

Advanced Data Processing Capabilities Make Actuators Smart



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Smart actuators improve uptime and reduce costs

Electric actuators have been used to control valves in demanding applications such as oil and gas, commercial power, and fresh water and wastewater processing since the 1980s. However, actuator and valve failures can compromise plant performance and employee safety. This can result in significant consequences for plant operators, including lost production and reduced profitability from downtime. This also can have an impact on the relationship and credibility of operators with their customers. In the water industry, equipment failure can cause contamination and create health risks for the general public, resulting in heavy fines and negative publicity for the operator. Thus, engineers designing plants and plant operators need actuators that can perform reliably and provide historical valve and actuator data for identifying maintenance requirements.

To meet ever-increasing requirements for efficiency and cost reduction, operators also look for highly reliable actuators that not only control the flow of fluids and gases but help them avoid expensive, unplanned downtime. According to Baker Hughes, a mere 3.65 days of unplanned downtime a year can cost oil and gas companies approximately \$5.037 million.

To avoid that unplanned downtime and loss in revenue, operators need actuators with a variety of sensors, data collection and analytics capabilities — equipment enhanced with the intelligence to identify and report valve performance that's outside of specified ranges. In addition, they want actuator hardware and software that alert technicians to mechanical issues before the valve or actuator breaks down and disrupts operations.

Data enables plant operators to determine if they're going to face equipment problems. That helps them to take corrective actions beforehand, so they don't face plant downtime and incur production losses and repair costs. Smart actuators and diagnostic systems enable operators to understand process applications better and determine what's running correctly (and what's not) with specific equipment.

The goal is to help business leaders make smarter long-term decisions for the benefit of their plants. Smart actuators provide them with more data in order to analyze operational trends and understand equipment performance over longer periods of time.

In this white paper, you will learn more about how advanced actuators can:

- **Improve** the reliability of equipment and processes
- **Simplify** maintenance
- **Ensure** accurate commissioning, setup and operation
- **Expand** data collection and analyses of equipment condition and performance



Previous generations of electric actuators were basically a motor to move a valve. Now, as the technology is growing, actuators are more than just the motor. They are critical for asset management. They're becoming an integral part of the total system that provides feedback to alert operators about what's exactly going on with the valve in the process.

Improve reliability of equipment and processes

Both the reliability of valves and the integrity of the data collected by smart actuators depend on better survivability built into the actuator. Long communication and power cables in refineries, treatment plants and mid-stream terminals act as antennas, picking up noise from neighboring equipment or the natural environment. Microcontrollers and other core circuitry can be very vulnerable in these extreme environments.

So when specifying and purchasing smart actuators, consider equipment engineered to protect their microcontroller and internal electronics. Outside electrical interference, vibration and extreme temperatures found in harsh conditions all can threaten reliability and integrity. Choose a rugged design that incorporates high-quality materials which:

- **Support** accurate data collection and retrieval
- **Extend** actuator service life
- **Expand** thermal operating ranges

Simplify maintenance

When developing the business case for investment in advanced actuators, consider the total cost of ownership, including expected maintenance expense. Plant operators and maintenance technicians can remove guesswork and save time because the actuators simplify maintenance by tracking usage and providing real-time and historical feedback of the collected data. This makes it possible to schedule maintenance for valves and the actuators themselves when it's truly needed — instead of by guesses or time interval-led procedures.

For example, a smart actuator should be able to measure torque, speed, voltage, temperature and vibration and track the data over time to help operators determine whether there's any changes through each stroke of the valve. Comparing the new data against the initial data collected during commissioning can indicate potential valve issues such as worn seats or seals, debris in the pipeline, and cavitation at the valve. Maintenance technicians can respond by physically checking the valve to determine whether lubrication is needed or components should be repaired or replaced before they fail.

The design of smart actuators also can speed up maintenance. Look for easy-to-use, sturdy and durable brackets and hold-downs for circuit boards and components. This also ensures robust connectivity throughout the rated seismic and vibration envelope.



Actuator capabilities can enable maintenance to be scheduled based on the actual condition of equipment, so plant owners are not arbitrarily sending out labor to check things when they don't need to. They're not going to have to routinely send out a service technician four times a year. Smart actuators are evolving to let service techs know when an actuator or valve needs attention.

Ensure accurate commissioning, setup and operation

In order for actuators, sensors, and data collection and analysis capabilities to perform reliably, plant operators will need equipment that can be easily and accurately installed and commissioned by their in-house technicians. Otherwise, operators will become dependent upon the assistance and availability of experts from the equipment manufacturer or supplier.

Consider actuators equipped with a simplified menu that enables maintenance technicians to set up the equipment quickly through an interface that guides users through an error-free process without the need of handheld tools and manuals. This ensures that all of the data captured by the smart actuator is correct and meets the application requirements.

Plant operators report faster and error-free commissioning and setup times with actuators that utilize an easy-to-follow, intuitive menu structure. Users of any skill level can configure the actuator through a variety of pre-set or customization options. Look for actuators that offer a large LCD display with a built-in ambient light and temperature sensor that enables consistent viewing in all environmental conditions. The larger size and high resolution of these displays should allow viewing distances up to 9 m (30 ft).

Expand data collection and analyses of equipment condition and performance

Over the past 35 years, the semiconductor industry has attempted to follow Moore's Law with the goal of doubling the density of chips every two years. The explosion in memory availability and increased processing power at lower costs are evidence of their efforts.

Enhancing the user experience are real-time torque graphs and alarm and event logs. Other data can be accessed in higher-quality resolution from LCD displays built into advanced actuators.



Smart actuators that take advantage of these advancements by incorporating next-generation diagnostics and analytics capabilities help operators monitor and track equipment performance and quickly respond to detected instances outside specified ranges. Look for large memory capacity to enable more data capture and storage for higher degrees of process monitoring, data logging and information feedback to plant operators and business decision-makers.

When evaluating which actuators to purchase, be sure to consider whether the models feature:

- **A real-time clock** that enables data logs to be time-stamped in order to support asset management functions and lifecycle analysis
- **A microcontroller** to track sensors and provide wired control networks with access to data; e.g., valve position vs. torque
- **Digital relays and switches** that can be monitored remotely to alert operators to equipment conditions
- **Easy retrieval of data** for display and analysis on tablets and other mobile devices as well as on office computers by operations and business teams



Flowserve can help

Flowserve manufactures the Limitorque® MX Series B (MXb) smart electric actuator, which offers superior reliability, enhanced analytics and an improved user experience. It facilitates quick and easy commissioning and increases process monitoring, helping to minimize unforeseen downtime, maintenance spend and consequential production losses. Please contact your local Flowserve sales representative to learn how we can help make the selection process easier. Contact details can be found on [Flowserve.com](https://www.flowserve.com).

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Andrew Trill earned a bachelor's degree in electrical engineering from the Pennsylvania State University and an MBA from the University of Lynchburg. At Flowserve, he previously worked as an applications engineer managing the firmware and hardware for the MX and QX lines of non-intrusive, multi-turn actuators.

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