Instrument aware

Modern instrumentation allows users to adopt beneficial predictive maintenance regimes, but Mark Allinson warns plant engineers of the need to check out the instruments themselves

Mark Allinson is with ABB

Maintenance engineers used to have a lot in common with fire fighters. Now, the job is increasingly about heading off trouble before it starts – and on highly automated plants, this predictive approach is possible, thanks largely to intelligent, digital instrumentation.

Which is good news. Across the process industries and utilities, where product specifications are tight and the pressure to minimise operating costs and maximise uptime is enormous, being able to spot early signs of deteriorating performance or out-of-specification product can make the difference between profit and loss. Similarly with energy: industry has witnessed massive hikes in gas and electricity prices, so being able to spot waste from, for example, leaking steam lines or over-temperature vessels can help.

But measuring and controlling process variables is just one part of the picture. The condition of field instruments, and their ability to provide accurate and repeatable measurements, also has a key bearing on plant performance, product quality and waste. That's why it often makes sense to use systems that not only gather process information, but also monitor the status of field instruments and flag any need for maintenance.

And that is where digital fieldbus plant network technologies come in. Single cable systems that replace conventional multi-core 4–20mA control loops, fieldbuses not only provide simplified, lower cost communication between field devices and the control system, but also enable diagnostics, as well as asset optimisation. And that applies to a wide range of instrumentation – from transmitters for flow, pressure, temperature and level, to online analysers, switchgear, PLCs (programmable logic controllers), remote I/O stations, drives, motors and HMIs.

Digital power

The point: with an old analogue 4–20mA wire installation, instrument failure might, at best, manifest itself as a 'limit violation' alarm somewhere – which could either mean a process excursion or an instrument failure. But, in a digital fieldbus setup, instrument status signals would immediately tell operators whether that alarm was due to the process or a malfunctioning device – and indicate the cause, location and required maintenance.

Again good news, but however smart your instruments, any maintenance – and for that matter, control – regime is useless, unless readings from the field instruments are reliable. And that's always down to choosing the right devices, installing them correctly and treating them with respect.

Consider calibration: many pressure transmitter vendors quote five years for recalibration, but that is based on a specific set of conditions. In many cases, users only find the right calibration frequency by calculating it themselves, taking into account the application performance and operating conditions.

Where applications have a direct bearing on plant safety or efficiency, accuracies of 0.5% of span or better might be required. On the other hand, if all that is needed is indication that a water level in a tank is centred, around 10% of span may be adequate. Similarly, in terms of operating conditions, parameters such as static pressure, ambient temperature and product density all contribute error figures to our pressure transmitter reading.

Best advice is to calculate the total probable error (TPE) from the quoted accuracy, and the likely effects of static pressure and temperature errors on performance. You also need stability per month data, normally provided by the vendor. Your calibration frequency for a given accuracy is then given by the required performance minus TPE, divided by the stability per month. PE

Pointers

- Install instrumentation for easy access, so that it can be cleaned, calibrated and repaired or replaced
- High temperatures and humidity may shorten instrument life
- Conduct regular plant performance surveys
- Conventional leak testing leaves 10% of problems undetected
- Consider thermal mass meters for compressed air consumption
- Examine air efficiency of pneumatic devices: some valve positioners use large amounts of compressed air