

Actuation & networks – Digital control goes wireless

A major valve automation upgrade performed by Rotork's Mexican office at a large petroleum tank farm has taken advantage of simplified installation, reduced costs and increased functionality offered by wireless flow control.

Almost 300 Rotork IQ3 intelligent electric valve actuators now installed in the plant are connected to 16 Pakscan Master Stations via wireless monitoring and control networks. Wireless Pakscan is a development of Rotork's well established wired Pakscan system, designed specifically for valve actuators and environments typically associated with oil, gas and petroleum installations. Wireless Pakscan eliminates virtually all the costs associated with the installation of network cabling, whilst enabling an increased level of information from the actuators to be communicated over the wireless network. The system also prevents potential automation and communication failures resulting from cabling problems.

Digital control goes wireless

The wireless system consists of three main hardware components:

A Pakscan 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 wireless coordinator module, which can be mounted, either indoors or outdoors, up to 200 metres away from the Master Station (further if standard fibre optic converters are employed) and which functions as the base station for the system's robust mesh network.

A wireless actuator module installed on each actuator on the wireless network. Utilising the internationally accepted licence-free 2.4GHz frequency the Pakscan wireless network card gives the user access to all the standard data available from the wired system, together with the diagnostic and asset management information stored by the actuator datalogger and configuration files. It allows easy extraction of these files, which is otherwise downloadable locally, using hand held tools.

The wireless system enables an available field device count of up to 300 for each Master Station, and has a line-of-site operating range of approximately 30 metres indoors and 100 metres outdoors. The use of meshing and repeaters further increases the range to individual field units.

In a wireless mesh, each actuator on the network can act as an independent router to help signals get to their intended



Figure 1: Almost 300 Rotork IQ3 intelligent electric valve actuators now installed in this plant are wirelessly monitored and controlled.

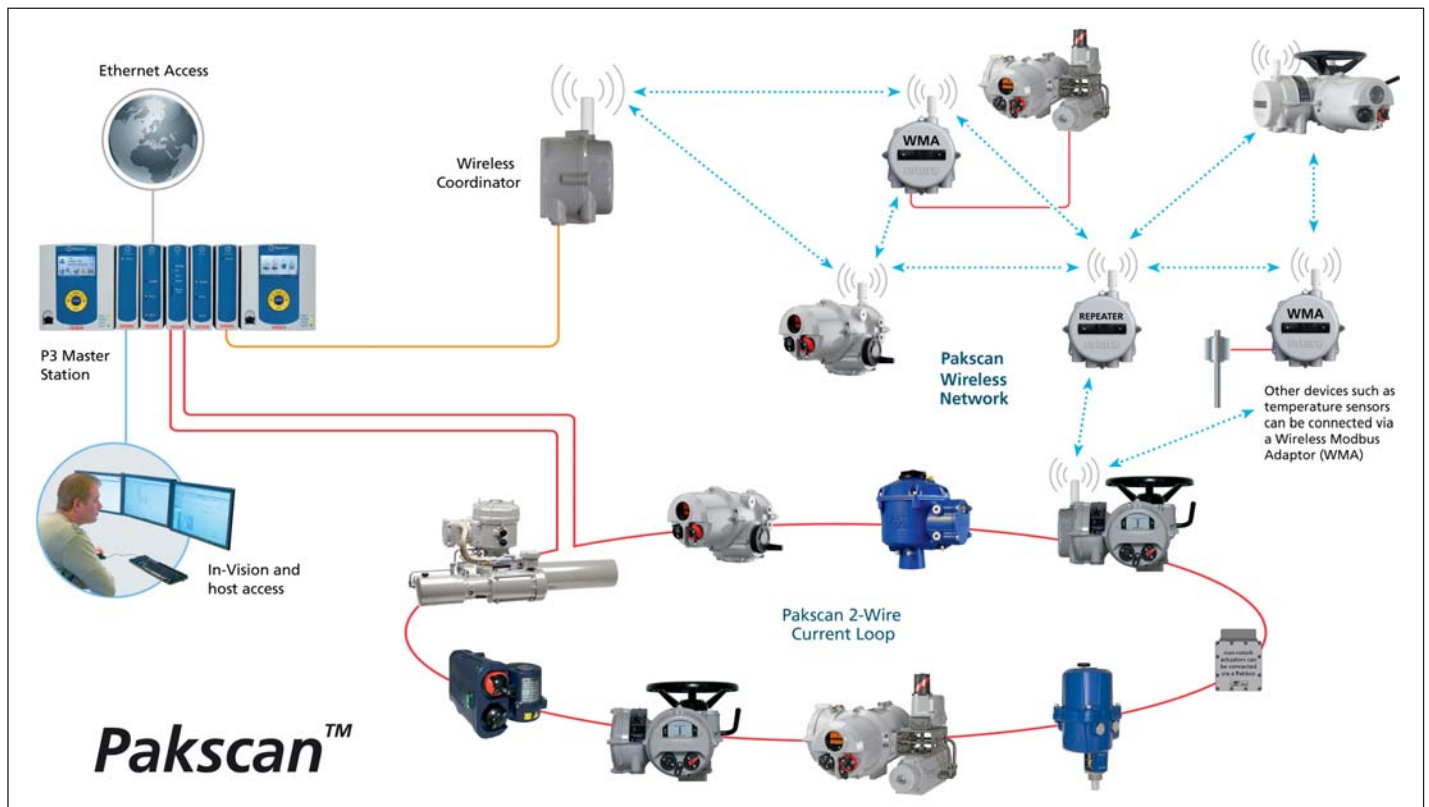


Figure 2: Schematic of Pakscan wired and wireless control networks. The schematic illustrates how either or both can be connected to the same Master Station.

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. This self-healing network mimics the loop-back capabilities of the established Pakscan two-wire loop.

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.

Third party devices can be incorporated into the wireless network using the Rotork Wireless Modbus Apapter (WMA). In this scenario the commands from the supervisory control system are routed directly through the Master Station to the third party unit.

Wireless monitoring and control can provide benefits for new installations or retrofit projects. Typically, the most obvious benefits are significant cost and labour savings that result from the elimination

of cables, conduits and the work required to install and maintain them. The ease of wireless installation also allows for a reduced start-up phase for a project, meaning that the plant can be operational in less time than for a wired network. Wireless is generally suitable for plants of most sizes and its inherent flexibility makes it easy to expand a small network. There can also be benefits in adding a wireless network to existing wired installations. For example, the modular nature of the system allows the user to have the choice of a fully wired loop for control and monitoring, a fully wireless control and monitoring system or wired control with wireless monitoring.

When considering wireless for monitoring and control or for monitoring only, it is recommended that a site survey be conducted in advance of installation. Tools and software are available to assist with a site survey and provide survey technicians that can inspect a potential site for possible problems specific to a wireless installation and make recommendations to overcome them. One of the most important things to check is the viability of reliable wireless communication between field units and the control room. Some situations may require a site trial in addition to a survey to make sure wireless technology can meet special demands.

The benefits of wireless flow control can be summarised as follows:

- Removal of cable and wiring installation costs
- Elimination of potential wiring issues
- Easy installation
- Reduced commissioning and decommissioning times
- Easy to expand and easy to retrofit on existing plant
- Highly reliable and secure data transfer
- Mesh configuration for increased network availability
- Elimination of wires, bundled cables, junction boxes and marshalling panels
- Lower engineering costs

Conclusion

Wireless technology has proved to be reliable, secure, and cost effective. Whilst it is true that some applications may not be suitable for wireless control, virtually every plant manager should become familiar with the technology and carefully consider its use when the time comes for a major upgrade, a new installation, or simply extending an existing system. It works well and can result in substantial cost savings and productivity benefits. In fact, the installed cost benefit of wireless technology is too appealing to be ignored whenever a new or retrofit installation is under consideration.