Tony Scott on behalf of the British Valve and Actuator Association

Intelligent valve actuators assist compliance

The stringent regulation of the water and waste treatment industry demands more efficiency and improvements in process performance. A key area is the elimination of unexpected breakdowns and interruptions to processes which can have quality, environmental and financial consequences.

Valves are the vital components in any plant that relies on well managed flow control. The condition of the valves is therefore a good indicator of the performance of the overall process. Keeping track of the condition of valves in key areas of the plant can therefore make an important contribution to maintaining efficiency and optimising long-term performance.

There are many factors that must be assessed in order to ensure that actuated valve installations and systems are as efficient and future-proof as possible. Firstly, the design of the equipment itself must be capable of performing in challenging environmental and operating conditions, often experiencing long periods of inactivity or conversely frequent operation, extreme temperatures, vibration, submersion and other influences which may affect its ability to operate with total reliability. Actuator design features such as double-sealing and non-intrusive enclosures offer reassurance in these areas, but the quality of the valve is equally important. If requiring repair or replacement, the valve is far more disruptive than the actuator, so compromising on an initial investment is usually a false economy in the long term.

Valve actuators make an important contribution to the efficiency of modern water and sewage treatment processes by enabling the benefits of remote control and facilitating automation; sites are often unmanned or operated by very small numbers of people. Digital control and monitoring networks such as Profibus are increasingly used to connect the actuators to on-site or, via telemetry or Ethernet, to remote centralised control rooms from where these plants are operated or third-party maintenance support is provided.

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As well as delivering these high levels of automation, modern intelligent valve actuators now offer additional reassurance for the operator with data logging technologies that enable actuator and valve performance to be continuously monitored at the valve and in the control room. Compilation and analysis of this data over time builds a real-time picture of the condition of the equipment, facilitating preventative maintenance and efficient asset management amongst other benefits. Built-in alarm parameters provide further peace of mind by immediately identifying any unexpected problems.

Torque demand

There are many different styles of valve and they each have their own unique torque demand curve. Capturing the torque demand curve from a newly installed and calibrated valve actuator assembly provides a reference point against which future curves can be measured. As a valve ages, the force required to open and close it can change because of internal and external factors. For example a threaded penstock rising stem which has not been lubricated will increase torque demand uniformly across the stroke. The identification of issues such as these can be used to keep the plant running with preventative maintenance.

Service log

Looking in more detail at the data that the actuator can provide for preventative maintenance purposes, a valve and actuator usage log should incorporate a record of total turns, average torque, total operations, total motor run time and maximum starts per

hour, supported with data for time-stamped alarms and user selectable limits for hi torque, hi-hi torque and number of torque trips. A full event/error log should record time-stamped commands and basic alarms, with all alarms independently recorded in an error log. Data stored in the actuator includes valve seating profiles along with the latest and average torque profiles. This can be supported by time-selectable trend log profiles, together with logged data on temperature, starts per hour and average positions. In this context the Namur107 standard helps the operator by enabling the selection of the most important alarms from a predefined list. For each alarm, one of four categories of importance can be selected, ranging from Failure to Out of Specification, and from Function Check to Maintenance.

For positive identification, a full description of the actuator (virtual nameplate, hardware, installed software and installed options) should also be stored and complemented by information about the valve, encompassing the type, size, manufacturer, installation date, serial number, tag number, service temperature and location. 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.

Know your assets

The ability to objectively analyse data from the plant, and pinpoint the areas that are important for an individual site's specific requirements, is essential for effective asset management.

At one end of the asset management spectrum, the equipment can be run without maintenance until it breaks down, when it is replaced. At the other end, preventative maintenance can be used to keep the equipment in peak condition and eliminate unexpected interruptions. Both options, and anything in-between, are viable as a strategy, but modern maintenance techniques indicate that the costs of maintenance in an operate-to-fail condition are greater than 20 times that of a condition monitoring approach when plant downtime is considered. Further savings can be achieved by adopting the right maintenance approach relative to the criticality to the process of the actuator being monitored.

Using the data available from intelligent valve actuators for managed technical support increases plant availability and helps to avoid costly unpredicted downtime. Ongoing technical support further contributes to increases in availability and reliability, leading to improvements in operational performance, whilst less time spent on maintenance enables employees to spend more time on productive activity.

Investment in an asset management strategy governing the maintenance and operability of actuated valves increases the productive life of equipment, thereby retaining its value as an asset rather than a liability.

As equipment lifecycles are optimised, the overall costs of maintenance should reduce as reliability increases, whilst the improvements in reliability ensure compliance with the challenges of increased environmental and operating regulations.

About the author

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