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HYTERA INDUSTRY REPORT

KEEP EVERYONE SAFE & ONLINE FOR THE OIL & GAS INDUSTRY

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Content

ONGOING DIGITAL REVOLUTION

Sustainability is a constant focus for the oil and gas industry and companies have been using digital technologies every year to improve productivity, reduce controlling costs, and enhance reliability and safety. Improving safety in operations is one of the highest priorities for the oil and gas industry, and the whole industry is strictly standardizing their operations, identifying potential hazards and managing risks at every stage to ensure safety. Fortunately, the productivity of the oil and gas industry increases while the overall quantity of process safety events decreases year by year.

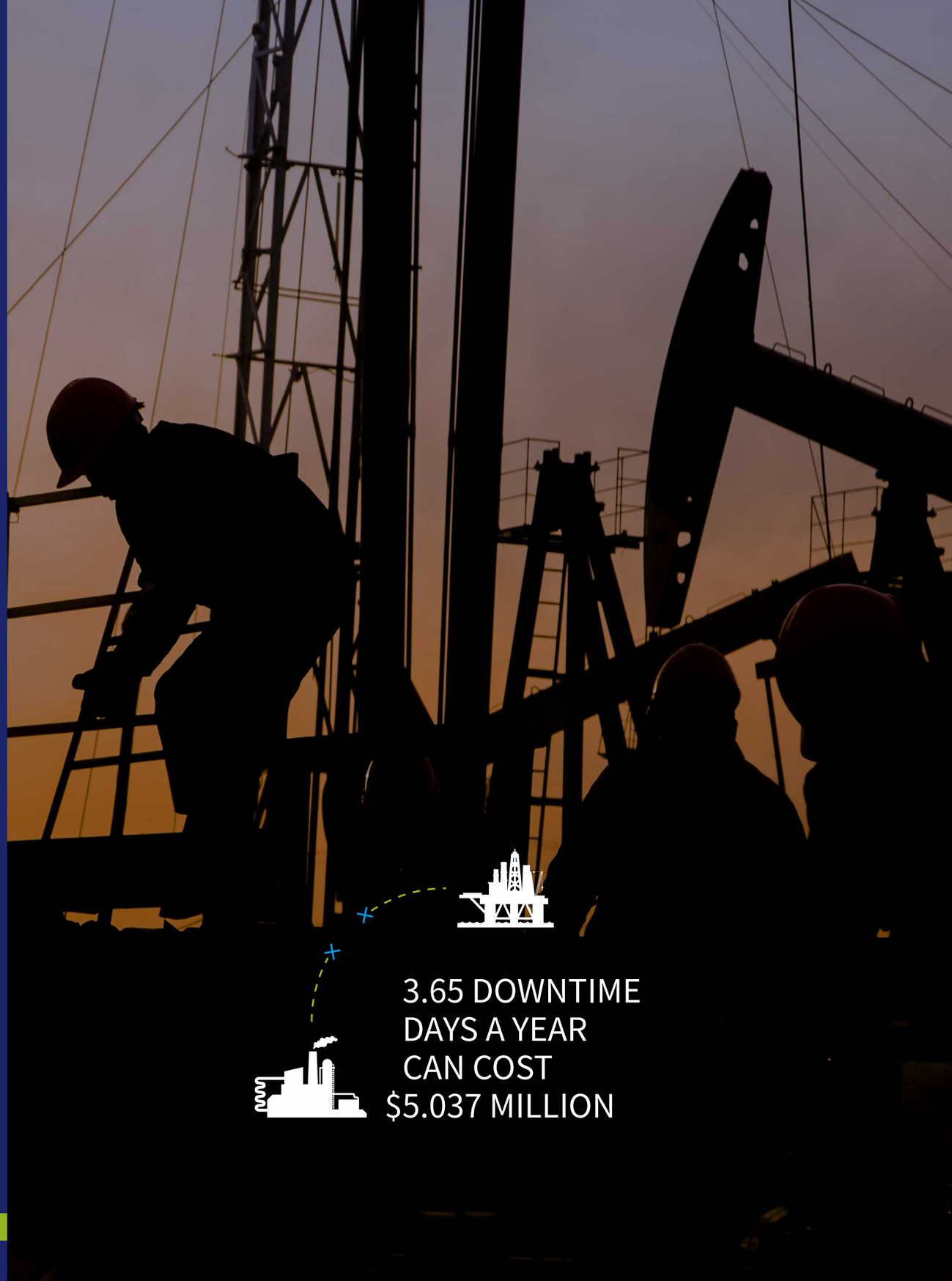
UNAVOIDABLE CHALLENGES

Although the overall quantity of process safety events is reducing gradually, how to ensure safety is still a tough challenge. All oil and gas companies work tirelessly with the aim of protecting the environment , health and safety. Due to their efforts, the industry is becoming an increasingly safer place to work, despite an environment that often involves heavy equipment, hazardous materials, high temperatures and high-pressure equipment, which is reflected by a declining rate of illness and injuries.

However, despite efforts being made with rules and standards which work perfectly on paper, in the field it can be completely different. It was found that, *during 2003–2016, 1,485 oil and gas extraction workers were killed on the job, resulting in an annual fatality rate more than six times higher than the rate among all U.S. workers*[1].

Moreover, the oil and gas industry also needs to consider the impact resulting from downtime, especially unplanned downtime. If not, costs could be huge, *just 1% of unplanned downtime—or 3.65 downtime days per year—can cost organizations $5.037 million each year. Averaging just over 27 days of downtime each year, offshore oil and gas organizations experience $38 million in financial impacts from unplanned downtime. For the worst performers the costs can be upwards of $88 million*[2].

IN OTHER WORDS, THE MORE TIME THE SYSTEM STAYS ONLINE AND SAFE, THE LESS INJURIES AND ECONOMIC LOSSES IT CAUSES.

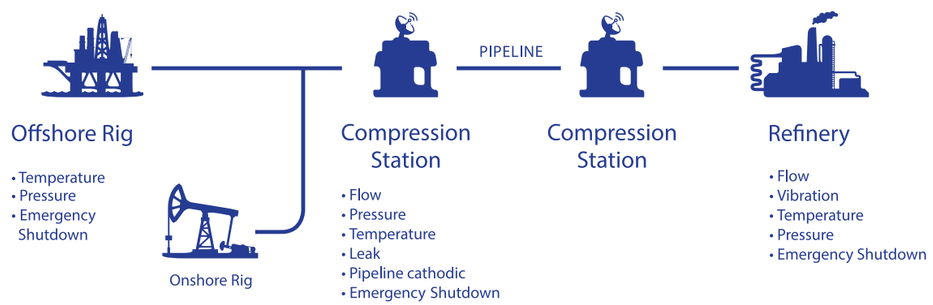


KEEP EVERYONE ONLINE & SAFE

ONLINE & SAFE

Facilities Online & Safe

In order to centrally manage thousands of facilities which are located in different places, digital technology such as SCADA and Distributed Control Systems (DCS) offer oil and gas companies the chance to remotely supervise and manage the facilities.



Picture1: SCADA used in all sections

As the quantities of facility are increasing, complex of the management increases too. More and more requirements such as asset tracking, big data analysis come out. SCADA cannot meet these new requirements. Actually Industry Internet of Things (IIoT), including SCADA, could be the best solution to get all the facilities connected, tracked, analyzed, and to improve the safety and efficiency of operations and maintenance, and keep facilities online and safe by eliminating facilities defects and unplanned downtime.

Workers Online & Safe

The combination of powerful equipment, flammable chemicals, and high pressures cause jobs in the oil and gas industry to turn deadly a lot quicker than other industries. This is why it is essential safety managers and supervisors identify and communicate recommended safety controls and hazards that exist on each work site before work begins[3].

To keep the workers online and safe in such hazardous environments, *radio communication across the terminal also plays an important part in responding to accidents and in safely moving equipment and personnel across the terminal. Occupational Safety and Health Administration (OSHA) believes that by using radio communication between personnel working on the ground, on the ship and in the crane, the number of accidents in this hazardous work environment can be reduced[4].*

Although voice communication over radio works well, it is not enough, the safety of the workers can be guaranteed better if the information on personnel location, the emergency, plus image and video could also be provided.

Business Online & Safe

The negative impact of downtime is amplified by the scale, complexity of operations and the immense commercial, human and environmental risk. The damage of downtime can not only be measured by injuries and economics losses, but also the trust from society such as government and residents.

Thereby, oil and gas companies make every effort to keep the whole business online, and the digital technology is used to help them analyze the data, identify the potential issue and then make the fast, accurate decision to prevent the risk and keep the business online and safe.

HYTERA WIRELESS RADIO COMMUNICATION SOLUTION

As part of digital technology, Hytera Wireless Radio Communication Solution could cover the requirements for upstream (Exploration, Production), midstream (Pipeline) and downstream (Refinery) in oil and gas industry.

The Solution, including DMR, TETRA, LTE and LoRa technologies, supports various communication services for keeping workers, facilities and businesses online and safe:

- Radio provides voice communication for the rig workers, even in noisy and hazardous environments.
- IIoT could help oil and gas companies track assets like the facilities and tools they use and provide wireless communication for SCADA, covering the areas wired communication could not reach.
- Image and video can be sent and received by radio between individuals and groups for enhancing the efficiency of communication.
- E-Patrol systems could generate and keep a record of the work-order for routine inspection and maintenance.

The whole communication system is designed to realize:

- Reliable and stable service. The communication system works seamlessly, staying online permanently.
- Resilient, even if a disaster or emergency happens. The system is robust, recovering from failure quickly.
- Trustworthy, for the lifetime of the system. With limited downtime, the system runs and provides uninterrupted service.
- Secure with no potential for information leaking, theft, or tampering.
- Intrinsically safe in hazardous environments.
- Seamlessly compatible with business systems.

UPSTREAM

MIDSTREAM

DOWNSTREAM

Hytera Wireless Radio Communication Solution covers all three production sections

SOLUTION FOR UPSTREAM

The exploration and production are conducted in environments such as intense cold, ice and snow, searing heat, heavy dust, high humidity, strong winds, torrential rain and salt fog, it is therefore necessary to keep those workers, facilities and business online and safe all the time.

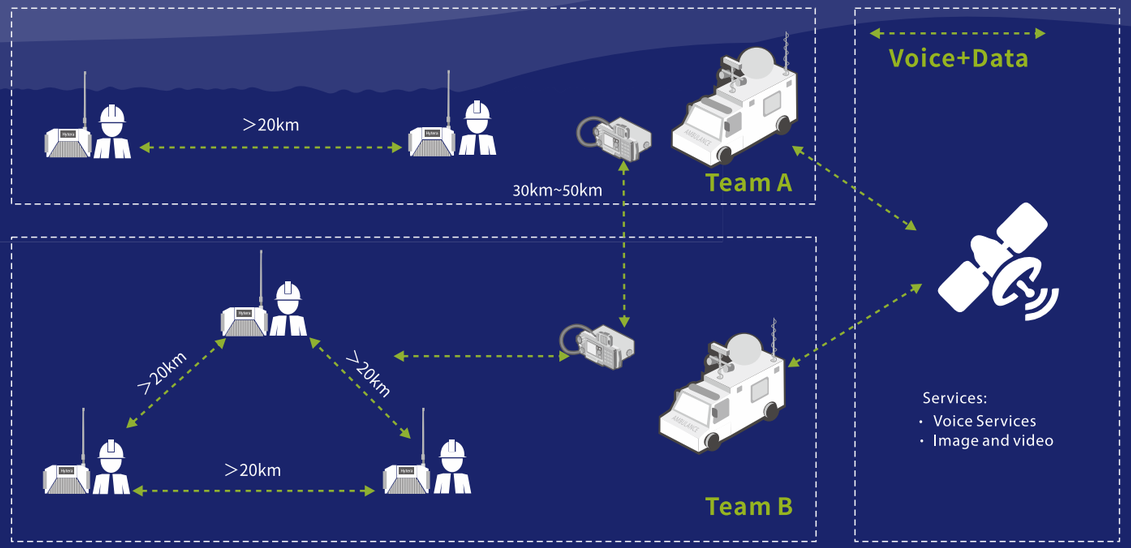
Exploration

In the exploration field, all teams are spread over a large working area and may need to move from one place to another to search underground or underwater.

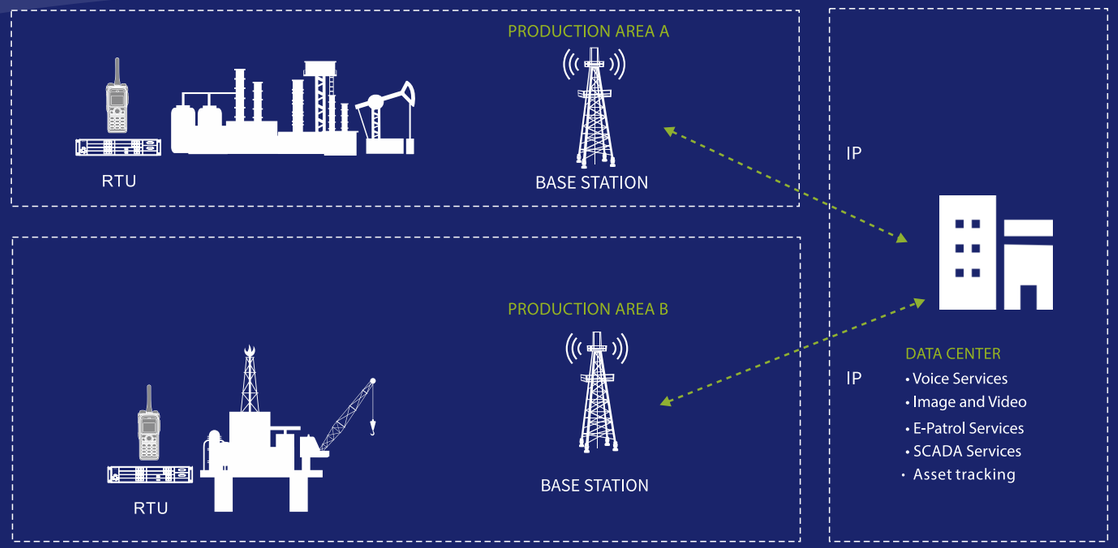
As part of Hytera wireless radio communication solution, the Ad-hoc could provide voice, data, image and even video for the exploration team with large area coverage. Based on wireless Ad-hoc networking, the Ad-hoc can create and join team-networks to deploy the communication system as soon as it is turned on. It also meets the need for mobile and flexible deployment because the Ad-hoc equipment can be installed in a vehicle, carried by a backpack, pole mounted or wall mounted with a light and compact design.

Production

Onshore and offshore oil and gas plants are dispersed. Hytera wireless radio communication solution could cover all potential production areas with an outdoor base station and iMesh if necessary, which can be flexibility deployed by wall-mounting or pole-mounting in the production plant. It is also cost-effective for running voice, SCADA, image and video, E-Patrol and asset tracking services.



Ad-hoc for Exploration



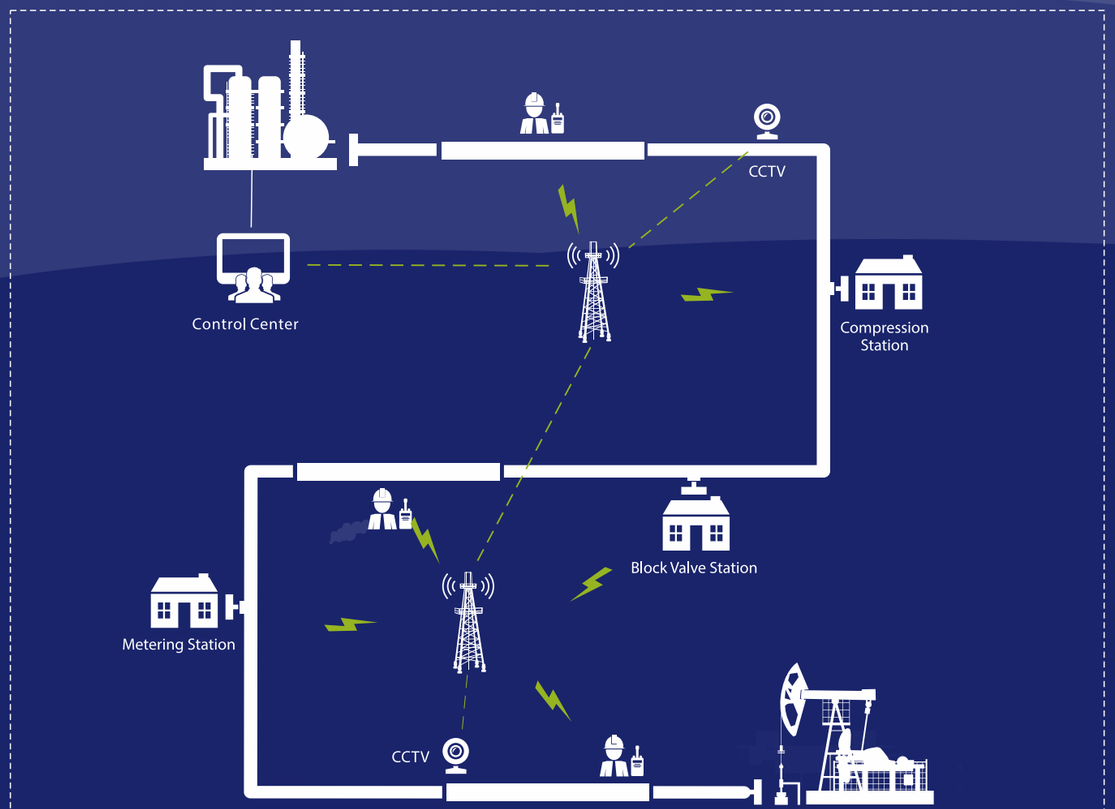
Solution for Production

SOLUTION FOR MIDSTREAM

The main business of a pipeline is bringing oil and gas from wells to processing facilities, some of which are not covered by a cellular signal.

Pipeline

Hytera wireless radio communication solution provides voice, image, video, and e-patrol services for the workers to communicate with each others when they do routine inspections along the pipeline and SCADA runs on wireless communication where optical fiber does not exist. No matter where the rig workers are located, all data is secured with encryption preventing loss, damage, and intrusion.



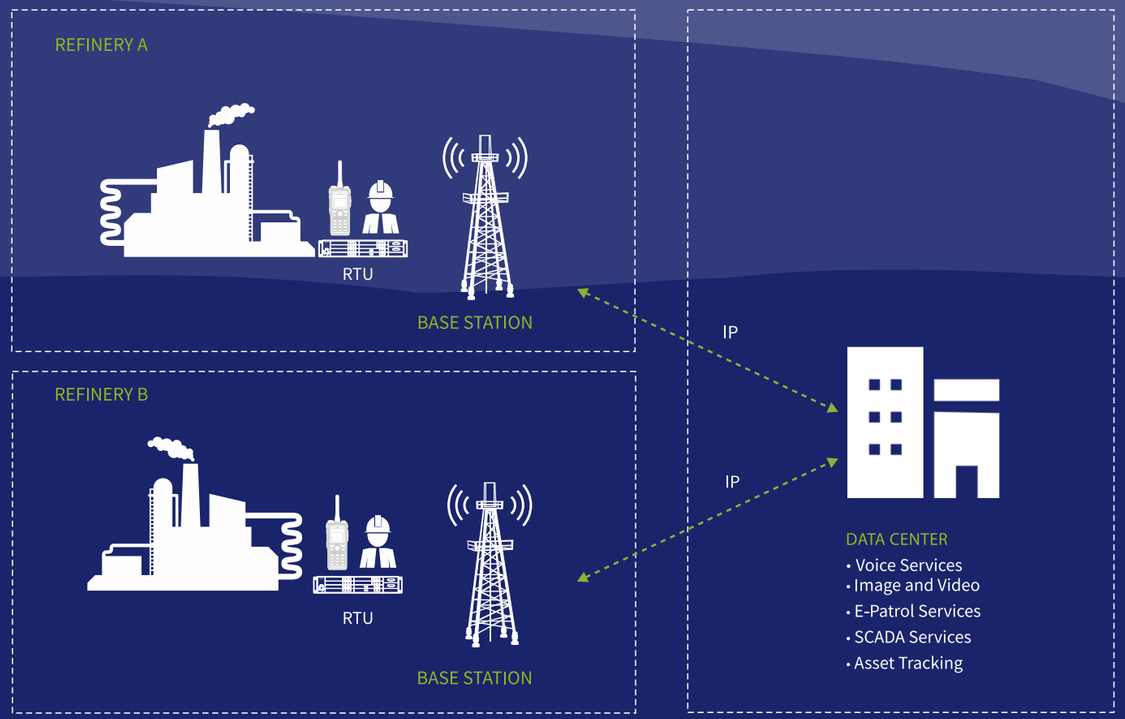
Solution for Pipeline

SOLUTION FOR DOWNSTREAM

The feedstocks are refined in the factory into various consumable products such as fuel oil, diesel oil and jet fuel. Thereby the facilities and rig workers are continuous in a hazardous environment, meaning any incident like a leak or explosion could bring huge loss.

Refinery

Although the structure of a refinery factory can result in a loss of wireless signal, Hytera wireless radio communication solution can play a crucial role, helping the refinery have full coverage to keep all facilities and tools connected and tracked. The solution also improves the efficiency of communication, meaning any worker could communicate with someone else via voice communication, and if help was required, they could get remote guidance via picture and video.



Solution for Refinery

CONCLUSIONS

Thanks to its scalability and flexibility, Hytera wireless radio communication solution is suitable for different requirements:

Migration from analog to digital

Currently, more and more customers are migrating their existing analogue systems to new DMR and TETRA technologies, according to the European Telecommunications Standards Institute (ETSI), this is due to:

- The analogue supply chain decreasing quickly in the coming years;
- Customers needing more advanced features, like better voice quality, longer battery life and enhanced digital functions.

Migration to Broadband

It is obvious that the more data is required, the more bandwidth is needed. LTE is more suitable for the oil and gas industry to run voice, image, video, IIoT and other services together. The Hytera LTE system, fully complies with 3GPP standards for voice, data and video, and it could provide more applications to help customers analyze the data of the facility, worker and business to make right decisions at the right time.

PRODUCT OVERVIEW

DMR PRODUCT OVERVIEW

							
PD56X	PD78X	PD98X	PD56X UL913	PD78X UL913	PD98X UL913	PD71X Ex	PD79X Ex
Non explosion-proof Radio			UL: Class **I**,**II**,**III**,DIV **I** Groups C-G, -30°C to +55°C T4			ATEX: **II** 2G Ex ib **IIC** T4 (Gas); **II** 2D Ex ib **IIIC** T120°C **IP**5X (Dust); **I** M2 Ex ib (mining)	

		
DMR **I**ndoor Base Station	DMR Outdoor Base Station	DMR Ad-hoc
• Tri-diversity for **l**arger coverage • 1+1 hot standby for stab**i**lity • **B**lade design for easy O&M • Up to 48 Carriers per site for high capacity • Supports SCADA	• **F**lexib**l**e deployment (W**a**ll mounted, po**l**e mounted) • Software-defined up to 4 carrier • Software-defined frequency • Low power consumption • Supports SCADA	• Up to 32 hops Network • Link Automatic Detection • GSM Link as Backup • 20W with big coverage • **I**P67 Protection

TETRA PRODUCT OVERVIEW

				
PT580H Plus	STP9X00	PT580H Plus UL913	PT790Ex	STP8X100
Non explosion-proof Radio		UL: Class **I**,**II**,**III**,DIV **I** Groups C-G, -30°C to +55°C. T4	ATEX: **II** 1G Ex ia **IIC** T4 (Gas); **II** 1D Ex ia **IIIC** T120°C **IP**6X(Dust); **I** M1 Ex ia (Mining)	ATEX: **II** 2G Ex ib **IIC** T4 (Gas); **II** 2D Ex ib **IIIC** T90°C **IP**6X (Dust);

	
TETRA **I**ndoor Base Station	TETRA Outdoor Base Station
• Tri-diversity for **l**arger coverage • 1+1 hot standby for stab**i**lity • **B**lade design for easy O&M • Up to 12 carriers per site for high capacity • Supports SCADA	• **F**lexib**l**e deployment (wa**l**l-mounted, po**l**e-mounted) • Cascade up to 2 carrier • Low power consumption • Supports SCADA

LTE PRODUCT OVERVIEW

 PDC760	 PTC760
Multi-Mode Advanced Radio	Multi-Mode Advanced Radio
• Supports LTE+ DMR • Industry-Level Screen • Resistant (supports glove touch) • Visible under strong light / dark environment • IP67 Water & Dust Proof	• Supports LTE+ TETRA • Industry-Level Screen • Resistant (supports glove touch) • Visible under strong light / dark environment • IP67 Water & Dust Proof

			
LTE Base-Band Unit	LTE Remote Radio Unit	LTE Integrated Base Station	LTE Ad-hoc
• Multi-cast • Load balancing • Hot standby • Single site trunking • Supports SCADA	• Hot standby • Load distribution • High reliability and capacity • Supports SCADA	• Integrated with BBU and RRU • Flexible deployment (wall-mounted, pole-mounted) • IP66 Water & Dust Proof • Single site trunking • Supports SCADA	• Flexible and fast deployment • Auto-switch to the best link • Maximum 20Mbps bandwidth • 1km~20km coverage • COFDM technology, strong resistance to multipath interference

LoRa OVERVIEW


LoRa Gateway
• Northbound interface supports DMR, WiFi, LAN, 4G protocols. • Southbound interface supports IoT, LoRa, etc. • Real-time network coverage • Low Power • Long Range

APPENDIX

1. Burden, Need, and Impact Report from The National Institute for Occupational Safety and Health (NIOSH)
https://www.cdc.gov/niosh/programs/oilgas/burden.html

2. Impact-of-digital-on-unplanned-downtime-study
https://www.bhge.com/sites/default/files/2017-12/impact-of-digital-on-unplanned-downtime-study.pdf

3. Oil and Gas Industry infographic
https://www.graphicproducts.com/infographics/oil-gas-industry/

4. Radio Communication Can Assist Container Gantry Crane Operators in Marine Terminals
https://www.osha.gov/Publications/radio-communication-factsheet.html