Wireless Solutions for Upstream and Downstream Applications

Wireless Control Infrastructure for Productivity and Safety Gains in Oil & Gas Applications
Comprehensive Wireless Solutions for Oil and Gas Applications

For more than 30 years, Cooper Bussmann has provided complete wireless monitoring, control, and networking solutions for the oil and gas industry. Our products and solutions are used throughout the world in oil and gas exploration, pipelines, refining and petrochemicals. The Cooper Bussmann ELPRO brand of products has helped the supermajors, global EPC’s, and the largest national authorities improve the management of their assets and operations with our reliable and secure wireless solutions.

We help keep you on top and in control of your operations with Wireless, Ethernet Switching and Network Management Products. ELPRO’s diverse portfolio delivers monitoring and control infrastructure utilized throughout the oil and gas exploration and production process. Our solutions can provide the most fundamental improvement in process automation.

We provide comprehensive solutions for upstream, mid-stream and downstream oil and gas applications. ELPRO industrial wireless mesh I/O, Ethernet modems and industrial grade Ethernet switches meet the demands of rugged, long-distance applications. Our network management system lets you manage your network complexities and the inter-operation of diverse wireless and LAN equipment from one location. Our System Solutions group can work with you to connect your diverse automation systems, instrumentation and controls and integrate your processes.

Ensure Your Long-Distance Operations Stay Connected in the Toughest Environments

Oil and gas represents some of the most demanding environments with unique and challenging communications needs. Oil and gas companies rely on our automation and control technologies to monitor and manage various operational activities including leak detection, cathodic protection, flow measurement, wellhead control and environmental monitoring. Well owners, rig operators, shallow gas producers and exploration companies are using wireless to increase productivity, reduce costs and improve safety.

Wireless Benefits

- **Long Range**
  - Current frequencies allow for 20-50km LOS between clients
- **High Speed**
  - Up to 50Mbps bandwidth
- **Secure**
  - Military-grade security encryption
- **Low Powered**
  - Uses small solar/battery installations
- **Rugged**
  - Weatherproof casing
- **Reliable**
  - Advanced, self-healing meshing technology provides high availability
- **Easy Deployment**
  - Deploys more easily and can be redeployed more quickly when compared to wired installation
- **Cost Effective**
  - Lower install costs and longer, faster equipment uptime
Wireless Applications for Cathodic Protection of Pipelines, Bridges, Wellheads and Tanks

Owners and operators of oil fields and offshore rigs face continual challenges in asset productivity and operational efficiency. Wireless networking infrastructure is the facilitator to provide increased safety and productivity in environmentally challenging applications. Wireless flow, pressure, level, temperature and valve position monitoring are used to streamline pipeline operation and storage while increasing safety and regulatory compliance. Wireless solutions can effectively manage pipeline corrosion, a growing problem for the aging pipeline infrastructure that can lead to leaks, emissions and even deadly explosions in production facilities and refineries.

Using wireless connectivity, secure extraction of data acquisition from wellhead monitoring devices can be transmitted to a central control room or multiple stations at once for quick and easy analysis. As a result, operators can respond with actions that will reduce or eliminate well downtime.

Many fields are not occupied locally, so there is a need to maintain the local security and alert authorities to compromises and potential dangers. Video surveillance through wireless connectivity can feed back to management facilities. By monitoring and recording in real-time mode, operators can more quickly respond to a security breach.

"Wireless Sensor Networking (WSN) has emerged as a key technology for accelerating oil and gas exploration and advancing the latest extraction techniques."

ON World, Global Technology Research Firm
Fuel Interface Detection
Magellan Midstream Partners owns the longest refined petroleum products pipeline system in the U.S. They transport a variety of products such as gasoline, diesel, jet fuel and also own a number of terminals. Generally, the same pipeline will transport multiple products. For example, after a batch of gasoline has entered the system, it would be followed by a batch of diesel fuel. The interface of two fuels will usually consist of a small percentage of mixed products referred to as transmix. The storage terminal must know when the next type of fuel is about to arrive so they do not pump diesel into tanks storing gasoline, for example, as well, divert the transmix into a separate tank.

Approximately one hour ahead of product arrival at each terminal, Magellan has installed density meters, also called interface detectors. The interface detectors are designed to alert terminal operators of the impending arrival of a different fuel type. The interface detectors have a 4-20mA output that is wired into an ELPRO 905U-1 multi I/O wireless radio transceiver. At the terminal is another 905U-1 outputting that signal.

Prior to knowledge of ELPRO’s solution, Magellan used analog leased telephone lines. Some sites had also used 450MHz licensed radios, but these also had fees associated with them, and were therefore costly in the long term. 900MHz frequency hoppers from ELPRO resolved the issues with fixed frequency radios and leased lines. The solution provided a wireless alternative to expensive wiring. This solution has proved so successful that Magellan is using ELPRO radios at every opportunity to replace leased lines and other brands and types of radios at new and existing IFD sites. In addition to interface detection, Magellan also uses ELPRO radios in tank farms for tank pump control and tank gauging.

Tank Radar Level Alarm
An oil refinery fitted ELPRO wireless gateways to its tank radar level gauges. ELPRO was chosen because of the gateways’ ability to connect to a wide range of different level gauges, each using different field bus protocols. The ELPRO gateways also connected directly to the tanks independent high-level point alarm. The wireless tank farm system formed part of a plant-wide wireless information system, utilizing ELPRO’s efficient peer-to-peer WIBnet wireless communications. The system also formed part of the plant energy management system, and OBL alarm monitoring system.

Problems Solved
Achieving improved productivity, reduced costs, and increased safety with wireless.

Pipeline Monitoring and Control
The probable causes of pipeline failures are corrosion and leakage. An operator of a long oil pipeline was trying to prevent costly corrosion, leaks, and litigation. Undetected failures of the protection system can lead to expensive corrosion and leaks. Therefore, a solution was needed to provide monitoring and control capabilities across extended distances.

ELPRO single I/O wireless transmitters were implemented to monitor the performance of its cathodic protection system. The cathodic protection actively suppresses pipeline corrosion by injecting electrical currents into the pipeline.

The ELPRO wireless units monitor the injection current at the active injection sites, and also monitor pipeline voltage at points between injection sites. Hundreds of these measurements are transmitted to a SCADA computer providing an indication of system performance and early alarm of system failure. The ELPRO units are powered from a small compact alkaline battery, powering down between measurements to extend battery life to 3+ years. Multiple wireless repeater units extend the wireless range to cover the complete length of the pipeline.

The combination of ELPRO low-power small I/O count wireless modules, ELPRO protocol interface gateway modules, the pipelines cathodic protection system and a SCADA system were used to monitor/control the health of the long pipeline. The cathodic protection system actively suppressed pipeline corrosion by injecting electrical currents into the pipeline and the SCADA system provided supervisory control/data acquisition of field information at the control room to avoid costly corrosion, leaks and litigation. The battery powered ELPRO low-power devices delivered not only wireless communications but the injected voltage to the cathodic devices as well. Hundreds of measurements were able to be transmitted to a SCADA computer via wireless gateway repeaters and on to the SCADA system.

The Cooper Bussmann wireless Oil and Gas solution provided the wide-ranging monitoring/control needed for the long pipeline. The new system can now prevent pipeline failures caused by costly corrosion and leakage.
**Proven Wellhead Monitoring Solutions**

**Variable Oil Wellhead Monitoring**

**Problem:**
PEMEX, the Mexican state-owned petroleum company, needed a secure and reliable solution to connect numerous WirelessHART™ field devices from remote oil wellhead sites over long distances to their control system. Monitoring temperature and pressure variables in various fields of oil extraction across long distances was well beyond the capabilities of WirelessHART networks.

The land in the fields of PEMEX onshore oil extraction is challenging, making wiring complicated, and, as there are more than 30,000 additional points, the extraction task is even more difficult. The 1,420 WirelessHART gateways needed wireless Ethernet long-haul connectivity for remote locations or installations spread over large distances.

**Solution:**
ELPRO deployed a 900MHz long-range meshing Ethernet network to solve the problem. The Cooper Bussmann ELPRO 945U-E Industrial Ethernet modems provided secure, reliable, high-speed data connectivity for PEMEX over very long distances. Installed devices are capable of reading pressure and temperature in each of the “Christmas Trees” and they integrate into a long-range wireless network within the assets of PEMEX oil extraction.

**Results:**
Previously, PEMEX had to hire teams by area within the oil fields for monitoring the pressure and oil temperature. These variables affected the extraction yield which was reflected in many millions of dollars. With this ELPRO solution, monitoring of all these variables from a control center was possible with more detailed control of variations. ELPRO provided an effective solution that allowed PEMEX to take advantage of WirelessHART field devices without the cost and time required for a traditional wired/fiber solution.

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**Coal Seam Gas Wellhead Monitoring**

**Problem:**
A major coal seam gas supplier in Queensland, Australia needed a wireless control infrastructure. The site can accommodate an expansion to 12M tonnes of LNG a year, subject to demand and had extensions of QGC Assets from several hundred wells to several thousand wells.

**Technical Requirements:**
- Ethernet Modems capable of approximately 10km range
- 900MHz or lower frequency range very strongly preferred (i.e. not 2.4GHz)
- Any module to be able to be a repeater due to the nature of the terrain
- Poll system with maximum 30 second poll cycle time
- Meshed RF System to avoid problems with point-to-point failures
- Peak data rate requirement of 2.5Mbps (point to point)
- AES encryption required
- Over the air configuration and diagnostics required
- Firmware upgradeable over the air highly desirable
- Network Management Software
- RS232 and RS485 ports highly valued

**Solution:**
ELPRO radios were selected and integrated into RDC500 standardized wellhead. The radio design uses a network consisting of wireless access point repeater sites. Each site collects gas flow, pressure, temperature, water flow and can shutdown valves or pumps.

**Results:**
Wireless is able to provide up-to-date production data, provides shutdown capability, lowers the requirement to be onsite and improves personnel safety. One of the world’s largest wireless mesh networks is now in place with several hundred wellhead sites in a field that will expand to 12 million tons of LNG annually.
End-to-End Networking Solutions

Network Connectivity and Management

Wireless Product Portfolio

Information: Monitor. Optimize.

Controller: Integrate. Extend.


Sensor: Smart. Diagnostics.

“900MHz frequency hoppers from ELPRO resolved issues with fixed frequency radios and leased lines at new and existing IFD sites. The solution provided a wireless alternative to expensive wiring.”

Magellan Midstream Partners

Major Oil Refinery improves compressor station monitoring productivity from 5:1 to 50:1. “Given the skilled worker shortage, we really are doing more with less, with wireless.”

Director of Process Engineering
For more information:
Please visit our website for further details or contact your local representative.

North America & Latin America
5735 W. Las Positas, Ste.100
Pleasanton, CA 94588, USA
Telephone: +1 925 924 8500
elpro-sales@cooperindustries.com

Australia, New Zealand
Cooper Technology Centre
Suite 2.01, Quad 2, 8 Parkview Drive
Sydney Olympic Park, NSW, 2127, AUSTRALIA
Telephone: +61 2 8787 2777
elpro-sales@cooperindustries.com

Europe
Melton Road
Burton-on-the-Wolds
Leicestershire, LE12 5TH, ENGLAND
Telephone: +44 15 0988 2600
elpro-sales@cooperindustries.com

Southeast Asia
2 Serangoon North Avenue 5
# 06-01 Fu Yu Building, 554911, SINGAPORE
Telephone: +65 6645 9888
elpro-sales@cooperindustries.com

China
955 Shengli Road
East Area of Zhangjiang High-Tech Park
Shanghai, 201201, CHINA
Telephone: +86 138 1763 6001
elpro-sales@cooperindustries.com

For more than 30 years, the Cooper Bussmann ELPRO brand of products have provided complete wireless monitoring and control solutions to the industrial market. Offering a comprehensive range of industrial wireless products, global technical support and over 100 technically qualified partners worldwide, Cooper Bussmann is a market leader in industrial wireless technology today. With numerous solutions deployed worldwide in process, instrumentation and automation applications, ELPRO has a solution for your application need.

www.cooperbussmann.com/wireless

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