Wireless monitoring and control – where did it come from and where is it going?

Fig 1 – Because actuators are situated in the critical areas of plant operation, the information that they provide is especially valuable for gauging the health of the process.

The benefits of digital network monitoring and control systems are widely acknowledged. Reduced cabling complexity, reduced installation costs and the desire to obtain increased levels of information from the plant have all contributed to the development and adoption of the technology since the second half of the twentieth century. With the introduction of its first Pakscan system in 1984 – designed specifically for valve actuators - Rotork has always been a pioneer in this field.

By Shelley Pike, Rotork

The emergence of open systems aimed at the broad spectrum of plant equipment accelerated the process. Assisted by the addition of asynchronous communications, on top of the synchronous or cyclic process data, the emergence of enhanced device description files in the 1990s based on EDDL and FDT technology in the early 2000s enabled the creation of a standardised mechanism for interfacing to field devices over differing control systems. This allows one platform to access diagnostics and status information along with configuration services across differing network systems. By the turn of the millennium, these developments were dramatically improving data accessibility between the control room and the device, whilst the range of data available was reaching the point where asset management was becoming possible. Historical operating data logging, combined with diagnostic software programmes, introduced the possibility of predictive maintenance, reducing the reliance on traditional over-cautious routine maintenance schedules.

Where it is now

The introduction of wireless is a logical progression of the continuous development of network systems. It brings with it many additional functional benefits as well as further reductions in engineering, installation and maintenance costs.

The addition of wireless systems to conventional networks can increase the ability to monitor and interrogate the field units whilst a stand-alone wireless mesh network facilitates control, enables plant monitoring and the capture of data from the field at low cost.

These monitoring and control functions have added significance due to the proliferation of data available from today's intelligent actuators, which have also been continuously evolving and developing.

Because actuators are situated in the critical areas of plant operation, the information that they provide is especially valuable for gauging the health of the process. The collection and analysis of all this information can therefore make a vital contribution to users' abilities to manage their flow control assets, maximise efficiency and reduce the cost of ownership.

It has long been recognised that the full potential of this high level of information is limited by the amount of data accessible through conventional wiring, meaning that preventative maintenance, involving the

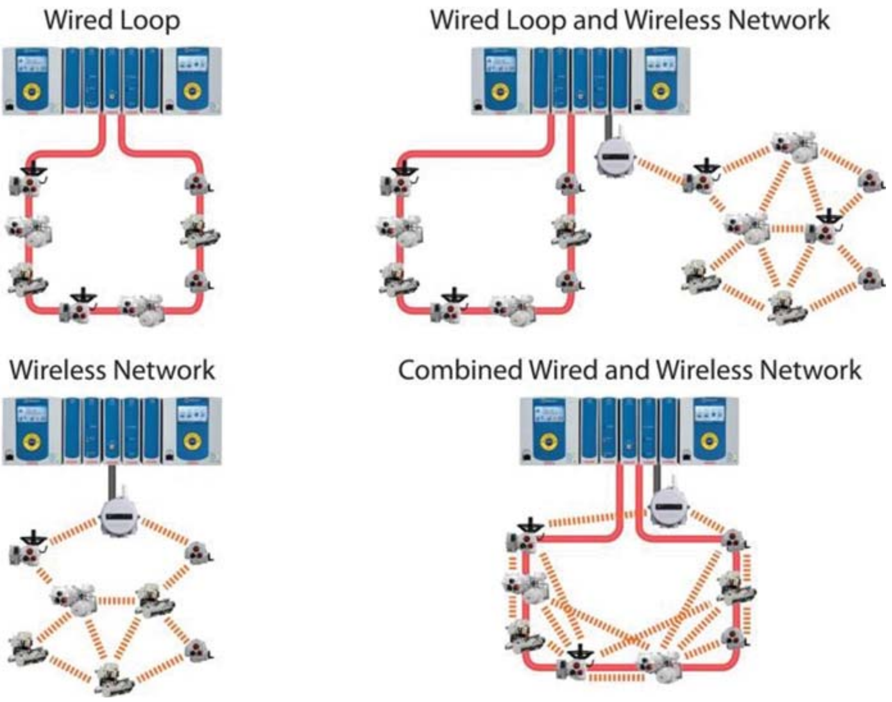

Fig 2 – Wired and wireless network combinations.

manual checking of devices, would still be required in these environments. However, the development of networks, both wired and wireless, now means that all this data is available for the generation of predictive maintenance, with the inherent benefit of optimum plant utilisation and the ability to identify and repair potential breakdowns before there is an unplanned interruption to the process. Making the plant more available improves the flow of production, creating more profitability.

Rotork's IQ3 intelligent actuator technology, applicable to electric and electro-hydraulic actuators, incorporates the industry's most comprehensive menu of operating and diagnostic data, designed to support asset management and refined with the benefit of feedback from the field over a period of twenty years.

The actuator indication window is the focus of attention for setting operational parameters and displaying valve, actuator and process information in real time directly at the actuator. This display can include menu driven setting information, current and historical status, process performance and diagnostics. For example, changes to the valve operating torque characteristics can be displayed, traced and identified. There is ample space to store all this information in the actuator's expansive datalogger.

Looking in more detail at the data that is provided for predictive maintenance purposes, the valve and actuator usage log incorporates a record of total turns, average torque, total operations, total motor run time and maximum starts per hour. This information is supported with data for time-stamped alarms and user selectable limits for high torque, high-high torque and number of torque trips. The full event/error log records time-stamped commands and basic alarms, whilst all alarms are independently recorded in the error log. The torque profiles provide valuable information on the condition of the valve. Data stored in the actuator includes the latest and average profiles and the valve seating profiles. This is supported by trend log profiles selectable from 24 hours up to 5 years together with logged data on temperature, starts per hour and average positions. In this context Namur NE107 helps the operator by enabling the selection of the most important alarms from a list of 32. For each

Fig 3 – The actuator indication window is the focus of attention for setting operational parameters and displaying valve, actuator and process information in real time directly at the actuator.

alarm, one of 4 categories of importance can be selected, ranging through Failure, Out of Specification, Function Check and Maintenance.

For positive identification, a full description of the actuator (virtual nameplate, hardware, installed software and installed options) is also stored and can be displayed. This is complemented by information about the valve, encompassing the type, size, manufacturer, installation date, serial number, tag number, service temperature and location. If fitted, the same data can be included for any second stage gearbox. The logged data is completed by the inclusion of details of the service history including factory acceptance date, commissioning date, last inspection date and service notes.

This information is all available at the actuator and downloadable using the hand-held setting tool for transfer to a PC running Insight 2 diagnostic software. It is also downloadable over the Pakscan wireless network, so the user can perform the operation without leaving the control room, saving the time and the expense of visiting many individual valve installations on large sites, or actuated valves in remote or hazardous locations.

Each Pakscan network, wired or wireless, is supervised by the Pakscan master station, which links the plant network with the SCADA, DCS or other controlling element. Information transmitted over the Pakscan network is stored in the master station in the LTD (Long Term Datalogger) module. The information monitored and recorded by the LTD can be saved for future reference and gives total visibility of every command and status update for every Pakscan device on the network. This information can be used as part of the asset management function. In addition, Rotork's Invision software is designed to operate with Pakscan and is generally used as a local operator control panel and a maintenance and diagnostic tool.

Where is it going?

As well as improving the ability to capture the information from the plant, wireless technology also provides increased flexibility and opportunities for ensuring that it is used in the most effective way. The ability to objectively analyse this information and identify the key areas that are important for each individual site's specific requirements is an essential requirement for effective asset management. Rotork Site Services already provides this function as an integral part of

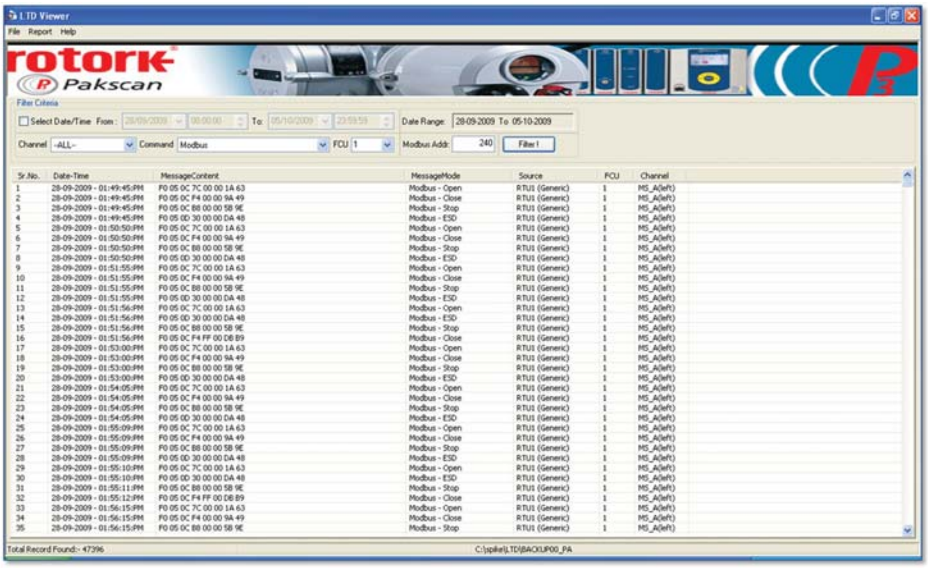

Fig 4 – The information monitored and recorded by the Long Term Datalogger can be saved for future reference and gives total visibility of every command and status update for every Pakscan device on the network.

its Client Support Programme and its value can be gauged from figures provided from customers' own information, showing an average 20% reduction in valve and actuator related problems and a 30% reduction in maintenance costs in the first year for plant operators adopting the service.

Currently this aspect of the service involves a visit to the site in order to collect the data from the network, but options to further enhance the service include a direct link between the master station and Rotork Site Services via the internet or the cloud. This will introduce real-time direct access to all the dataloggers on the wireless network by the asset management team, improving the ability to provide a responsive, efficient and economical service. For example, direct access could be particularly beneficial during the early stages of the programme in order to build up an accurate picture of future maintenance and replacement part requirements, bearing in mind that on the same site there can be dramatic differences between the operating frequencies of different actuators which would need to be identified.

In fact there are numerous advantages resulting from a Client Support Progamme with remote 24/7 access to the field units. For example, this level of direct access would enable alarms and notifications from individual field units on the network to be immediately notified to the support team, enabling a precise response and swift elimination of the potential problem. Actuators programmed with operating parameter alarms would be able to communicate with the team only when necessary, enabling plants to run with enhanced efficiency with peace of mind for the operators.

Overall, direct day-to-day access will make a huge contribution to the achievement of the goals of best practice asset management. These include the avoidance of unpredicted downtime and the protection of investments through optimised maintenance, with support tailored to match the criticality of individual devices. Well maintained and functionally useful equipment has greater value to the operator's business, enables employees to spend less time on maintenance and more on productivity, thereby protecting the operator's commitments to its own customers. By association, greater awareness of technology upgrades enables equipment lifecycles to be maximised, further increasing the return on investment.

Fig 5 – The ability to objectively analyse information and identify the key areas that are important for each individual site's specific requirements is an essential requirement for effective asset management.

About the author

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Shelley Pike is Systems Sales Manager for Rotork, providing worldwide technical support for all the company's network systems products. Shelley, who has a degree in electronics engineering, originally joined Rotork as an engineering apprentice and was promoted to her current position in 2008. Shelley plays a key role in the development of Rotork's network products and has been closely involved with the introduction of the wireless Pakscan system.

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