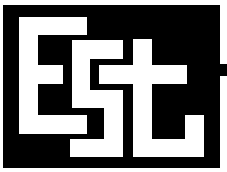

APPLICATION PAPER

Wireless Networking for Offshore Oil Platforms

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Oil exploration and production is a costly and complex business. The constant need for petroleum products requires oil producers to maximize output from all areas of their pumping and transportation facilities. Competition from foreign oil companies further increases demands for increased efficiency from domestic producers. This demand for increased productivity has required oil producers to automate production platforms to ensure continual pumping and transportation processes are carried out safely and economically. By implementing a wireless network, multiple automated platforms can be controlled from a central location. This results in a reduction of personnel needed to monitor the individual platforms and allows small, unmanned single pile platforms to be operated and controlled from a manned platform.

Overview

As the demand for petroleum products increase, so does the supply. Unfortunately, this oversupply has driven down the price for a barrel of oil. In spite of the low price for oil, exploration is conducted to locate major deposits or, previously overlooked pockets of oil and gas in developed oil fields. For example, the oilfields in the Gulf of Mexico are considered to be a "mature" area, meaning most significant deposits have been located and developed. Recent innovations in technology such as three-dimensional seismic imagery and improved deep water drilling capability are generating renewed interest in this area. Three-dimensional imagery is able to provide increased detail and can show the location of missed pockets in existing oil fields, and can also better define salt deposits under which oil and gas are located. These salt deposits are located in relatively shallow water (150-400 ft) which makes them more economical to work than a deep water site. In the deeper water off the Gulf of Mexico, numerous very large deposits have been reported, and improvements in exploration and drilling technology are increasing the depth at which oil may be extracted. Most past production has taken place at depths of less than 1000 feet, but recently, larger companies have co-operated on deep-water projects and have developed production wells at depths in excess of 3000 feet. Current exploration drilling is taking place in areas where the ocean depths are in excess of 6000 feet and plans are in place to construct shipboard drilling rigs capable of operation in water depths exceeding 10,000 feet.

Additional incentive to pursue deep water Gulf of Mexico oil production comes in response to legislation passed in Congress. The1995 *Deep Water Royalty Relief Act* lowered the royalties paid on new wells drilled between 1995 and the year 2000 on federal leases in the central and western Gulf, in waters deeper than 656 feet. This act also lowered royalties for operators of existing wells who could not expand production without reduced royalty payments.

Oil and gas companies have been working the oil fields in the Gulf of Mexico for over 50 years. This has resulted in large amounts of infrastructure in the form of drilling platforms, production platforms and associated pipeline to transport the oil and gas to onshore locations. As various oil fields become depleted, a means for abandoning the facility in a clean, orderly fashion is required. This is regulated by the Department of Energy's Mineral Management Services, which has more closely monitored the process in light of increased environmental concerns. In some case's, a facility may be sold to a smaller producer hoping to extract the remaining oil and gas, and use the existing transportation infrastructure to get the product to the market.

Platform Automation

The offshore environment is a difficult place to work. Wind and waves can increase damage inflicted by the corrosive salt spray. Structures installed will require continual maintenance and upkeep. Weather is also a factor in production platform operation. When high wind and sea conditions or a hurricane approach, platform operators must be evacuated to prevent injury or loss of life. While platform maintenance and upkeep can be rescheduled around weather considerations, it is highly desirable for the platform to operate around the clock until the deposit is completely extracted. When pumping operations cease, not only is production lost, but nearby competitors may also be pumping from the same deposit, resulting in a loss of raw resources.

To enable continuous production, most repetitive, labor intensive operations such as opening and closing valves,

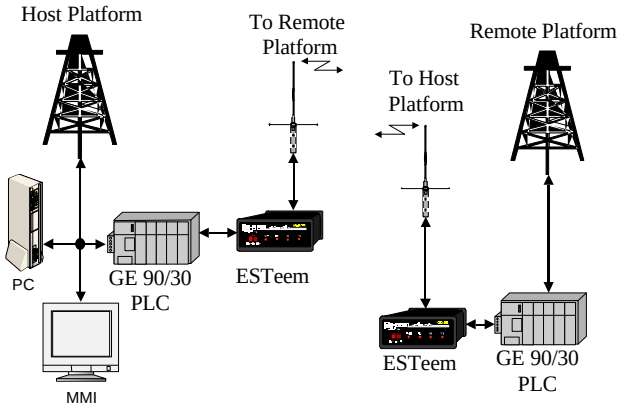

Figure 1: Site Diagram

monitoring tank levels and performing transfer functions are performed by programmable logic controllers (PLC's). The gains in efficiency realized by automating a single platform are multiplied by automating other platforms and linking them together. By using a specific platform as a control point to monitor other platforms, staffing requirements are reduced. With non-networked unmanned platforms, the only method to determine production status required personnel to travel to the platform via boat or helicopter and physically inspect the platform. Inspection is required to verify that the platform is operating and has not "shut-in" (stopped pumping). Not only is this a source of recurring costs, but it can also result in platforms sitting idle until manually restarted. By networking the platform, personnel at a central control point can monitor status, restart platforms that have shut-in, and adjust control parameters to maximize production. There are several choices for connecting automated platforms.

- Satellite or cellular telephone with telephone modems.
- Hardwire via cabling.
- ESTeem Wireless modem.

The first approach is possible but not optimal because phone lines are scarce and usually reserved for critical voice communications. The second choice, hardwiring, is not usually an economical solution. The third choice, an ESTeem Wireless modem, is the cost-effective solution. A network comprised of narrow band ESTeem Wireless modems can provide a private radio network capable of secure data transfer.

Wireless Networking in Action

Mike Kimball of Bayard Engineering Corporation (BEC) was tasked with automating two oil platforms to create a point-to-point Supervisory Control and Data Acquisition (SCADA) network. The platforms are located in the Gulf of Mexico approximately 20 miles apart and are required to operate 24 hours a day 7 days a week (see Figure 1).

At the host platform, Mr. Kimball chose GE Fanuc® Series 90/30 PLC's to perform control and data acquisition functions. A Personal Computer running WonderWare® Man-Machine Interface (MMI) software is used for operator control, and ESTeem® Model 96C Wireless modems link the host platform to the remote platform (see Figure 2).

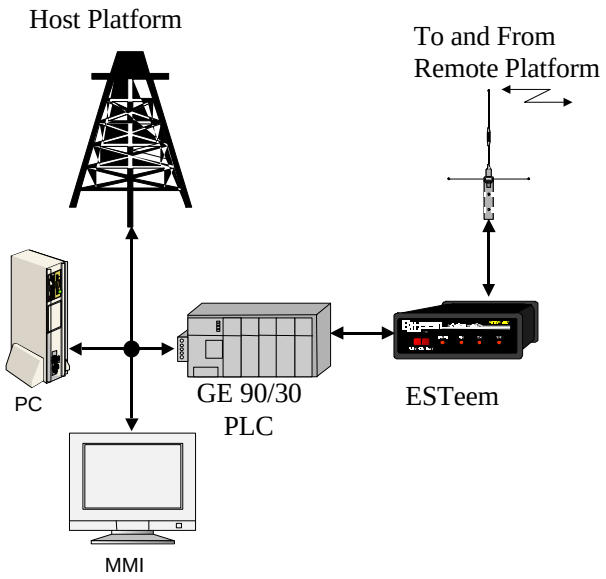

Figure 2: Host Platform

At the remote platform, a series 90/30 PLC is also used for control and data acquisition. The PLC communicates with the host platform via an ESTeem® Model 96C Wireless modem (see fig. 3).

The PLC, MMI and ESTeem wireless modem are the components forming a point to point SCADA network between the oil platforms.

Implementing a Wireless Solution

Requirements for installing a wireless system are not complicated, but attention to detail during installation is critical. A radio site survey, which includes a site walkdown, spectrum analysis, signal strength measurement between nodes and polling tests to verify connectivity, is highly recommended. A Site walkdown

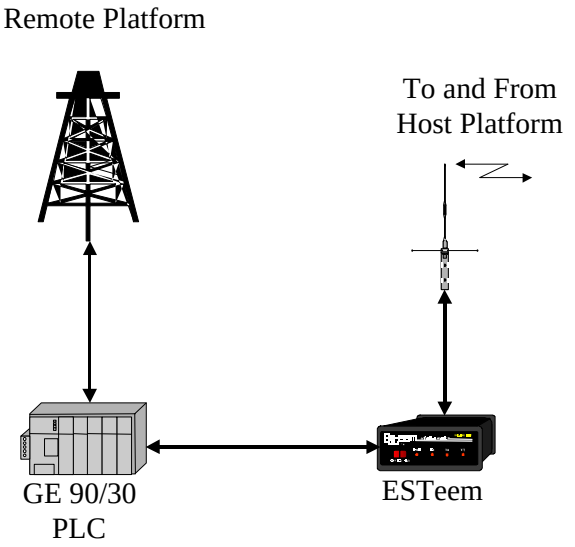

Figure 3: Remote Platform

will determine the best antenna locations and determine any line of site obstructions. Spectrum analysis will pinpoint an operating frequency to license for best system performance and identify any frequencies that are unusable due to interference or other radio systems in use. Signal strength measurements are taken at each node to verify the node will communicate in adverse conditions and quantify the effects of any line of site obstructions. Polling tests will be conducted over an extended timeframe to verify connectivity and check for intermittent interference.

Conclusion

The oil industry is costly and competitive. Efficiency in all aspects of production is essential. Automating production platforms, and networking the platforms together minimize recurring costs for labor and equipment. The clear choice for connecting automated platforms is through the use of the ESTeem Wireless modem.