Huawei Oil and Gas Digital Production Solution
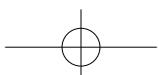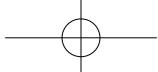
HUAWEI

Preface

Turbulent economic times have compelled oil and gas companies to address challenges by increasing their core competitiveness and optimizing the production chain from the source by leveraging information technologies. In recent years, more and more companies in the oil and gas industry have used information communication technology (ICT) to streamline the management process, improve communication efficiency, and decrease production costs. By combining ICT with traditional oil and gas production technologies, companies minimize the risks in developing oil and gas, while achieving safe and efficient operation.

As a leading global information and communication solutions supplier, Huawei has gained rich experience in the ICT field. We devote our efforts to providing comprehensive and high-efficiency ICT solutions for energy, government, finance, traffic, and

power industries across the world. We have invested a great deal of time and effort in developing technologies to support oil and gas development and production. Based on these technologies, Huawei has launched an oil and gas digital production solution that facilitates remote management and control, improves operating efficiency, and reduces operating expense (OPEX).

By deploying a variety of communication networks, multimedia digital trunking system, and intelligent video surveillance systems in oil and gas fields, the production solution applies reliable, high-speed data transmission to provide real-time communications for safe production and better operating efficiency.

Challenges of Oil and Gas production

Because oil and gas fields generally extend across large areas and challenging terrain, it is often impossible to collect data in real time by manual data recording. As a result, improving production and management efficiency is difficult.

Additionally, traditional manual maintenance methods are challenged by the difficulties of dealing with flammable, explosive, and poisonous substances, as well as the risks of someone stealing or damaging company assets. Maintaining and protecting these assets imposes a heavy workload, reduces efficiency, and requires constant readiness to respond to emergencies.

What can address these challenges? The answer is ICT, which supports production automation, unified scheduling, and secure monitoring for safe and cost-effective production:

- ICT networks apply to a wide variety of complex production environments; can be accessed in different ways, and carry vital communications on reliable, high-bandwidth links. These capabilities ensure real-time data uploads and can serve as the foundation for remote control.
- When working in oil and gas fields, workers need mobile terminals for coordinating activities and handling emergencies. These terminals can support traditional voice services as well as video and data services for troubleshooting. Using terminals that are waterproof, dustproof, shockproof, flameproof, and corrosion resistant enables reliable operations in harsh environments.
- An intelligent surveillance system helps prevent intrusion, shorten response times, and reduce the workforce.

Oil and Gas Digital Production Solution

Based on the information requirements for oil and gas development, Huawei offers an oil and gas digital production solution which supports the production business from network, communication, and security technologies. we provide diversified network infrastructures to suit different production environments, as well as trunking communication systems and video surveillance systems, to realize auto monitoring of production process, intelligent warning of danger and timely response of unified dispatching & commanding.
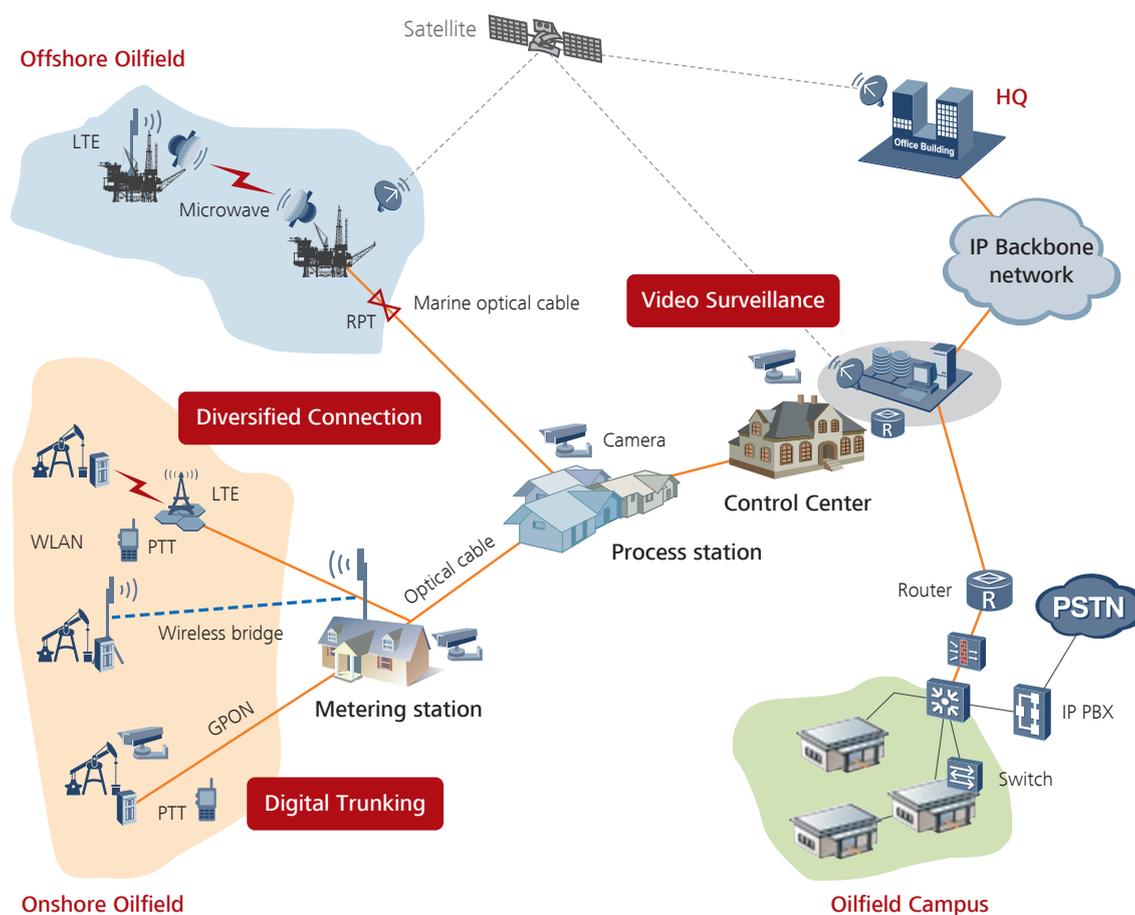

Figure 1 Oil and gas digital production solution network

Huawei can offers products and technologies such as optical fiber, submarine optical cable, wireless bridge, Long Term Evolution (LTE), microwave transmission, and wireless local area networks (WLANs) to meet service interaction and communication requirements. These products and technologies can be combined flexibly to suit offshore and onshore oil and gas fields.

To meet requirements for coordinating schedules during troubleshooting, preventive maintenance, and emergency rescue, we provide trunking systems to implement group calls, broadcast calls, dispatch console, call control, duplex communication, and high-speed data services.

We supply intelligent video surveillance systems to monitor key production areas in oil and gas fields to ensure human safety and production security.

Oil and Gas Production Infrastructure Network Solution

Automation is proving increasingly useful for oil and gas development, so infrastructure networks have to carry ever greater numbers of communication services. Production services such as supervisory control and data acquisition (SCADA) and schedule services demand real-time capability and high reliability. On the other hand, services such as production management, video surveillance, and internet surfing tend to involve high volumes of "bursty" traffic. These services require the infrastructure network with high-reliability, bandwidth guarantee. We offer three kinds of communication network solutions for different application of these business scenarios.

LTE+WLAN Network Solution

- **Application Scenario**

  LTE+WLAN networks can be easily and cost-effectively deployed where a great number of oil and gas wells are distributed.

- **Overview**

  Figure 2 shows an LTE+WLAN network for oil and gas production that covers the entire field seamlessly and allows easy services access.
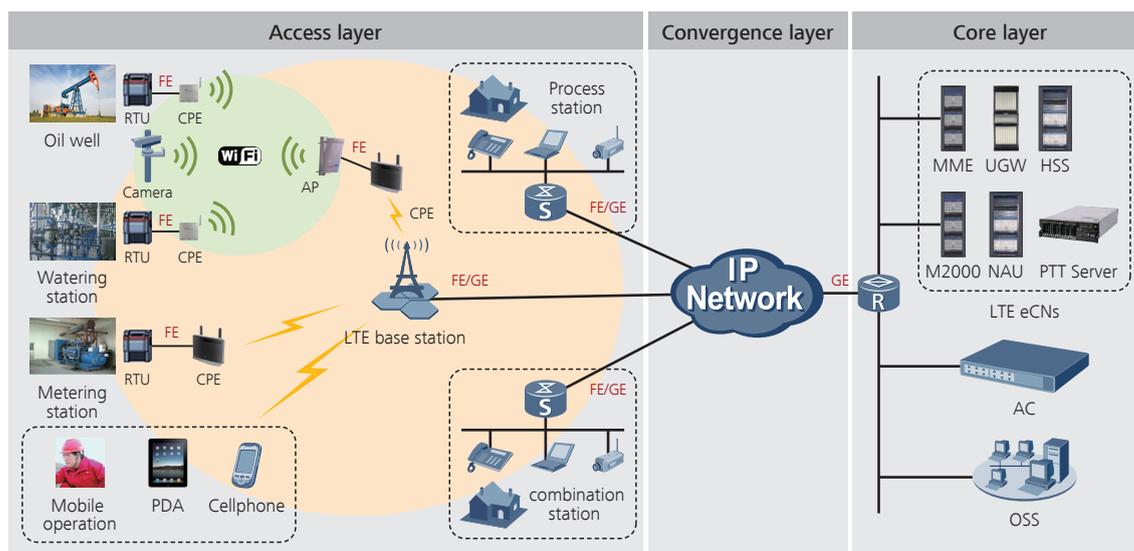
Figure 2 LTE+WLAN network for oil and gas production

In this solution, LTE base stations upload data over microwave equipment or optical fibers. In the areas covered by LTE networks, users can access the LTE networks directly by mobile PDAs or cell phones to process the business, also can by fixed terminals indirectly through CPE(Customer Premise Equipment) to upload the production data and video surveillance data. Fixed terminals can link the CPE by cable, or by WLAN network.

- **Benefits**
  - The ratio of uplink bandwidth to downlink bandwidth can be set to suit video surveillance or broadband service requirements.
  - CPE is protected to IP67 and is suitable for harsh environments.
  - High bandwidth network can carry voice, data, and video services simultaneously.
  - WLANs can be built flexibly to enrich network access means.

Oil and Gas P2P/PMP Network Solution

- **Application Scenario**

  WLAN networks can be cost-effectively deployed in remote oil and gas fields that have a small number of oil and gas wells, allowing data to be transmitted in point-to-point (P2P) or point-to-multipoint connections.

- **Overview**

  Laying out optical cables or building wireless base stations for a few remote oil and gas wells increases CAPEX. For a more cost-effective approach, Huawei offers a wireless transmission and coverage solution with wireless bridge and WLANs, as shown in Figure 3.
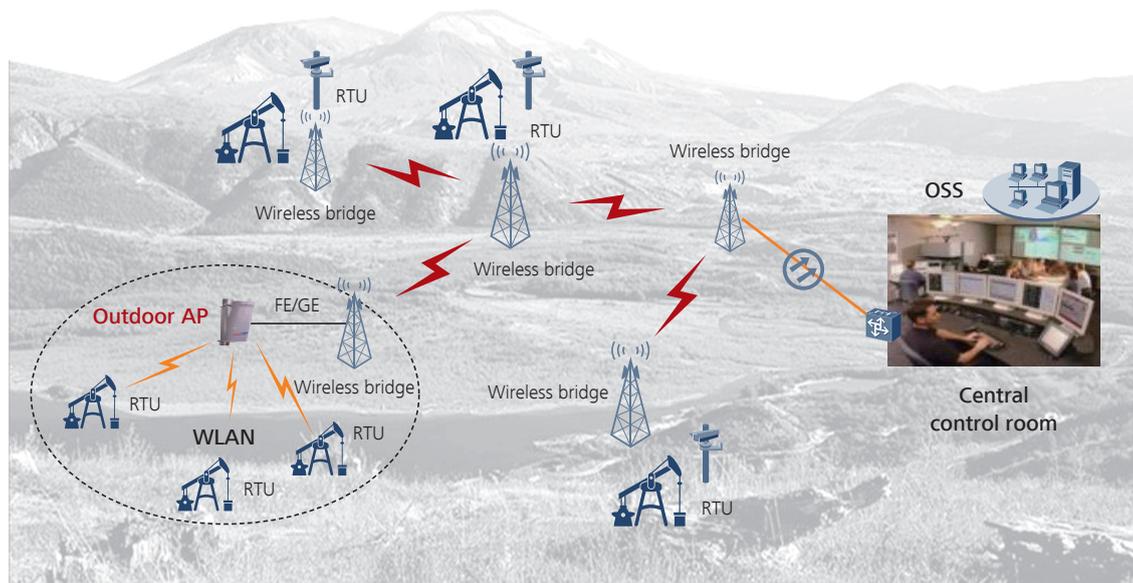

Figure 3 Oil and gas P2P/PMP network solution

Wireless bridge work with WLANs to realize an optimal combination. WLANs deployed in small operating areas implement signal access, while wireless bridge transmit data between stations and wells, including connections for wells that are far way from each other.

- **Benefits**
  - Outdoors AP equipment is suitable for harsh environments.
  - High bandwidth network can carry production data and video surveillance data simultaneously.
  - Wireless bridge is plug-and-play and can be configured automatically.
  - WLANs can be set up flexibly to enrich network access means.

- **Application Scenario**

  For oil and gas fields that are unsuitable to deploy wireless network, or have laid optical cable along with power cables to wells and stations, we provide xPON network solution to realize the wired access and communication of oil and gas production business.

- **Overview**

  Optical fibers can be laid out for command center and processing stations to form ring network of multi-service transmission platform (MSTP) or synchronous digital hierarchy (SDH). Optical line terminals (OLTs) are installed at stations to manage the access over optical fibers in the area. The optical distribution nodes (ODNs) split one signal to many and connect to optical network units(ONU). One or more wells have an optical network unit (ONU), which then connects to remote terminal units (RTUs) and video surveillance systems over optical fibers or copper cables in the downlink direction, allowing the uploading of production data and videos (Figure 4).

Huawei Oil and Gas Digital Production Solution

Central control room

Process station   OSS   Process station

SDH/MSTP transmission network

OLT   OLT

Optical splitter   Optical splitter

ONU   ONU   ONU   ONU

camera RTU   camera RTU   camera RTU   camera RTU

Well data and video acquisition   **Station data and video acquisition**
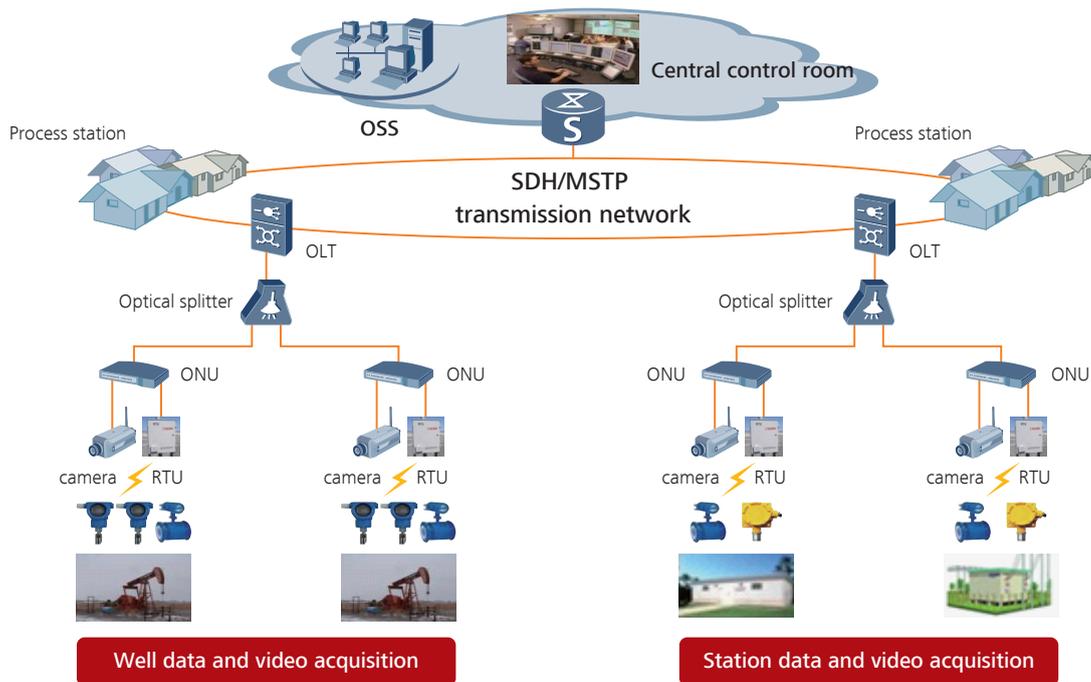
Figure 4 Oil and gas xPON network solution

- **Benefits**
  - ONUs are plug-and-play devices and can be configured automatically.
  - High bandwidth network can carry voice, data, and video services simultaneously.
  - Optical power is split in passive mode to save energy.
  - Services can be deployed rapidly, and equipment can be maintained conveniently.
  - The equipment is protected to IP67 and suitable for a variety of weather conditions.

Multimedia Digital Trunking Communication Solution

The business of oil and gas field is so complicated that the successful completion of many operations need good collaboration, the traditional trunking system can only provide voice communication service that cannot meet multimedia communication requirements. For example, when field operators are in equipment inspection and repair process, if they can provide more video and data information about production field for experts's online guide in headquarter, the efficiency of problem solving will improve greatly.

- **Application Scenario**

  The multimedia digital trunking communication solution applies to activities that benefit from unified scheduling, such as preventive maintenance, troubleshooting, and emergency rescue.

- **Overview**

  Huawei's digital trunking communication system uses a wireless network to provide group calls, broadcast calls, dispatch console, call control, duplex communication, and high-speed data services. These capabilities support activities such as emergency rescue, preventive maintenance, well site operations, and security patrolling. The system's user terminals are dustproof, waterproof, shockproof, and flameproof. Figure 5 shows a multimedia digital trunking communication solution.
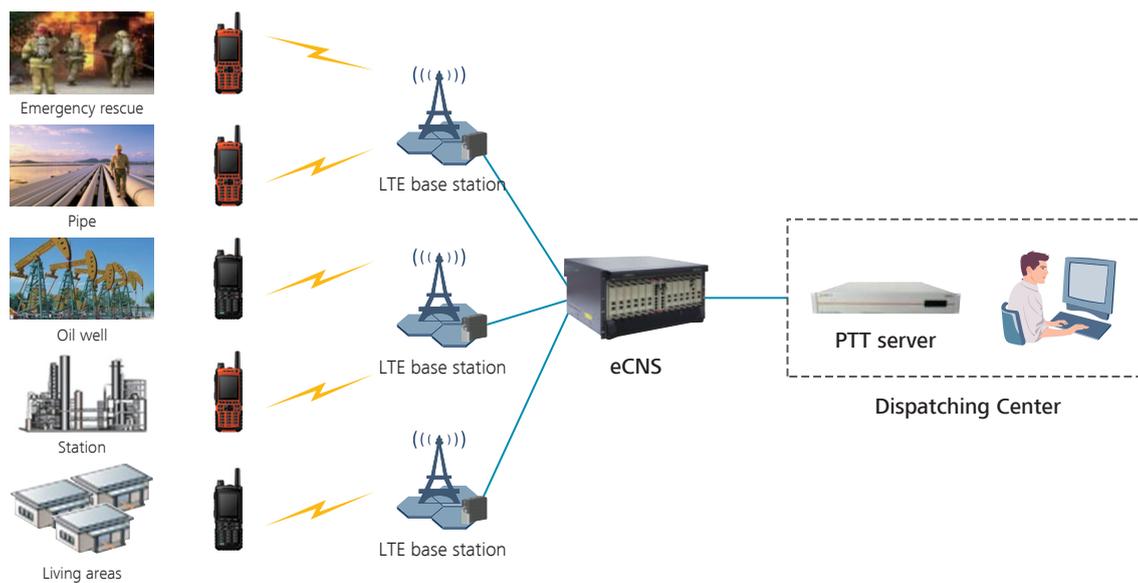

Figure 5 Multimedia digital trunking communication solution

Huawei Oil and Gas Digital Production Solution

- **Benefits**
  - The trunking mode enables multiple parties to talk with each other, facilitating unified scheduling in emergencies.
  - Data, photos, and videos can be shared to show site conditions in real time.
  - An emergency command vehicle can allow site personnel to communicate with the oil and gas field headquarters using multimedia information to support rapid decision-making.
  - End-to-end (E2E) encryption is supported, ensuring information security.

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Digital Production Video Surveillance Solution

With oil and gas wells typically scattered in remote areas with challenging terrain, it is difficult to ensure production security and coordinate personnel by relying only on manual methods. A reliable surveillance system can help.

- **Application Scenario**

    In oil and gas field critical areas, such as wells, pipelines, plants, crossings, surveillance systems are required to deploy to monitor, help preventing intrusion and protecting assets.

    we can provide intelligent video surveillance systems. Network cameras, coders, CPEs(Customer Premise Equipments) and loudspeakers are deployed in critical areas. These equipments access the network in wired or wireless mode to send video data to the central control room. The intelligent video server processes the video data and analyzes the video information in real time. If an intrusion is detected, the system generates an alarm linkage and notifies site personnel. In addition, the personnel in monitoring center can disperse intruders through PA/GA system. All these functions help ensure efficient emergency handling and production security. Figure 6 shows the solution network.
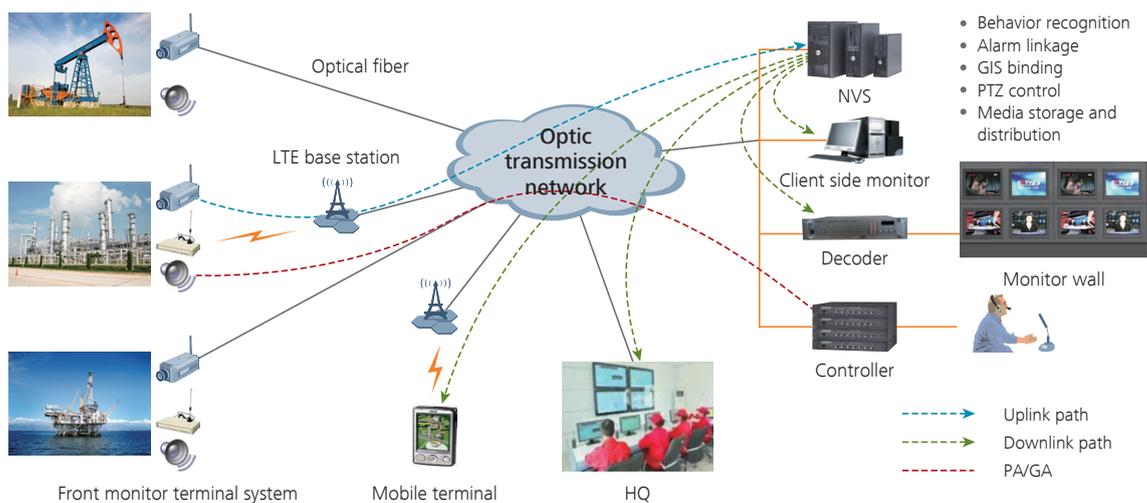
Figure 6 Digital production video surveillance solution

- **Benefits**
    - The video surveillance system monitors the production site, intelligently analyzes images, generates alarms for intrusion and thefts, and takes protective measures.
    - The control center communicates with production sites to handle alarms and coordinate production remotely.
    - The oil and gas field headquarters personnel can keep track of production conditions, analyze data, and make decisions by using the video surveillance system.
    - The video surveillance system is compatible with the systems on the live network, maximizing return on investment (ROI).
    - High-definition experience, lower bandwidth compared to other companies in case of the certain image equality.
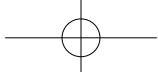
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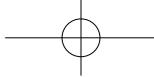
Advantages of Huawei Oil and Gas Digital Production Solution

Huawei's oil and gas digital production solution uses multiple communication and information technologies to help oil and gas companies handle the wide variety of tasks required to keep production running smoothly under all conditions. Toward this goal, the solution enables users to transmit information reliably in real time, improving collaboration and decision-making, significantly decreasing labor and capital costs, and ensuring production security. Our solution have following advantages.

- **The overall advantages of the solution include:**
  Diversified networks that suit a variety of scenarios
  Backbone networks and new networks can use optical fibers, while areas where oil and gas wells are centralized can be covered by an LTE network. Wells that are widely scattered are provided with wireless bridge, and terminals in small areas access the LTE network over WLANs. Flexible network combinations satisfy various service and scenario requirements and maximize ROI.

- **Multimedia digital trunking system**
  The digital trunking communication system supports voice, data, and video services, allowing the sharing of images and technical documentation for preventive maintenance and troubleshooting.

- **Intelligent video surveillance system**
  By intelligently analyzing image data sent from oil and gas fields, the video surveillance system rapidly detects exceptions such as intrusions and thefts and generates alarms.

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