Worldwide Success Cases
for the Oil & Gas Industry

Moxa's Proven Solutions for the Harshest Oil & Gas Environments

Gas Wellhead Monitoring

Pipeline Monitoring

Drilling Communications

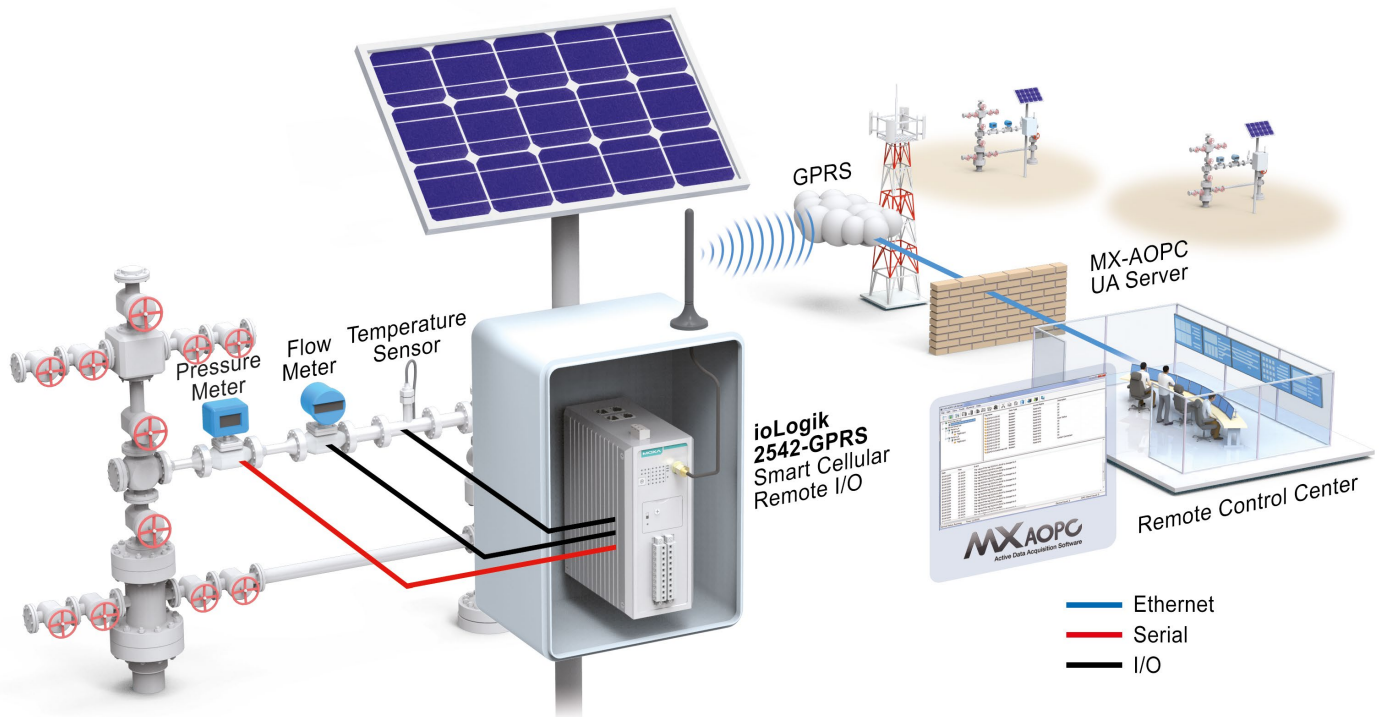Wireless Communications for Fracturing

Crude Oil Processing

www.moxa.com

Smart Data Acquisition for Natural Gas Wellhead Monitoring

Location: **Europe**

Application:

Natural Gas Wellhead Monitoring

One of largest energy companies in Southeast Europe wants to digitize their oilfield in order to enhance efficiency. To achieve this goal, the company introduced a wellhead automation monitoring system for its natural gas production across multiple countries in Southeast Europe.

GPRS

MX-AOPC UA Server

Pressure Meter

Flow Meter

Temperature Sensor

ioLogik 2542-GPRS Smart Cellular Remote I/O

MX AOPC Active Data Acquisition Software

Remote Control Center

— Ethernet
— Serial
— I/O

Project Background

The data that is most valuable to energy companies includes gas flows and temperatures of the gas when it is being dispatched from the fields. Once the oil company has extracted this data, it will usually transmit the data to the control center via a cellular communications link where the operator can then perform data analysis. However, every time the servers in the control center send a request to the field sites for new data, it will cost the oil company money. One way to avoid the cost of transmitting so much data is to store data at the local site when an event is triggered. Another pain point for the company is that the cabinets they use cannot accommodate a cellular router, a data logger, and a remote I/O due to space constraints. Therefore, a smart data acquisition solution that can provide multiple functions and fit in a limited amount of space will have significant advantages over other solutions.

System Requirements

- GPRS cellular connection
- VPN function
- Event-driven data collection and local storage capability
- Remember the last counter value in the event of power loss
- Alert management
- Class 1 Division 2 ATEX and IECEx certifications, as well as wide operating temperature capability

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Moxa's Solution

The company wanted to deploy cellular communications between gas fields and a control center in order to reduce the upfront infrastructure cost and also increase efficiency. This was achieved by deploying Moxa's ioLogik 2542-GPRS smart remote I/O, which is a 4-in-1 data acquisition solution. Moxa's ioLogik 2500 has a cellular communication module and VPN function that can connect meters and sensors at field sites, as well as transmit data via a cellular connection. Consolidating all these functions into a single device simplifies installation; one compact unit can be placed in the small cabinets rather than trying to fit multiple devices. Additionally, the ioLogik 2542-GPRS can be powered by solar panels, further reducing the total cost of ownership.

The smart remote I/O and the MX-AOPC UA server work together to intelligently manage the data logs by scheduling active messages to be automatically pushed from the ioLogik 2542-GPRS to the SCADA systems at the control center. This smart data acquisition takes place when the I/O state changes or preconfigured events occur, allowing information to be accurately and efficiently pushed to the SCADA system as it becomes available.

To ensure the integrity of critical data, the ioLogik 2542-GPRS has two functions to prevent data loss. The first is a smart remote I/O that allows the company to save I/O tags and serial tags locally in the microSD card at certain intervals to avoid data loss if the GPRS connection fails. If the connection does fail, the company can retrieve data from the FTP to avoid data loss due to the disrupted connection. In addition, the smart remote I/O can also record the counter value of gas wells even when power is disconnected. When power resumes, it can continue counting values based on the last recorded value.

With Click&Go Plus control logic, the ioLogik 2542-GPRS allows the company to easily set up alerts, the data logger, and acquisition mechanisms. Even when deploying hundreds of smart remote I/Os at field sites, the company can still complete the project effortlessly.

Why Moxa?

- 4-in-1 data acquisition solution (data acquisition, Modbus gateway, unmanged switch, and data logger) saves cabinet space and reduces the total cost

- The smart data acquisition mechanism reduces data traffic and cellular data fees

- Requires minimum installation, configuration, and maintenance when compared to deploying multiple devices at the same time

Featured Product

ioLogik 2542-GPRS Series
Smart Cellular Remote I/O with Click&Go Plus

↗ http://www.moxa.com/product/ioLogik_2542-GPRS.htm

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Long-Distance Wireless Communications for Natural Gas Pipeline Monitoring

Location: **U.S.A.**

Application:

Pipeline Monitoring

One of the leading energy companies in the U.S. operates midstream services across several counties in the Eastern states. In order to migrate towards a complete digital oilfield, the company is retrofitting the backhaul portion of the network for pipeline monitoring.
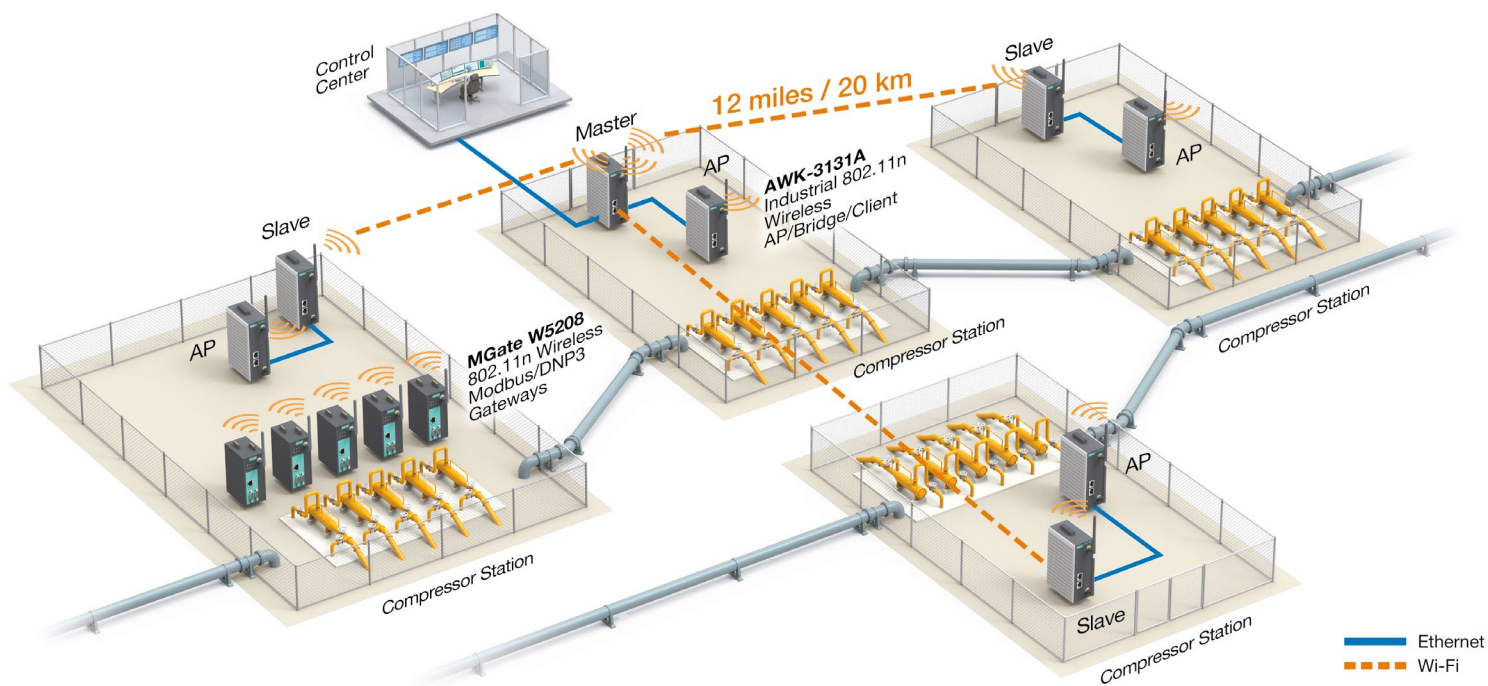
Project Background

There are several compressor stations along the pipeline that are located 12 miles (19.3 km) apart from each other. Each compressor station serves as an aggregation point of the field site, which collects information such as pressure and gas levels from the RTU devices and sensors. To manage the assets from a central location, the company used to deploy a 900 MHz serial radio for its long-distance communications system. However, the radio no longer functions as expected, which makes managing communications from a central location difficult. As the pipeline extends many kilometers away from the control center, the company is looking for a cost-effective wireless solution that can help build a communications backhaul for the compressor stations and the network operation center. In addition, they require a solution that can help aggregate the data from the field sites.

System Requirements

- Long-distance wireless communication capabilities for the backhaul part of the network, the compressor stations, and the network operation center

- Retrieve Modbus serial data through a wireless network for data aggregation

- Class 1 Division 2 ATEX and IECEx certifications, as well as wide operating temperature capabilities

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Moxa's Solution

To build a wireless network backhaul, the company deploys Moxa's AWK-3131A 802.11n AP/bridge/client, which supports Master/Slave mode for wireless bridge connections. One of the challenges when building a wireless backhaul is to avoid interference and ensure reliable communications. The energy company chose to deploy Moxa's AWK-3131A wireless AP because it can operate on the 5 GHz band, which experiences less interference than the 2.4 GHz band. Traditionally, it has been very difficult to achieve smooth transmissions across distances of up to 20 km using the 5 GHz band. However, the AWK-3131A Series uses Moxa's proprietary mechanism to successfully build the wireless backhaul portion of the network. This allowed the compressor stations and the network operation center to communicate smoothly over longer distances.

For field site aggregation, the company deployed Moxa's MGate W5208 wireless protocol gateways to retrieve Modbus data from the field sites and send it to the compressor stations over a wireless connection. As the company previously used wireless communications for data aggregation, deploying Moxa's MGate W5208 wireless protocol gateways avoided incurring the additional cost of building a wired communications network. The data aggregated can be seamlessly transmitted via a wireless connection to the backhaul part of the network. By utilizing Moxa's wireless protocol gateways, the company was able to implement a more cost-effective solution for data acquisition.

Why Moxa?

- Reliable and secure wireless communications across distances of up to 20 km on the backhaul network

- A two-in-one gateway for connecting Modbus serial devices to a wireless LAN, thereby reducing costs and the complexity of the system

- A cost-effective solution for data aggregation as well as developing the network backhaul

Featured Products

AWK 3131A Series
Industrial Wireless AP/Bridge/Client

↗ http://www.moxa.com/product/AWK-3131A.htm

MGate W5208 Series
Industrial Wireless Modbus/DNP3 Gateways

↗ http://www.moxa.com/product/MGate_W5108_W5208_Series.htm

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Building a Modern Drilling Chair to Help Lower the Total Cost of Ownership

Location: China

Application:
Drilling Communications

An oil & gas system integrator that specializes in drilling solutions and operates globally requires a modern drilling chair solution, which includes screen panels and control pads for drillers. The solution must allow the drillers to control and perform drilling in a more comfortable and secure manner.
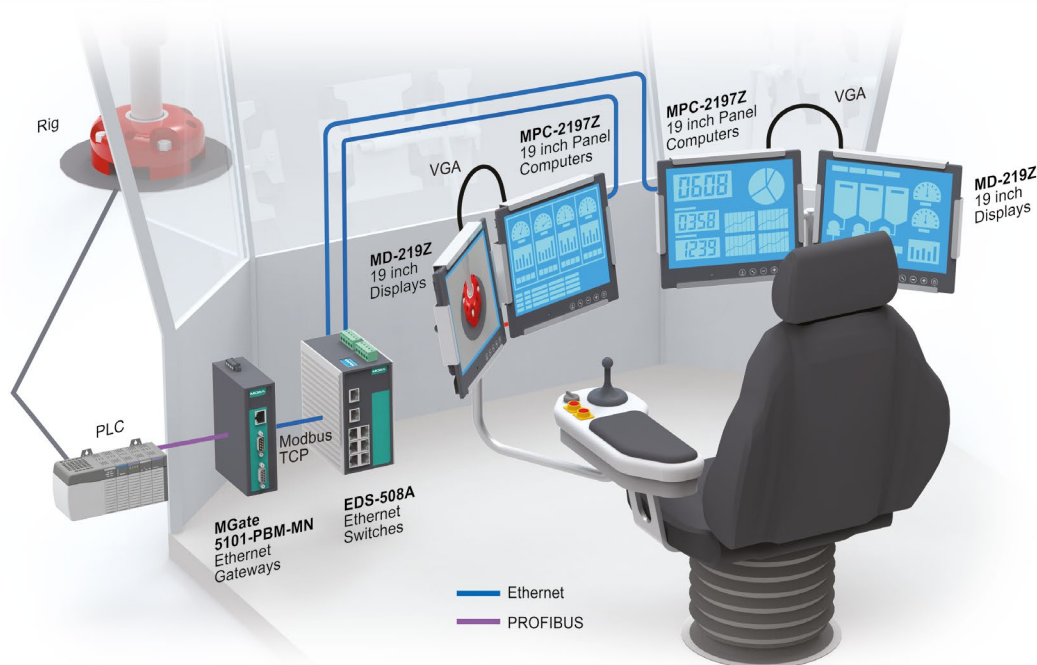
Project Background

The company's previous solution was to show drilling parameters across four displays on the drilling chair. However, the PCs were located in the system control room, which was located about 100 meters away. The PCs in the control room were connected with the displays on the drilling chair via VGA cables, but this resulted in the signal transmission often suffering interference. As a result of this, the reliability and security of the data did not meet the standard required by the company. Furthermore, the performance of the PC and the panel of the previous solution were not designed to meet the needs of digital oilfields, which is a trend that the company is keen to embrace.

To build a drilling system ready for the next generation of devices that will facilitate digital oilfields, the company wants to implement a compact, cost-effective solution that streamlines integration and enhances system performance.

System Requirements

- Panel computers that can replace existing PCs and displays
- High processor performance and more touch responsive panel computers
- PROFINET-to-Ethernet gateways to connect PLCs and computers for seamless data transmission and easy integration
- Class 1 Division 2 ATEX and IECEx certifications, as well as wide operating temperature capabilities

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Moxa's Solution

For many years, Moxa has cooperated with oil & gas service companies throughout the world to deliver innovative solutions. Our complete product portfolio ensures that regardless of the harshness of the oil & gas environment, Moxa has products that can work reliably in these conditions. To increase the efficiency of their current solution and reduce the total cost of ownership, the system integrator removed the two existing PCs at the oil rig and installed two of Moxa's MPC-2197Z touch panel computers on the drilling chair. The two displays that were originally in the control room were replaced with Moxa's MD-219Z displays. Instead of connecting the PCs and displays via VGA cables, the company installed the panel computers on the drilling chair to make it easier for the operator to perform drilling. One of the pain points for the operator when using the previous system was that the metallic frame on the existing displays made it very difficult to touch the screen around the metallic frame where the 'close' button is located. Moxa's MPC-2197Z flat panel computers feature an Intel 3rd generation processor, as well as fast, sensitive multi-touch capabilities that avoid any interoperability issues and enhance operational efficiency.

Another challenge that had to be overcome before the customer could seamlessly migrate to the new drilling chair was protocol conversion. Moxa's MGate 5101 Ethernet gateways played a key role in simplifying this transition as the most commonly used PLC protocol at oil & gas field sites is PROFINET, which is unable to directly connect to panel computers. In addition, Moxa's EDS-508A Ethernet switches were deployed to facilitate data being transmitted smoothly into the rig control system.

After an integrated, networked system had been implemented, the operational efficiency of the drilling chair was successfully enhanced in a cost-effective manner.

Why Moxa?

• Specialized solutions for oil & gas applications

• Lower total cost of ownership

• A complete product portfolio, including products with C1D2 / ATEX Zone 2 certifications

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Featured Products

MPC-2197Z Series
19 inch Fanless Panel Computers

↗ http://www.moxa.com/product/ MPC-2190-Marine-Panel-PC-Series.htm

MD-219Z Series
19 inch Displays

↗ http://www.moxa.com/product/ MD-219.htm

EDS-508A Series
Industrial Managed Ethernet Switches

↗ http://www.moxa.com/product/ EDS-508505A.htm

MGate 5101-PBM-MN Series
Industrial PROFIBUS-to-Modbus TCP Gateways

↗ http://www.moxa.com/product/ MGate_5101-PBM-MN_Series.htm

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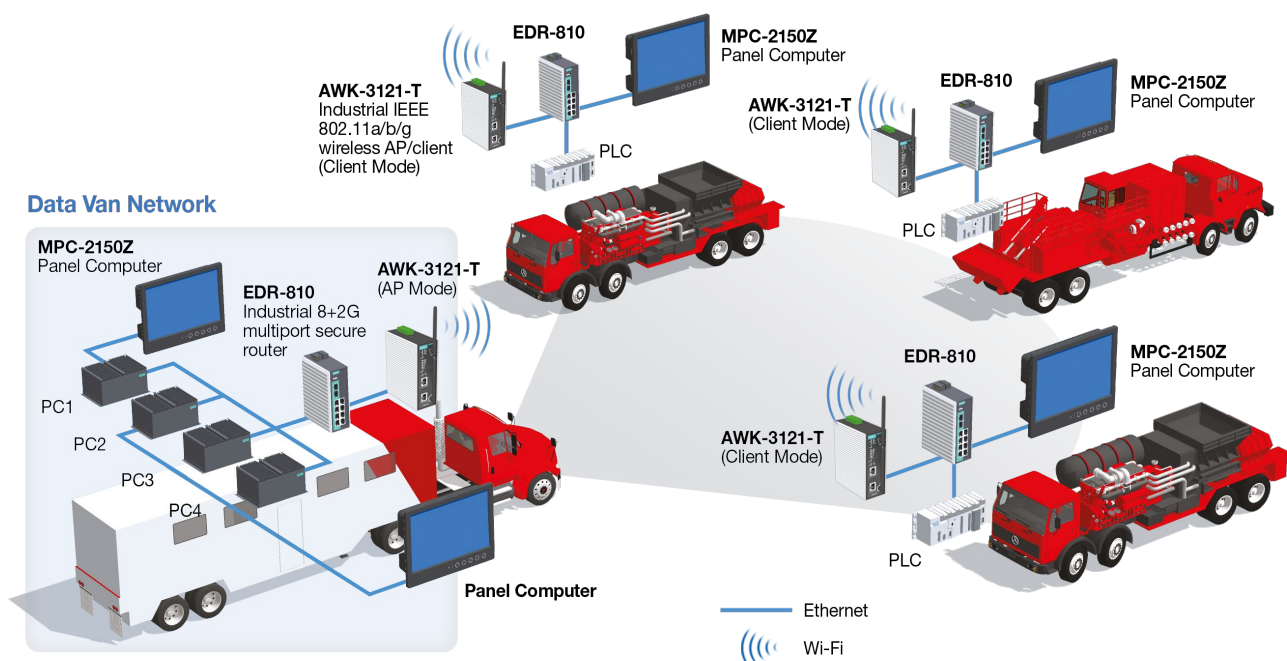Reliable Networks ▲ Sincere Service

Secure Wireless Communications for Connecting Fracturing Trucks

Location: **USA**

Application:

Oil Extraction with Fracturing Trucks

A fracturing service company was seeking a reliable and flexible wireless network that can ensure seamless connectivity for its fracturing trucks to communicate with mobile data vans.

EDR-810

MPC-2150Z Panel Computer

AWK-3121-T Industrial IEEE 802.11a/b/g wireless AP/client (Client Mode)

MPC-2150Z Panel Computer

AWK-3121-T (Client Mode)

EDR-810

PLC

Data Van Network

MPC-2150Z Panel Computer

EDR-810 Industrial 8+2G multiport secure router

AWK-3121-T (AP Mode)

MPC-2150Z Panel Computer

PC1

PC2

PC3

PC4

EDR-810

MPC-2150Z Panel Computer

AWK-3121-T (Client Mode)

PLC

Panel Computer

Ethernet

Wi-Fi

Project Background

Some oil & gas applications require fracturing trucks to extract oil from shale. A fracturing service company has a fleet of trucks that they rent to oil extraction operators. Traditionally, wired cables are used to enable communications between the trucks and data vans at the site, but these cables often break or get cut, and they are very expensive to replace. For this reason, the fracturing service company decided to look into a wireless solution.

The ideal wireless device must provide a reliable and flexible network, allowing fracturing trucks to communicate with mobile data vans that collect data. In addition, a highly secure network that does not limit data transmission bandwidth is required to ensure that critical devices on the trucks and data vans can transmit and receive data error free.

System Requirements

- Must be able to withstand extreme temperatures and hazardous conditions at fracturing sites
- Flexible wireless networks that can replace wired networks
- A secure network for PLC devices to transmit and receive data error free

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Moxa's Solution

Extracting oil at a fracturing site could potentially cause serious damage if the on-site devices are not protected properly. Moxa's AWK-3121-T wireless AP/client and EDR-810-T secure router are compliant with UL/cUL Class 1 Division 2 and ATEX Zone 2 certifications. This means the devices will function reliably in extreme temperatures between -40 to 75°C, making them well suited for oil & gas environments.

Fracturing trucks communicate with a nearby data van to receive and transmit critical data. To streamline the network's transition from wired to wireless, operators replaced their cables with Moxa's AWK-3121-T wireless AP/client to form a reliable and flexible wireless network. Normally, a wireless AP on a data van provides wireless access to several wireless clients installed on fracturing trucks. To ensure continuous wireless communication when the wireless AP on the data van is not available, the wireless clients will automatically negotiate and determine which one will act as the new wireless AP.

A PLC is installed on each fracturing truck to control the oil extraction process. To ensure error-free data communications between the control center and the PLCs, Moxa's EDR-810-T secure router, which supports deep packet inspection, is used to ensure that all of the data packets transmitted and received between the control center and the PLCs are safe.

Why Moxa?

- Compliant with UL/cUL Class 1 Division 2 and ATEX Zone 2 certifications for oil extraction environments

- A -40 to 75°C operating temperature range for outdoor environments

- An auto-configuration function ensures that wireless clients can be reconfigured automatically as APs when the primary AP is not available

- A secure router that supports deep packet inspection to ensure safety-critical data communications

Featured Products

AWK-3121-T Series
Industrial IEEE 802.11a/b/g Wireless AP/Client

↗ http://www.moxa.com/product/AWK-3121_Series.htm

EDR-810-T Series
Industrial 8+2G Multiport Secure Router

↗ http://www.moxa.com/product/EDR-810.htm

AWK-3131A-T
Industrial IEEE 802.11a/b/g/n Wireless AP/Bridge/Client

↗ http://www.moxa.com/product/AWK-3131A.htm

MPC-2150Z Series
15-inch Industrial Fanless Panel Computer

↗ http://www.moxa.com/product/MPC-2150.htm

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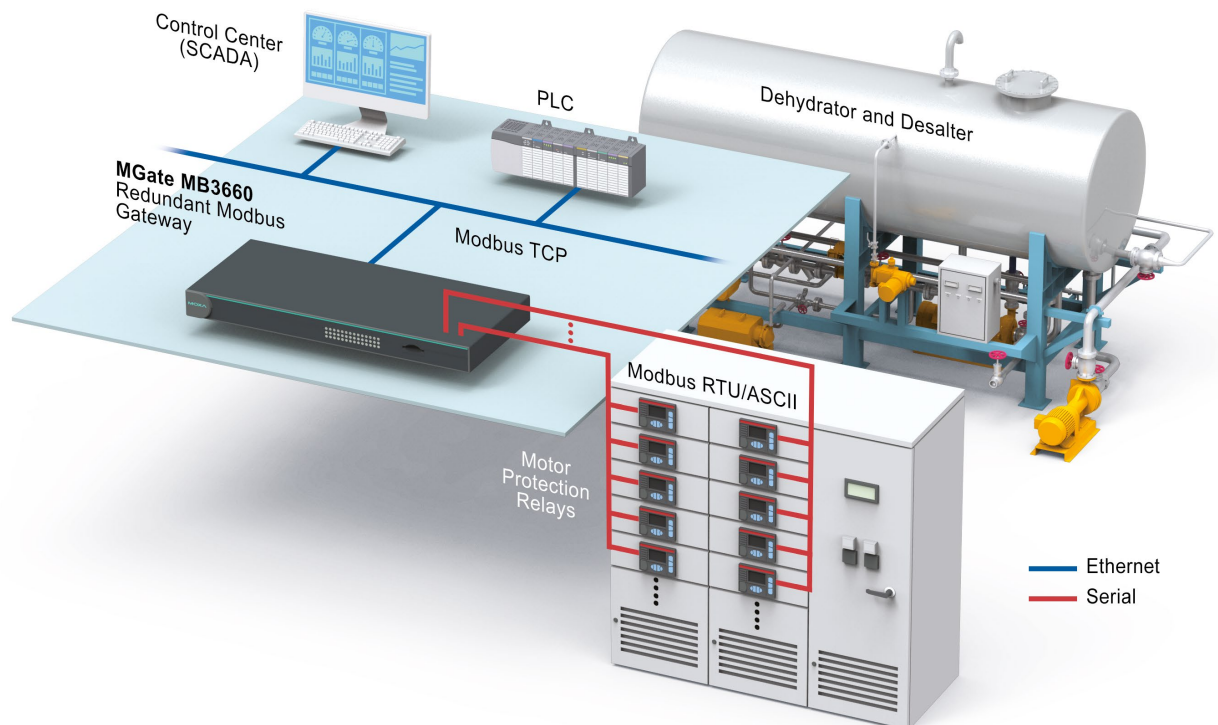**MOXA**®
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Reduce the Network Communications Cost for a Crude Oil Dehydration and Desalting System

Location: **EMEA**

Application:
Crude Oil Processing

A system integrator, who operates around the world globally, is building a network communications system for a dehydration and desalting system. The system consists of multiple motor protection relays. The status of each relay must be monitored to ensure the motors work smoothly and the system can effectively remove undesirable water, salts, and solids from the crude oil.

Control Center (SCADA)

PLC

Dehydrator and Desalter

MGate MB3660 Redundant Modbus Gateway

Modbus TCP

Modbus RTU/ASCII

Motor Protection Relays

— Ethernet
— Serial

Project Background

There are many motor protection relays in one dehydration and desalting system. The relay data, using the Modbus RTU protocol, needs to be sent back to the control center for centralized monitoring. Previously, the system integrator deployed 2-port protocol gateways to connect protection relays one-by-one. This is not ideal when dozens of protection relays are required due to the high cost of equipment as well as installation costs that include powering, cabling, and commissioning. Projects such as these require high-port density protocol gateways that can connect multiple devices.

System Requirements

- High-port density gateways to connect dozens of motor protection relays
- Gateways that are easy to install
- Long product lifecycles to reduce maintenance costs

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Moxa's Solution

To integrate Modbus TCP and RTU/ASCII networks, the system integrator chose Moxa's MGate MB3660 redundant Modbus gateways as part of its network solution for the dehydration and desalting system. The MGate MB3660 gateway (16-port model) can manage up to 496 serial slave nodes, so one gateway can connect at least six motor protection relays that are connected with each other in daisy chains. Even for large networks, the system integrator only has to deploy a few devices, reducing the installation time as well as the total cost of ownership.

Equipped with two Ethernet ports with the same IP or dual IP addresses, the MGate MB3660 protocol gateway can connect the motor protection relays to the same network without deploying additional Ethernet switches. To enable the redundancy mechanism, the system integrator uses two Ethernet ports to simultaneously connect to the control center. Moreover, the MGate MB3660 gateway features a dual power supply, which increases network reliability by ensuring that if one power supply fails, the network will not disconnect.

The high-port density gateways allow the system integrator to provide a cost-effective solution to monitor all aspects of the motor protection relays. This method of deployment means the oil company does not need to deploy as many gateways at the same time. Therefore, they do not need as many IP addresses for their networks and can manage their systems by using the IP addresses that have already been assigned to them.

Why Moxa?

• A complete product portfolio that increases flexibility

• Lowers the total cost of ownership by reducing the upfront cost of purchasing multiple devices, as well as reducing the installation and commissioning costs

• Deploying rugged products with redundancy features to enhance network reliability

Featured Products

MGate MB3660 Series
Industrial Redundant Modbus Gateways

http://www.moxa.com/product/ MGate_MB3660_Series.htm

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Build Communications for Various Protocols in an Oilfield's Power Distribution and Metering System

Location: Russia

Application:
Power Automation for Pipelines

Power automation is essential for pipeline management and is often a pipeline's largest operational cost. Power availability is seen as an essential component and must be available 24/7. In order to increase energy efficiency, an oil company in Russia wants to upgrade its power distribution and metering systems for its oil pipelines.
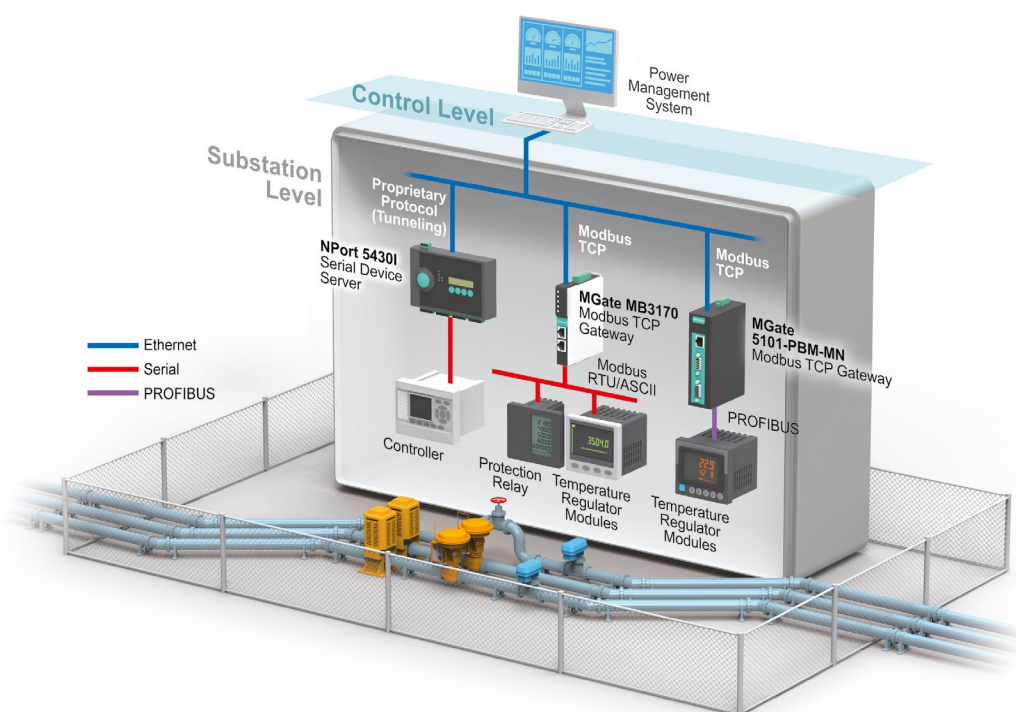
Project Background

In order to monitor and control the power systems in real time, the company needs reliable Ethernet-based networks that connect the field devices at the substations to the control center. The serial-interfaced field devices at the substations use different communication protocols that increase the complexity of transmitting data packets to the control level. In addition, magnetic isolation protection is required for the network devices to ensure reliability.

System Requirements

- An integrated solution that can connect legacy devices with the power management system
- Integration of various communications protocols (including proprietary protocols)
- 2 KV isolation protection to guarantee high reliability
- Class 1 Division 2 ATEX and IECEx certifications, as well as wide operating temperature capability

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Moxa's Solution

The field devices in the power distribution system, such as the protection relays and the temperature regulator modules, use Modbus RTU for serial communications. However, there are also some temperature regulator modules that use the PROFIBUS protocol. Moxa provides a complete product portfolio of protocol gateways to convert various communication protocols on Ethernet-based networks. The temperature regulator modules that use the PROFIBUS protocol are converted to Modbus TCP by Moxa's MGate 5101-PBM-MN protocol gateways. In addition to protocol conversion, the oil company has to connect all the protection relays. Finally, it must also connect the other temperature regulator modules. Moxa's MB3170 protocol gateways can help integrate these field devices with Ethernet-based communications.

At the field sites, some of the serial-interfaced controllers are using proprietary protocols where the precise structure of the data packets is unknown. In this case, the oil company deployed Moxa's NPort 5430I serial device servers to create a transparent tunnel for transmitting packets over the Ethernet-based network. The software installed in Moxa's serial device servers allowed the company to use its existing device utility software for its SCADA system. The result was that devices at the substation level could efficiently integrate to the control level.

Why Moxa?

- A complete serial-to-Ethernet connectivity solution, which includes protocol conversion and allows legacy devices to connect with the new devices
- Easy to use
- 30 years of experience developing serial communications products that can easily integrate different interfaces on networks
- Product longevity and a leader in serial-communications technology

Featured Products

NPort 5430I Series
Serial Device Servers

http://www.moxa.com/product/
NPort_5410.htm

MGate MB3170 Series
Advanced Serial-to-
Ethernet Modbus Gateways

http://www.moxa.com/product/
MGate_MB3170_3270.htm

MGate 5101-PBM-MN Series
Industrial PROFIBUS-to-
Modbus TCP Gateways

http://www.moxa.com/product/
MGate_5101-PBM-MN_Series.htm

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