LONMARK® INTERNATIONAL

CASE STUDY

Fort Benning Saves Energy with Wireless Control of Outdoor Lights

Fort Benning, GA, continues to update its Energy Management and Control System to improve system performance and reliability and, ultimately, to save on energy costs. A wireless controls system was initially installed as part of the EMCS at Fort Benning in the mid-1980s to allow operations personnel to manage electrical load shedding during times of peak energy demand. Since that time, the EMCS has expanded to include hard-wired, Ethernet-based direct digital control systems as well as state-of-the-art bidirectional wireless controls.

The new wireless control system provides operations and maintenance personnel with information and data needed to remotely monitor and control outdoor lighting systems, such as those at physical training fields and school crossing lights, as well as monitor building mechanical systems. The EMCS currently uses hard-wired, networked and wireless control systems to monitor and control various heating, ventilation and air conditioning systems and lighting systems throughout the post.

The Old

Fort Benning recently upgraded from the Dorsett Infoscan 2000 wireless FM control system to a wireless controls system that provides for bidirectional communications capabilities. The Infoscan 2000 system was installed in the 1980s to turn on and off school crossing lights, field lights and the HVAC for various buildings. The system included a control room server with the controls software application and an operator work station.

All control functions originated from the EMCS control room via the Infoscan 2000 server. The control software communicated via custom designed and fabricated printed circuit boards to a high power transmitter that operated in the UHF range.

An antenna mounted on a water tower broadcasted the unique codes generated by the control system to the receivers located at the lights and buildings. One antenna served the entire post.

Simulated status feedback was displayed in the EMCS control room. Lights on a panel board would indicate that a code was transmitted, but there was no feedback that the system or device being controlled actually turned on or off.

The Infoscan 2000 system components located in the control room consisted of antiquated components and software that could not be upgraded without replacing the entire system. Based on its age, it was determined that one or more of the components was about to experience a catastrophic failure. As it turned out, about four months after installing the new wireless control system, the Infoscan 2000 server failed.

The New

The new wireless control system uses bidirectional transceivers that receive and transmit data. These transceivers use the LONWORKS protocol to communicate between a local LONWORKS controller and the EMCS control room server. The data stored on the server can be seen by any work station at Fort Benning that has an authorized user ID and password.

The new system operates in the 900 megahertz frequency range implementing frequency-hopping, spread spectrum technology and data encryption standards. The transceivers operate as a transparent device on the control system network without residing as a “node” on the network. The LONWORKS wireless transceivers are AIC Wireless model WLD-900.

The Main Components of the Wireless Control System Include:

Enterprise server – Control room computer server containing the archived data from logs created by local web servers (building controllers). The enterprise server contains control system interface software that allows the EMCS operator to monitor the system, observe alarms and turn on and off the lights. The server can also be programmed with schedules for the lights.

Ethernet network – Used to allow the building controller to communicate with the enterprise server. All user-manipulated control communications flow through the network.

Building controller – Contains the program and schedule to turn on and off the lights. The building controller will operate even if there is an outage of the Ethernet network or enterprise server. The building controller communicates via a twisted-pair cable with LONWORKS controllers and a base station transceiver for

wireless communication with other remote wireless clients and client networks.

Base station transceiver – Provides interface between the hard-wired LONWORKS controls system and the remote-mounted transceivers. The base station exchanges information and data with multiple client transceivers. Information exchange is wireless via antennas located at both the base station and the client transceiver.

Client transceiver – Located at each device or network that will be controlled via the system. Information and data is exchanged wirelessly between the client transceiver and the base station transceiver. The client transceiver is hardwired via twisted-pair cable to a local LONWORKS controller.

LONWORKS controller – The controller contains stand-alone logic that operates and monitors lights, a natural gas flow meter and an electricity totalizing meter. The controller can be configured with a number of input types, including an analog input so that an analog value – natural gas flow rate or electric meter total flow – can be continuously transmitted via the system back to the central control room enterprise server.

Repeater station – A repeater station is used for those applications where a client transceiver cannot communicate with the base station due to distance or other obstruction. A repeater comprises two WLD-900 radios wired back-to-back via twisted-pair cable. One of the transceivers is addressed as a client to the base station while the other is addressed as a new base station to communicate with other remote clients.

The retired Infoscan 2000 wireless control system operated much like an FM radio and was powerful enough so that the signal could be picked up almost anywhere on post, including indoors. The new LONWORKS wireless control system is capable of operating in non-line-of-sight situations. However, extended ranges require line of sight between transmitter and receiver.

The transceivers typically have a range of a mile or so, but this can vary based on topography and obstructions. In one application at Benning, the transceiver is communicating about three miles between a natural gas meter station and a repeater that then transmits another three miles to a base station.

It is possible that a hill, structure, or even a tree could block the transceiver from receiving the transmitted signal. For most applications at Fort Benning, a high gain directional antenna was required to communicate between the client transceiver and the base station.

Advantages

Since the new wireless system has the capability for bidirectional communications, the local panels were designed to provide status feedback for the controlled devices, typically lights. Alarms are provided in the EMCS control room on the operator control station if the operational and command statuses of associated logic control points are different. If the lights are on when they should be off, or off when they should be on, the control system will provide the EMCS operator with an alarm.

Another significant advantage of the new system is that it can be used to transmit analog and pulse signals in addition to digital, discrete signals as required for on-and-off control of a device. Basically, the wireless system can be used in most any application where a hard-wired control cable is used.

The wireless control system was initially installed at Fort Benning to control only the school crossing, field and basketball court lights. The system has since been expanded to continuously monitor from the EMCS control room the chiller status and the natural gas and electricity use rates. For the natural gas and electric meter installation, pulses are transmitted so that a flow rate and total flow can be determined in the EMCS control room.

The Fort Benning wireless control system currently has four base stations and four repeater stations that cover most of the post. This system controls lights at 12 school crossings and 13 fields and courts. It is estimated that Fort Benning is saving about US$200,000 annually in electricity by using the wireless system to remotely turn on and off the field and basketball court lights.

It is anticipated that the wireless system will continue to grow at Fort Benning for those control applications where it is not economically feasible to install a hardwired LONWORKS or Ethernet network.

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