Fast network control for valve actuators

Reliable and comprehensive data communications are essential elements in the modern process plant. Plant managers demand more information, more quickly than ever before. Process operators must have the ability for full control at all times, 24 hours a day, 365 days of the year. Maintenance managers need the information required for efficient asset management.

By Shelley Pike, Systems Sales Manager, Rotork

To meet these information requirements, design engineers incorporate field communication networks to enable every piece of critical plant to be controlled and monitored by Distributed Control System (DCS). The DCS often utilises multiple systems that are assigned to management, operational and maintenance tasks, exchanging data about the equipment and process under their control.

In this scenario, the Rotork Pakscan system provides the essential link between the valve actuator and the supervisory controller. Pakscan is a complete field network control system, comprising a Master Station and field network devices linked via a fault tolerant redundant highway. The Master Station is the interface between the host Modbus system and the field devices, performing the functions of running the field network, data aggregator and viewer and managing the host Modbus database.

The Modbus database presented to the host is independent of the field network protocol, giving a common open industry standard interface to the host for process control information. Around the world more than 150,000 field units are connected to Pakscan networks, delivering robust and reliable plant monitoring and control in many industry sectors.

Speed is important

Essential capabilities for the modern network include security, built-in redundancy, the ability to monitor and report status changes within a defined time, detect and isolate faults and communicate alarms to the supervisory system to enable identification and mitigation. Speed plays an important role in all these functions. Building on thirty years of experience in the field, Rotork has now introduced its next generation Pakscan system, bringing with it a P4 Master Station and ultra-fast Plus field network.

The Plus network operates at communication speeds of up to 15 Mbit/second using the highly noise immune SHDSL telecoms protocol. Each Plus network can connect up to 300 field devices with a distance between each
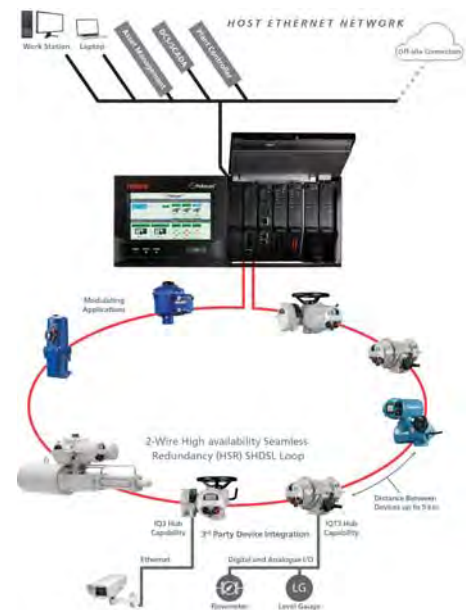

Figure 1: Schematic of Pakscan P4 network configuration. High Availability Seamless Redundancy (HSR) is designed to provide maximum availability. A network speed of up to 15 Mbit/second enables fast response to command signals and reporting of device status and alarms. It can also handle high data load transmissions of device configuration and historical data logs, without affecting the important plant process data. Pakscan is designed for economical installation and minimum cost of ownership. The single twisted pair cable or wireless network reduces installation engineering effort and associated costs and further economy is enabled by long wired loop network lengths without external repeaters or network biasing and termination. Installation and commissioning without specialist software reduces downtime and contributes to improved productivity.

device of up to 5 km, resulting in network lengths which can extend over hundreds of kilometres. The ultra-fast, full-duplex, two-wire network enables full modulating positional control of process valves as well as on-off isolating valves. Enhanced speed of data collection is achieved by having up to six individual messages on the highway at any time, facilitating far faster scan times than existing networks.

Redundancy to the internationally recognised High Availability Seamless Redundancy (HSR) standard ensures instant isolation of any loop fault, without loss of data, allowing continued operation of the plant if a fault occurs. Along with single and dual configurations, the P4 Master Station can be supplied in a hot standby configuration where all interfaces are duplicated, providing the highest level of availability.

Master Station with user interface

Figure 2: – Pakscan P4 Master Station.

On the P4 Master Station, a large touch screen display provides a multilingual user interface to enable device setup, interrogation and issue resolution. NAMUR standard diagnostic icons and colouring are used for easy recognition of status and alarms, whilst navigation around the screens is enhanced by having identical screens for both the in-built web pages and the integral touch screen, each using the same menu structure. A dedicated service Ethernet port maintains Local Area Network (LAN) separation between
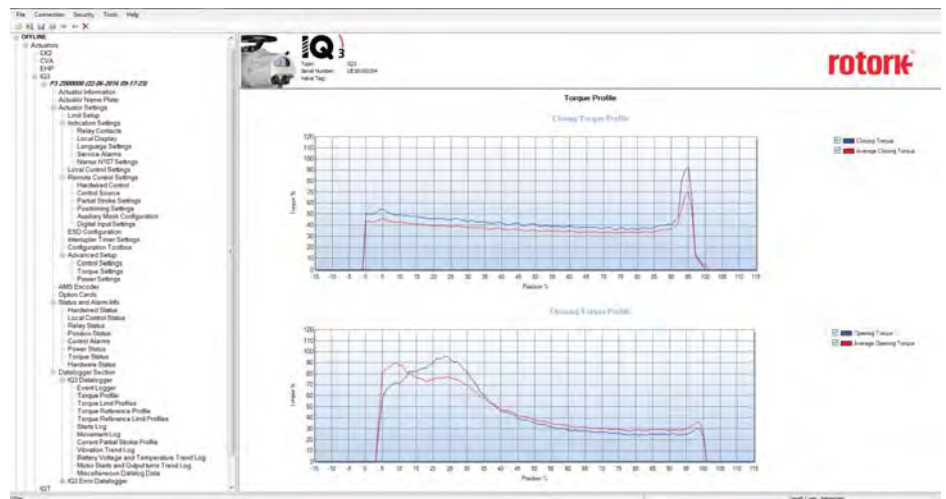

Figure 4: Insight2 computer screen, in this case showing valve torque profiles.

configuration or monitoring systems and the systems for controlling the process. The ability to connect the P4 Master Station to multiple hosts is facilitated with a fully pre-configured database, providing integration with proven communications to all major DCS and PLC suppliers via the Modbus TCP/ RTU protocol. The touch screen display also allows stand-alone operation in the event of unavailability of the host.

Pakscan is specifically designed for valve actuators and the spacious environments which typify actuator installations. On the network, actuators or General Purpose Field Control Units (GPFCU) can also be used as digital or analogue I/O hubs, providing the interface to connect to other actuator types and additional plant devices such as pumps and flowmeters.

Asset management and datalogging

Access to plentiful device data optimises the scope for predictive maintenance and asset management, at the DCS/PLC, the asset management system or at the Master Station. Available data includes operating history, status, diagnostics and

alarm logs. Using the Plus network, the actuator datalogger can be extracted as a scheduled background task, with no detrimental effects on the speed of process data transmission around the network, and viewed using Insight2 software, enabling valve torque profiles to be analysed.

Existing Pakscan systems upgradable

Generations of the Pakscan Classic loop network have now been in service for up to 30 years. The P4 Master Station in conjunction with the current Classic network is backward compatible with previous generation wired networks for field and host connectivity and can replace existing Master Stations without further network or device changes. To fully benefit from the P4 advantages, existing Pakscan Classic networks can be upgraded to the Plus network without changing the existing cable.

About the author

Shelley Pike is the 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 Pakscan P4 system.

Figure 3: Master Station screens; Left – Main Home Screen, Right – Field Unit Status Screen.