry's history – and a huge knowledge and experience gap. Evidence of this trend will be apparent in the near term, with industry analysts forecasting a 1 million labor gap and skills shortage.[6] Key to addressing the skills shortage will be an ability to deliver connectivity that integrates information seamlessly with workflows, processes and people across legacy systems in a borderless manner. Information and communications technology will play a central role here, especially in enabling integrated operations that deliver measurable business improvements such as reduction in downtime.

UTILIZING TECHNOLOGY TO ENABLE THE BEST DECISION-MAKING

The right kind of technology setup addresses these challenges, ensuring the seamless and secure mobilization of voice and data to help oil and gas companies make the best decisions – both in critical situations and to improve long-term productivity. Continuous and reliable communication between all stakeholders requires advanced digital Land Mobile Radio (LMR) and operational technology.

33%
INCREASE IN GLOBAL OIL DEMAND BY 2035

5 MILL
LABOR GAP AND SKILLS SHORTAGE BY 2015

INCREASING SAFETY IN HAZARDOUS WORK ENVIRONMENTS

As oil well locations become more remote and environmentally sensitive, it becomes even more important to have strict contingency plans in place if an emergency should happen. In these environments, it is critical that workers in functions such as maintenance, inspection and testing are equipped with rugged and reliable communication tools to support real-time collaboration and decision-making.

A vital part of driving efficient production processes involves extending communications safely into potentially hazardous areas. At every stage of the production process, strict safety measures must be maintained to prevent fires, explosions or environmental disasters.

As the primary communication device for field workers, the integrity of two-way radios operating in hazardous areas must be assured.

To align with best practice, oil and gas companies mandate the use of intrinsically safe (IS) equipment to safeguard personnel working in hazardous locations with potentially explosive substances. It is imperative that IS communication devices and accessories used by personnel are certified as a system, to ensure safety and performance requirements are not compromised.

Given the ignition risks in these environments, the robustness of two-way radio equipment must also be assured. For example, an IS two-way radio must be designed to minimise the risk of the battery becoming detached when dropped.

In short, to keep safety for personnel and the environment top priorities, two-way radios must be designed to be failsafe and comply with globally recognised IS standards such as ATEX and IEC Ex.

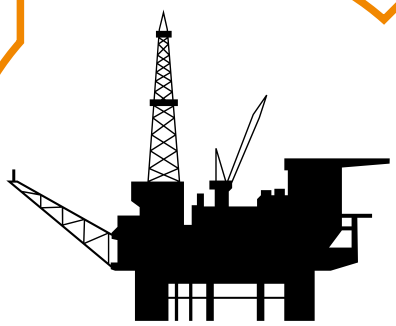
TIMELINE OF OPTIMIZED INCIDENT RESPONSE

9:13:36
CREW MEMBER MAKES EMERGENCY CALL

Call receives high priority and is immediately received by control room operator and the OIM (Offshore Installation Manager).

9:13:36
RADIO ID AND FLEETMAPS HARMONIZED FOR RIG PERSONNEL

With all radios and fleetmaps harmonized using remote terminal management, the control room operator recognizes the crew member's radio and captures incident details.



9:14:16
OIM MAKES PTT CALL TO PAGA TO ALERT FACILITY PERSONNEL

Integration of radio system with the rig's PAGA (Public Address and General Alarm) enables the OIM to activate alarms and make the PA announcement via his radio.

9:15:01
EMERGENCY SHUTDOWN ACTIVATED

Control room operator activates emergency shutdown via an RTU (Remote Terminal Unit) and takes additional steps to control the source.

9:16:21
OIM NOTIFIES ONSHORE DUTY EMERGENCY COORDINATOR

OIM connects to the Duty Emergency Coordinator's desktop client via a unified PTT application.

9:17:04
ALERT AND ACTIVATE EMERGENCY RESPONSE TEAM

Notification system issues call out messages sent to spill management teams. Backup Tier 2 resources mobilized.

10:49:15
INCIDENT LOGS COLLATED

On closure of the incident, logs of voice traffic are securely stored for post-incident analysis.

A digital oil rig helps drive better and faster decisions that make the difference when oil is spilling into the sea and every second counts. Efficient wireless voice and data communications on such a rig help workers offshore and onshore securely reach out and be reached, so emergency calls get to the right person immediately upon recognition of an issue. Advanced digital LMR systems such as ASTRO 25 and TETRA support swift response with key features such as:

Pre-emptive Priority Call – Takes priority over other types of calls being made simultaneously. Can be made by supervisors and key personnel so crucial operational information is relayed without delay.

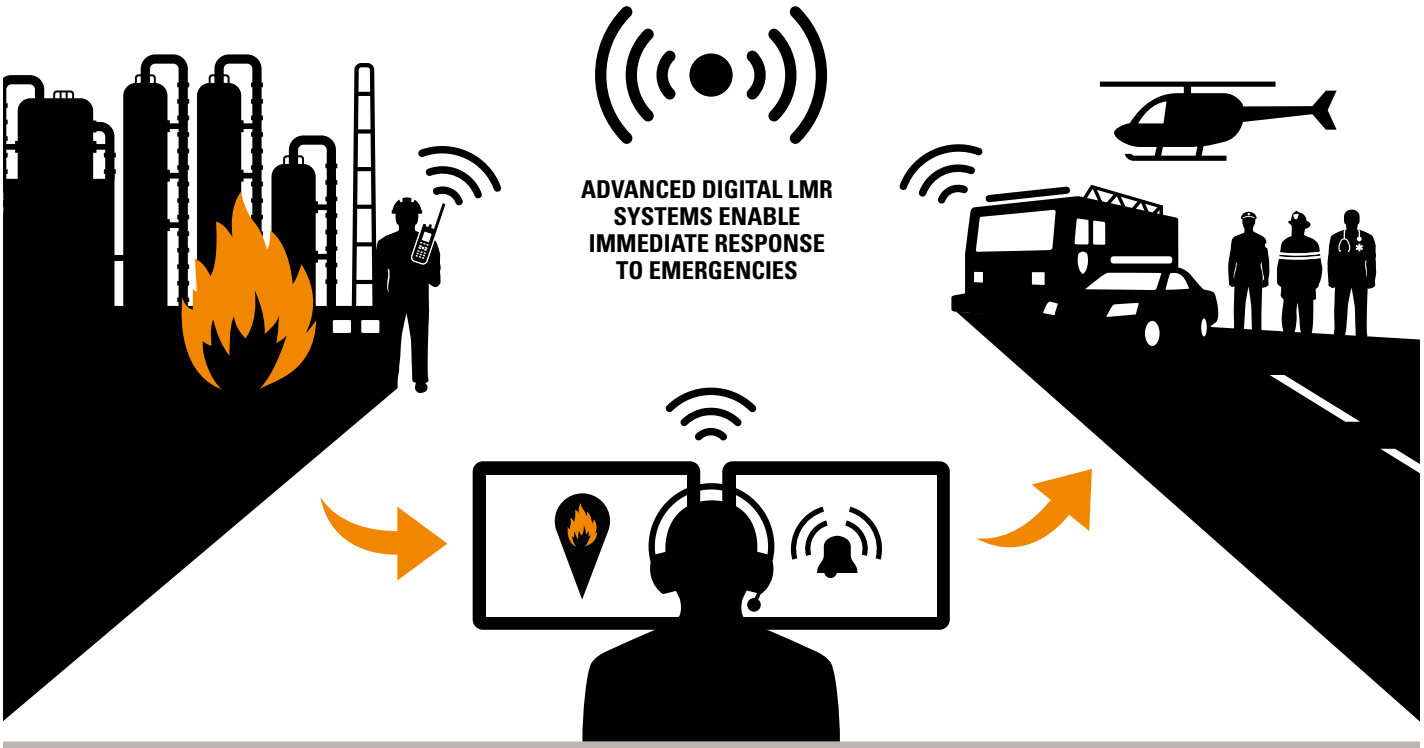
Remote Terminal Management – Allows for remote management of the software and configurations of every radio terminal from one central location.

System Pre-configurations – Emergency scenarios are pre-configured and automatically activate in response to incidents.

Unified Push-To-Talk (PTT) – Ensures seamless voice interoperability across all networks in the infrastructure.

Automated Notification – Gives immediate notification to all or parts of a team at the click of a button.

SEAMLESS AND EFFICIENT EMERGENCY RESPONSE



AT THE SAME TIME, OTHER RESOURCES ARE NOTIFIED IN CASE OF BACKUP AND FOR PRECISE LOGGING

Other emergency control centres

Network resources management

Data centre

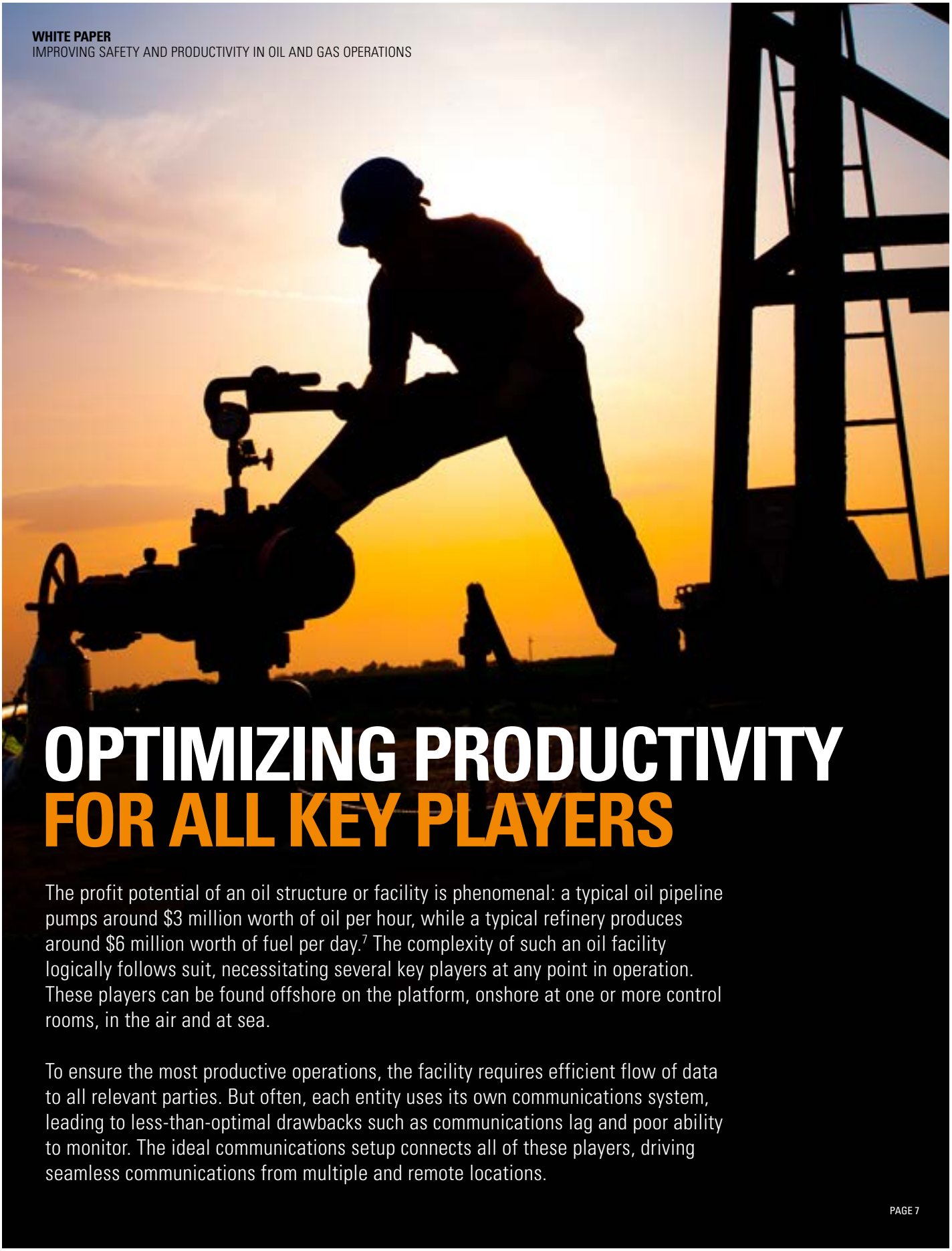
In emergency situations, it's vital to keep the lines of communication open; both to inform of the scope of danger and to be informed of the whereabouts of all employees so they stay out of the danger zone. ASTRO 25 and TETRA systems in particular can be optimized to streamline the mobilization of response resources. Key features to enable this include:

Early Warning Siren Activation – Sends tones and pre-recorded voice messages via the radio channel to specific sirens in relevant zones of the plant.

Geographic Redundancy – Uses two switches in different locations and a ring interconnection to ensure that if a disaster causes the failure of one switch, the other switch automatically provides near-instantaneous connectivity.

Group Call – Allows for group calls assigned according to different functions to increase communication efficiency.

Man Down – Automatically sends out an alert if the radio is tilted past a defined angle or remains stationary for a fixed period of time.

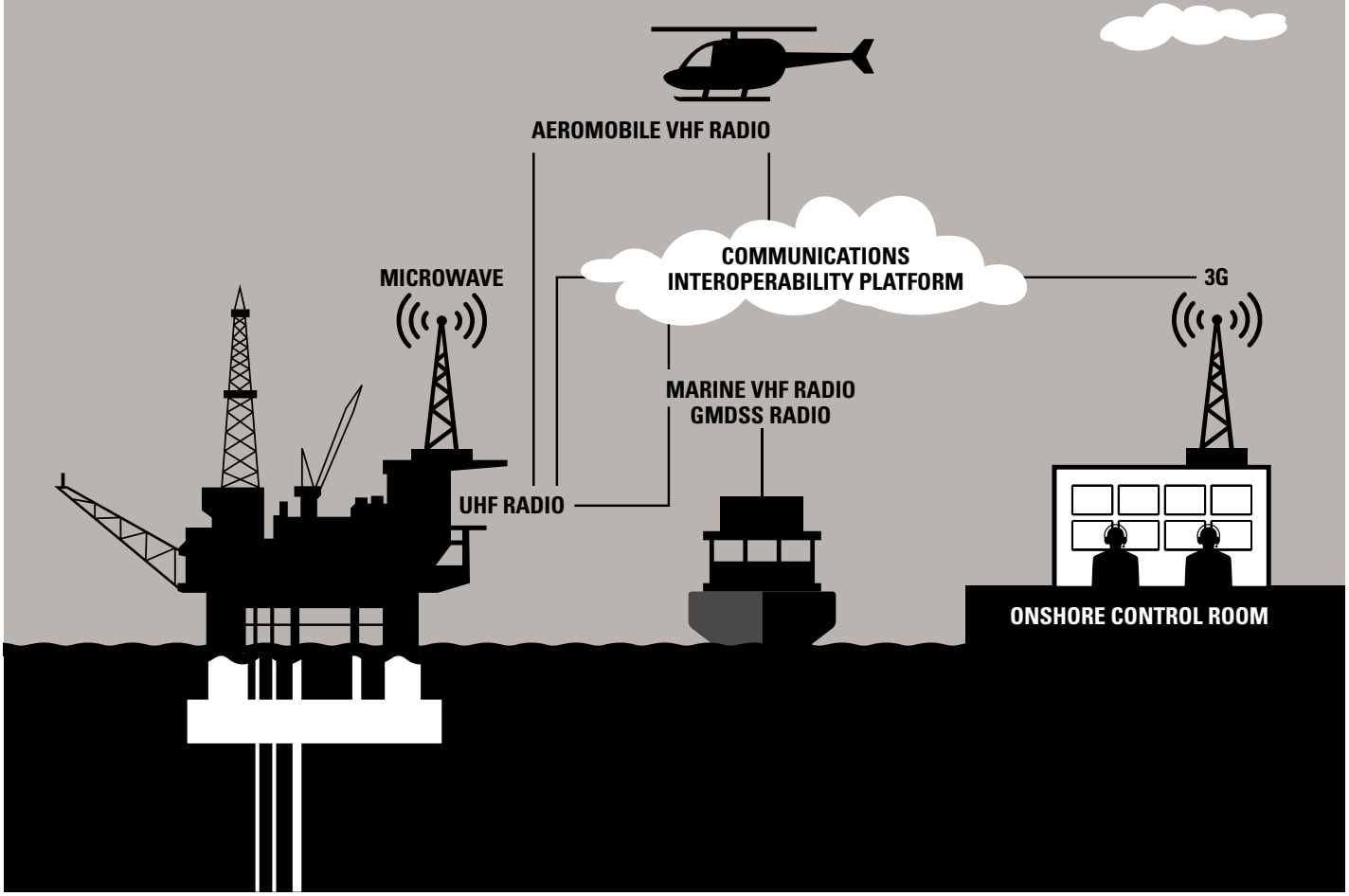


OPTIMIZING PRODUCTIVITY FOR ALL KEY PLAYERS

The profit potential of an oil structure or facility is phenomenal: a typical oil pipeline pumps around $3 million worth of oil per hour, while a typical refinery produces around $6 million worth of fuel per day.[7] The complexity of such an oil facility logically follows suit, necessitating several key players at any point in operation. These players can be found offshore on the platform, onshore at one or more control rooms, in the air and at sea.

To ensure the most productive operations, the facility requires efficient flow of data to all relevant parties. But often, each entity uses its own communications system, leading to less-than-optimal drawbacks such as communications lag and poor ability to monitor. The ideal communications setup connects all of these players, driving seamless communications from multiple and remote locations.

REMOTE COLLABORATION ENABLED THROUGH UNIFIED NETWORKS



REDUCED DOWNTIME, INCREASED EFFICIENCY

Effective and seamless communication helps reduce the risk of downtime. And in an industry in which avoiding just 10 hours of downtime per month can save a company $125,000,[8] keeping downtime to a minimum is imperative.

Disparate networks and a myriad of communication devices compound the challenge of achieving effective collaboration. To streamline communications, organizations can deploy a distributed interoperability platform optimized for integrating and transporting real-time voice and data securely over any network with connectivity to two-way radio, telephony and other legacy and modern communication systems.

A communications interoperability platform provides:

Onshore safety for specialists and professionals. By enabling communications interoperability across multiple networks and user devices, knowledge stays safely onshore for most optimal use of existing expertise.

Reduced flat time through effective real-time collaboration with domain experts anywhere in the world. By integrating two-way voice communications with collaborative IT applications such as Microsoft Lync, maintenance teams on the rig can resolve technical problems more quickly, more effectively and at lower cost.

FIELD AUTOMATION ENABLED THROUGH HIGH AVAILABILITY CONNECTIVITY

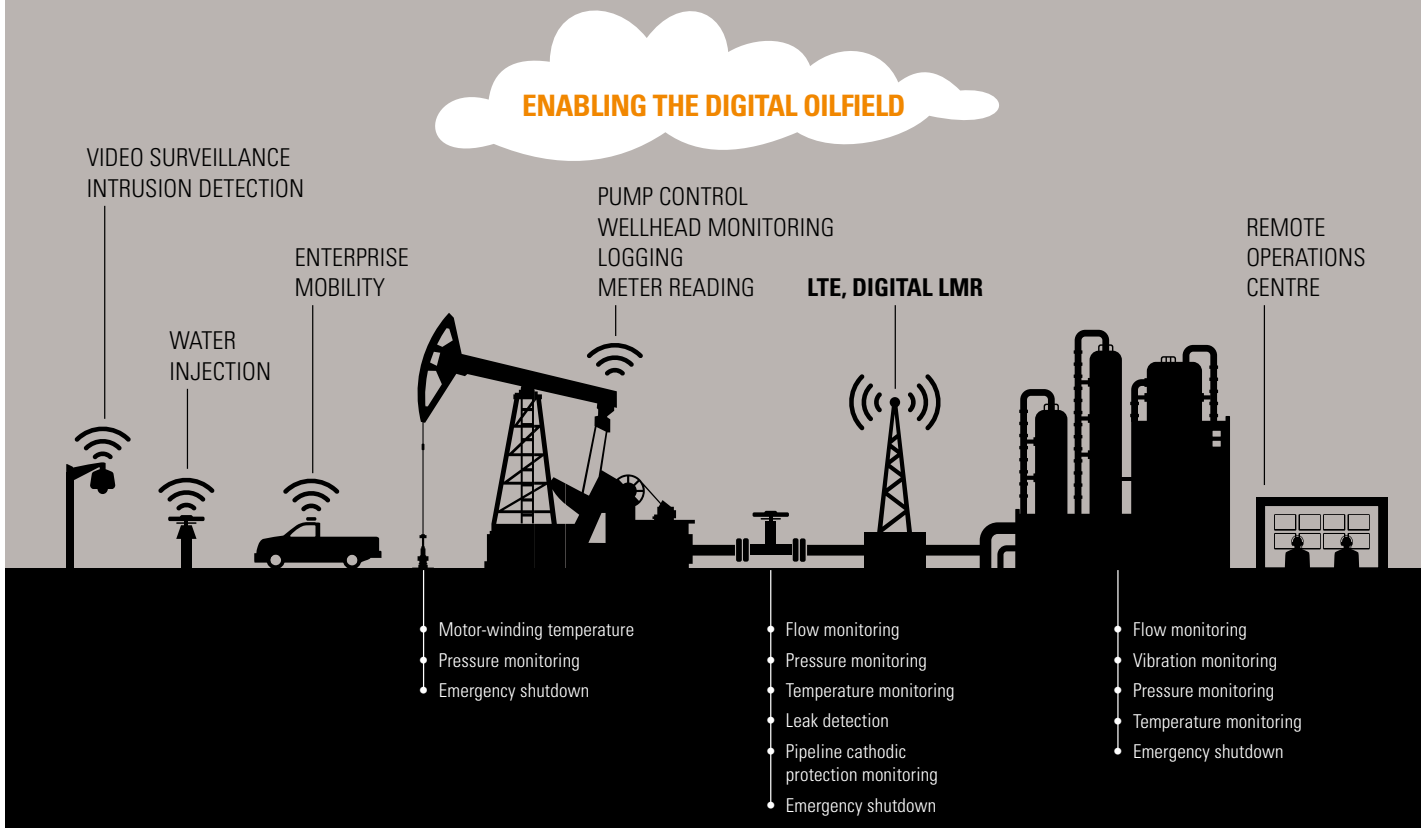
By extending high availability communication networks into the field, production efficiency and safety benefits can be realised.

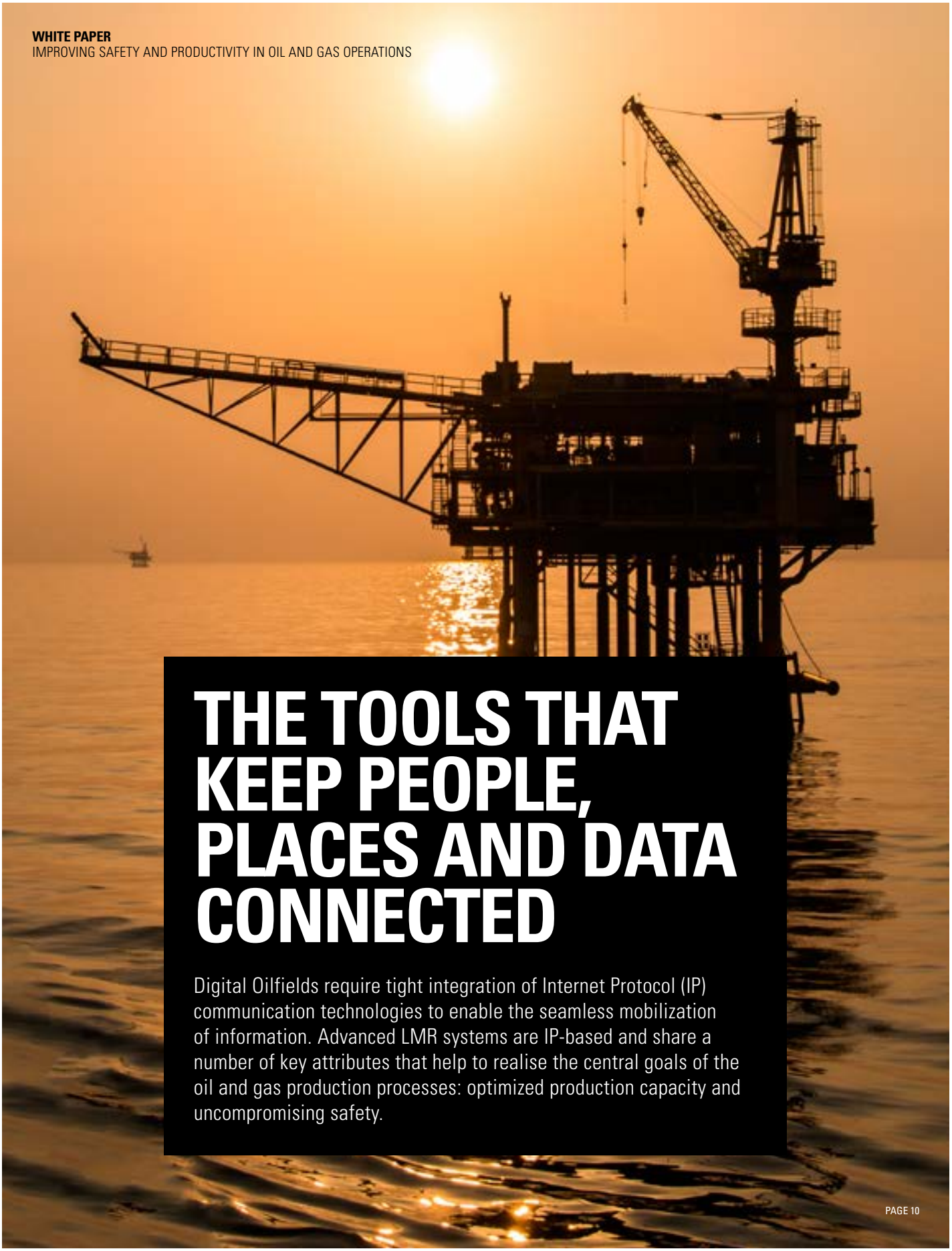
At the heart of the Digital Oilfield are advanced Remote Terminal Units (RTUs) that provide a powerful platform for measuring and controlling key production parameters like oil and gas flow rates, line and wellhead pressure, status of pump operation and monitoring of tank level.

Modern RTUs automate oil and gas production processes by performing many complex calculation tasks faster, holding larger local databases and controlling remote sites without active intervention from the control centre.

Additional functions can be integrated to achieve enhanced system monitoring and control of oil spills, leakages, fire detection and emergency shutdown (ESD).

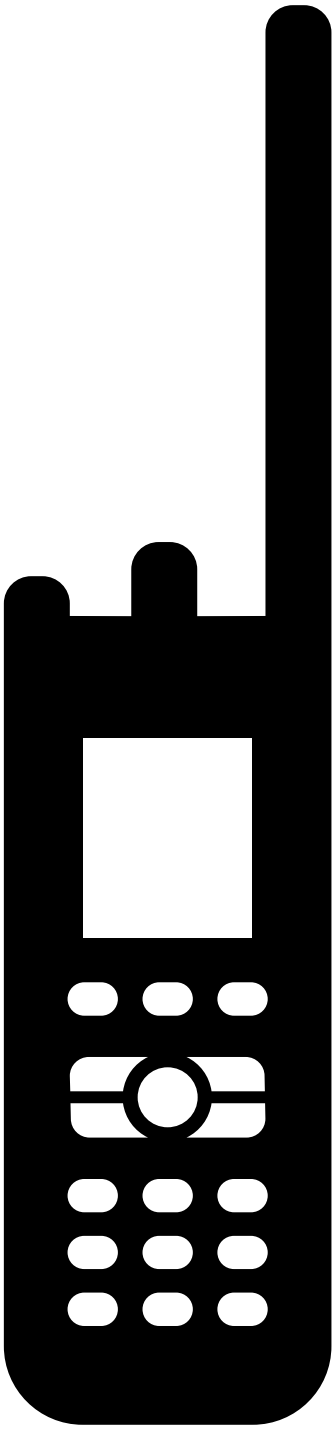
Mission-critical data connectivity provided by digital LMR or LTE enables multiple applications to be supported at remote sites – promoting personnel safety, preempting equipment shutdowns and increasing production efficiency.





THE TOOLS THAT KEEP PEOPLE, PLACES AND DATA CONNECTED

Digital Oilfields require tight integration of Internet Protocol (IP) communication technologies to enable the seamless mobilization of information. Advanced LMR systems are IP-based and share a number of key attributes that help to realise the central goals of the oil and gas production processes: optimized production capacity and uncompromising safety.

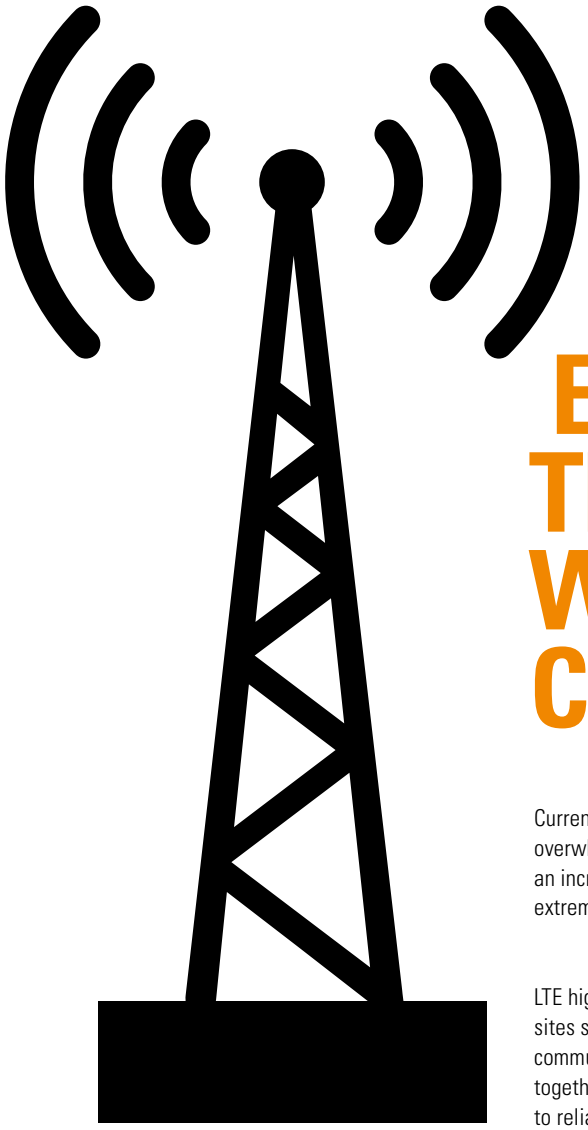


THE ADVANTAGES OF DIGITAL RADIO

Advanced digital LMR systems efficiently control both the data and voice aspects of communication – increasing productivity and safety.

Digital radio technology surpasses the capabilities of analog in multiple ways:

- Exceptionally clear voice communication and noise-cancelling accessories ensure the message gets through the first time, even in noisy environments.
- Integrated GPS location tracking to locate personnel at any given time, inside or outside the facility.
- Systems are based on IP architectures with Ethernet interfaces, enabling easier integration with enterprise IT systems.
- Longer battery life to last throughout lengthy shifts.
- Greater capacity for hundreds or even thousands of workgroups.
- Support for voice and data allows integrated applications such as encrypted communications, text messaging, work order ticket management, email gateways, dispatch consoles, remote system management, telephony integration and much more.
- Seamless integration with the WAVE interoperability platform. This makes it possible for teams of people, in the field or in the office, to effectively communicate and collaborate through voice and data – securely, reliably and in real time. This can be achieved regardless of network, carrier, protocol or device; and whether deployed on-premise or in the cloud.



PROCESS AUTOMATION ENABLED THROUGH WIRELESS CONNECTIVITY

Currently, an oil rig produces an astounding 1 Terabyte of data every day.[9] With the overwhelming amount of data flooding through the oil and gas value chain, there is an increasing need for a highly reliable broadband network that is able to support extreme amounts of data transfer over large, isolated areas.

LTE high-speed broadband networks extend broadband data capacity to remote sites such as metering stations and well sites in which real-time monitoring and communication are imperative. Process automation enabled through LTE networks, together with LMR and SCADA RTUs, help reduce the amount of manpower required to reliably collect and transmit information from remote locations.

MOTOROLA LEADS THE WAY IN DIGITAL OILFIELD TECHNOLOGY

Motorola Solutions remains the global leader in advanced digital LMR systems and in the provision of mission critical communication solutions. With a comprehensive technology portfolio that includes advanced RTUs, LTE, P25 and TETRA, Motorola is well positioned to deliver tailored solutions that support diverse operational requirements throughout the entire oil and gas value chain.

EXPLORE AND GET IN TOUCH

Go to our landing page to discover how we've helped other companies solve their critical challenges. Or contact us directly if you'd like more information about how we can help keep your company efficient, safe and secure.

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