Wireless takes control

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Holcim (US) Skyway plant in Chicago, Illinois, USA, is the first cement plant to use a secure broadband wireless system for its slag transport system, a vital area of plant operation. Wireless systems are finding their way into critical areas of plant operation for wire replacement. Engineering systems through free space is possible once the security and performance barrier is overcome. The traditional approach of utilising wire and fibre to connect remote areas will continue where wireless becomes compelling and with broadband capabilities, building for one application creates an infrastructure that can be used to provide a number of other services.

The security of a wireless system needs to be better than wired systems. It can create virtual circuits that can connect remote areas of the plant and overcome barriers. The use of mesh infrastructure can consist of multiple virtual circuits that are different for each plant or different parts of a plant as long as the security is implemented at Layer 2 of the OSI model.

Then, just like the wired network, areas of the plant can have multiple IP subnets to provision multiple services such as HART, VoIP, IP video, remote maintenance, and active ethernet I/O. Each of these services is available on range of different IP addresses yet all sharing a common media without wires.

It becomes compelling that a project to connect an instrument can be a step to provision multiple IP services. Holcim (US) has been first to undertake this approach to provide plant-wide coverage via a broadband wireless system. The wireless system can extend existing DCS or PLC systems though the use of Active ethernet I/O. Discrete, analogue, or serial signals can be converted to ethernet which has been used in SCADA applications for a long time.

The use of active ethernet I/O may require the use of interposing relays or analogue isolators to translate voltage levels or provide impedance matching but once again this in not uncommon. The commonality is the use of IEEE 802.3 ethernet which has been an industry standard for communications including wireless systems. The confidences in the use of wireless to be reliable, secure, and scale to provide plant wide coverage and easy to use is now available in a product called "Wave Relay™".

The Wave Relay wireless router met all of these requirements to provide a robust, highly secure, wireless infrastructure that was easy to use. Each of the equipment could then be linked just like connecting to a wired network. The same considerations are there as far as administration is concerned. Each of the available services is administrated via a web browser or an application that can scan the network and locate all equipment on the same subnet. The remote access to equipment over the wireless links provides flexibility for maintenance and plant operations. It also allows the plant to move things around without concern of where wires are run and eliminates digging trenches and obtaining permits.

The Holcim (US) Skyway plant in Chicago uses Wave Relay and active ethernet I/O to replace the existing wiring for their incoming feed system. This system is critical for plant operations since the day bin used to hold material for grinding has to be refilled every four hours otherwise the plant will have to stop operation. The wireless system made it easy to bridge the distance and the Wave Relay system provides links on the 2.4GHz and 5GHz bands for spectrum redundancy. The active ethernet I/O can be administrated over the wireless link without opening the panels that house the equipment to monitor or status of I/O. Logic operations are not performed in the active ethernet I/O hardware.

The present direction of the industry is away from proprietary systems to use of industry standard ethernet and web browsers that make use of IP to pass traffic. Remote I/O can be passed via MODBUS TCP to web servers for display on HMI or to remote controllers. The use of ISO/OSI Layer 2 encryption with a hardware accelerator and Layer 2 switching provides high performance for use in industrial plants. The expectation of end-users is that the wireless system should operate the same as if they were on the wired network. Point solutions are fine where appropriate but they are usually much slower. There is, however, a need to bridge multiple spectrums including 2.4GHz and 5GHz seamlessly as well as other spectra as they become available. This can be accomplished with a Layer 2 device. No special security software or knowledge is needed. Simply plug-in an ethernet device and it can join the network. There is no central server for security or systems administration. The wireless system can be upgraded from any location simply by uploading the change and the change will be replicated to all nodes simultaneously. The wireless system provides a mesh network that as more nodes are provisioned for whatever purpose, it builds infrastructure and fault tolerance into the system. The cost savings of not having to run wires or downtime to run conduit and pull wire is significant. This is good news for the budget. The use of wireless has proved itself by allowing the plant to provision new capabilities even while the plant is in operation and installed during brief periods when equipment is available for tie-in.

The use of free space as a means to provide new capabilities, or upgrade an existing system in an industrial plant can be realised through the use of a secure wireless broadband network. The use of broadband wireless with the right capabilities can provide real-time converged services for plant-wide operations, including control as demonstrated at the Holcim (US) Skyway plant in Chicago.