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Understanding Duty Cycles in Electric Actuators

When selecting an electric actuator for a quarter-turn valve, duty cycle is just as important as torque and speed. Duty cycle refers to how often an actuator can operate without overheating. Matching the actuator's duty rating to the application helps ensure reliable performance and long service life.



Actuator duty cycle is commonly expressed as a percentage. A **25% duty-cycle actuator** can operate for only a portion of a given period before requiring time to cool. For example, if the actuator runs for one minute, it may need approximately

three minutes of rest before operating again. These actuators are typically used in applications with infrequent valve movement. In contrast, a **100% duty-cycle actuator** is designed for continuous operation and can run without requiring cooling periods, making it suitable for applications involving frequent cycling or constant positioning adjustments.

The two most common valve automation applications are **on-off service** and **modulating service**, and each places very different demands on the actuator.

In **on-off service**, the valve acts as an isolation device, moving from fully open to fully closed and then remaining in position until another command is received. Common applications include pump isolation, HVAC systems, water distribution, and emergency shutoff valves. Because these valves may only cycle a few times per day, the actuator has plenty of time to cool between operations. As a result,

actuators with lower duty-cycle ratings, such as 25%, are often suitable and provide a cost-effective solution.

In **modulating service**, the valve continuously adjusts position to control flow, pressure, temperature, or level. Rather than simply opening or closing, the actuator may make frequent small movements throughout the day to maintain a



desired process condition. This creates a much higher number of motor starts and stops, generating additional heat and increasing wear on mechanical and electrical components.

Because of these demands, modulating-duty actuators are designed with higher-duty motors, enhanced thermal protection, and more robust gearing. Many are rated for **100% duty cycle** and can withstand the frequent operation required for process control. Using a standard on-off actuator in a modulating application can lead to overheating, premature failure, and increased maintenance costs.

When specifying an electric actuator, engineers should evaluate both torque requirements and operating frequency. Selecting an actuator with the proper duty cycle ensures dependable operation, longer equipment life, and lower overall ownership costs.

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