



P3 hot standby master station

At first glance, wireless network control and its application to valve actuation might not impress many plant engineers as being an earthshaking technological development. Yet, because of the tremendous cost savings that can result, the benefits associated with its adoption can be dramatic – an evolutionary achievement that is likely to change the process plant landscape for decades to come.

A Recent Installation

A large wastewater treatment plant in the USA faced a significant problem. It needed to retrofit actuators that controlled scum skimmers on several aeration tanks. Originally, the actuators were hardwired to the control room through a conduit that was embedded in concrete. To hardwire the actuators for network control, the plant was presented with two very expensive options. The first was to demolish the existing concrete structure to install new conduit and then refinish. The second was to run external conduits on the

surface of the structure. However, in order to avoid trip hazards and other health and safety issues, all external conduits needed to be clear from walkways. Therefore, any new conduits would need to be located along the edge of the aeration basins. If that option was selected, the basins would have to be decommissioned during installation.

In both cases the plant faced considerable costs. With an average distance of over 100 metres from actuator to control room plus the associated cost of decommissioning the tanks during construction, the estimated cost to run the new wiring was in excess of \$1.5M.

The plant therefore decided to install the Pakscan P3 wireless solution, which was achieved at a small fraction of the estimated cost of the hardwiring options. In addition to eliminating the need for control wiring, another major benefit gained is that the wireless-equipped actuators can now communicate vital actuator data logger information to the host control system.

How It Works

Introduced in 2009, the Rotork Pakscan P3 wireless network control

system was one of the first wireless valve actuator control communication systems to be launched. It is a further development of the Pakscan two-wire digital control system used in thousands of plants throughout the world today. Simply stated, the system establishes a secure wireless mesh network that is used to control actuators and other field devices throughout the plant and to gather important operating data for asset management and preventative maintenance from the connected MOVs.

The wireless system consists of three main hardware components:

A Pakscan P3 master station fitted with a wireless interface module, which is typically connected to the plant's control system using industry-standard Modbus protocol over either a serial or Ethernet connection.

A Pakscan P3 wireless coordinator module, which can be mounted, either indoors or outdoors, up to 200 metres away from the P3 master station and which functions as the base station for the system's robust mesh network.

A wireless actuator module installed in each actuator on the wireless network.

The wireless system operates on the license-free, globally recognized 2.4GHz ISM (Industrial Scientific and Medical) frequency band and has a line-of-site operating range of approximately 30 metres indoors and 100 metres outdoors. Up to 60 actuators can mesh with a wireless coordinator. In a Pakscan wireless mesh network, each actuator

on the network can act as an independent router to help signals get to their intended destination. A correctly designed network will be configured to provide two or more paths between each actuator and the wireless coordinator. Therefore, if the normal traffic route is blocked or if a hardware or communication failure should occur,

it can be overcome as the network dynamically determines an alternate route for the data to travel.

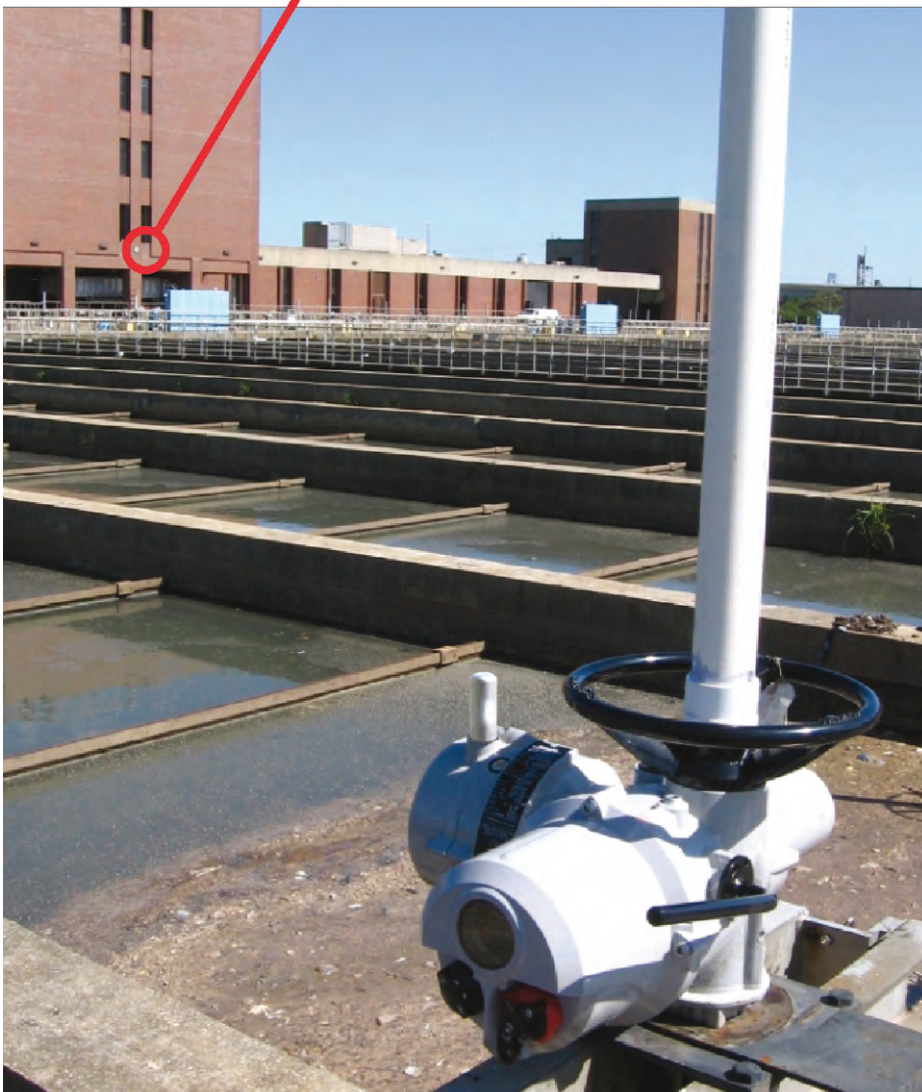
In such a network, privacy and security are high priorities. To prevent unauthorised commands being sent to devices over the wireless network, all control data is encrypted using the Advanced Encryption Standard (AES). Additional encryption is incorporated into the system to prevent unauthorised devices joining the network and to prevent a message replay attack. Another important feature is that the Pakscan P3 master station offers users the choice of fully wireless, fully wired, or a combination of both wired and wireless capabilities. This means an existing Pakscan P3 user can add a wireless segment to an existing wired installation using the existing master station.

All in all, the wastewater plant personnel report a high level of satisfaction with the wireless system's performance and are especially pleased with the low cost of installation.

When is Wireless Control feasible?

The first step before deciding to introduce wireless actuator control is to contact Rotork to schedule a wireless site survey.

Rotork works with the customer to establish the locations of the new actuators and physically test signal strength between all nodes. The overall topography of the site is important in order to maintain a reliable mesh network (a network that allows multiple communication paths to and from each actuator). In some instances wireless repeaters will be recommended to overcome wireless black spot areas. Also, it is important to check other active wireless signals in the area to ensure that the system will co-exist with other equipment.



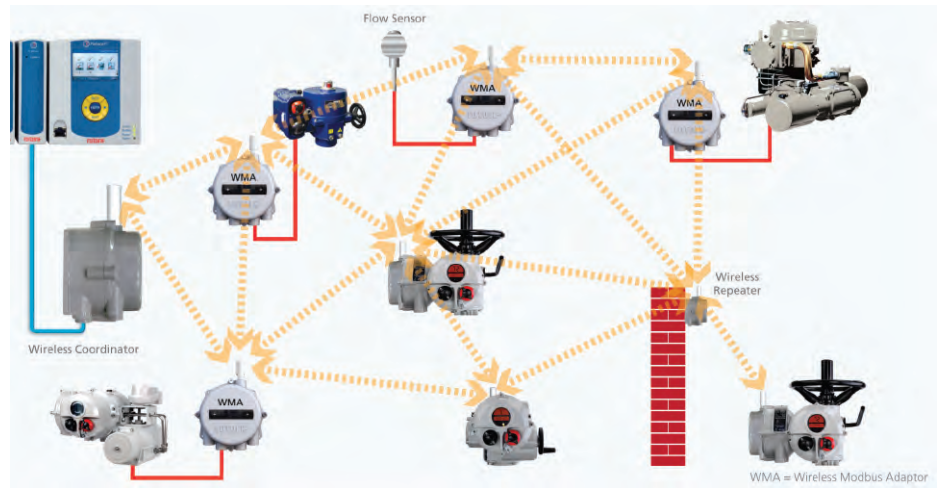
Wall mounted coordinator and deep cover mounted router actuator module

Wireless: The Future Is Now

New and existing plants across a wide spectrum of various process applications can benefit from the many advantages that MOV wireless network control offers.

Most important, there is no reason to wait to implement such a system. Reliable, robust, and secure wireless systems are available today that can save a plant a significant amount of money in installation costs as well as provide a stream of vital MOV data to the control room that can help to improve asset management and predictive maintenance capabilities for increased plant productivity and efficiency.

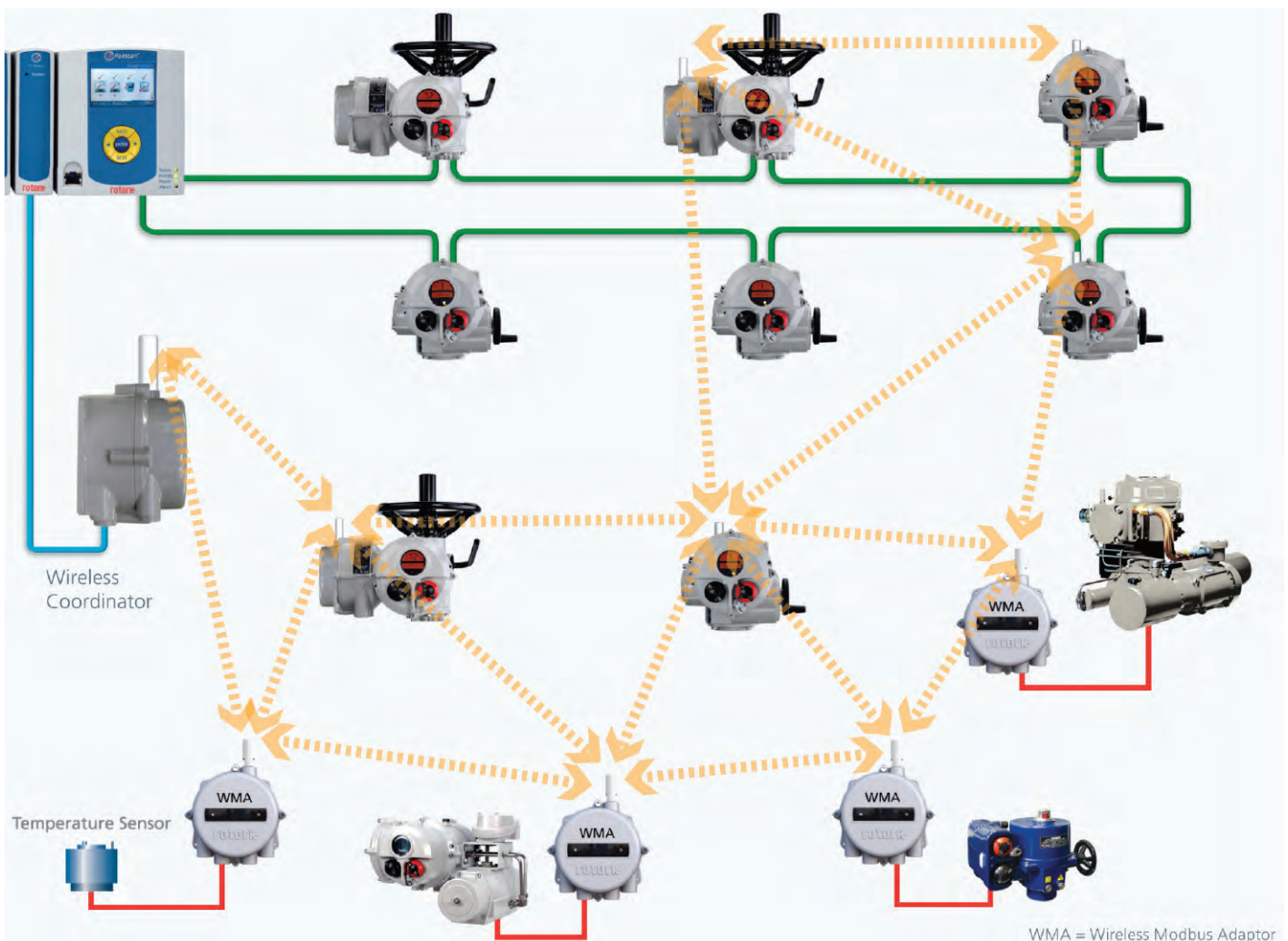
Virtually any type of facility that has a need for communication between the



Pakscan P3 Wireless only network.

plant's control system and MOVs located inside or outside plant walls can benefit greatly from wireless communication. Oil and gas refineries and terminals, electric utilities, water and wastewater treatment plants, pulp and paper manufacturers and chemical processing

plants are just a few examples. Most important, dependable, field-tested, wireless valve actuator network communication is available now, so the time is right for forward-thinking plant operators to consider adopting it when planning retrofits and new installations.



Combined Pakscan P3 2-wire (green) and P3 Wireless network including wireless monitoring of wired actuators.



IQ actuator with wireless router

Background

Many traditional processing plants were configured decades ago and have physical limitations that often make it difficult and cost-prohibitive to connect MOVs into the facility's control network. Specifically, until the mid 1980s, each MOV required an extensive amount of wiring together with associated conduits.

Then, about 25 years ago, the situation changed with the introduction of two-wire digital networks, which eliminated the need to individually hardwire each actuator into the control system. By introducing field control units (FCUs) inside each actuator, a network of actuators was able to be more easily

connected using a daisy chain configuration, thereby saving significant costs on wiring and conduits.

Apart from remotely opening and closing the valves, the two-wire network (so-named because the cable used to connect each actuator is a shielded twisted pair) configuration is able to transmit large amounts of actuator asset management data back to the control system. With Rotork Pakscan, this is performed by means of a master station, which constantly polls all of the actuators on the two-wire loop for status updates. Then, the host control system reads the data stored in master station address registers for each node (FCU) on the control loop.

However, there are many cases when even running a two-wire network might be too costly and difficult. In Rotork's experience, for example, at some old plants the original conduit was buried within the concrete structure and has long since rotted away or become moisture laden. The only option is to replace everything with new materials, and the cost of doing that can be prohibitive. The new wireless technology offers a relatively easy and practical way to connect valve actuators throughout the facility's environment to the plant control system, especially in areas where hardwiring actuators for network control has been impractical in the past.

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