

# Valve actuators: Technologies and trends

Traditionally, valve actuation has been less well publicized and potentially construed as less important in the world of flow control than valves. But that is changing, and at an accelerating rate. This article will explore market drivers, significant developments and emerging trends that are behind this refining focus on valve automation.

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## About the Author



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Research is a market research and consultancy firm, providing global clients with world-class market intelligence on industrial valves, pumps and flowmeters, in the form of market reports, databases and custom research. Collectively, Resolute Research possesses decades of experience in providing consulting services to professionals working in the industrial process industries. For more information, you can contact Matjaž at [m.matossec@resoluterresearch.com](mailto:m.matossec@resoluterresearch.com) or visit [www.resoluterresearch.com](http://www.resoluterresearch.com).



Man working on actuator

At the highest level, market drivers for valve actuators are summarized in what preoccupies every customer's mind: "added value". Added value can be described as improved functionality and performance at the same or lower cost. This has been of particular importance in the oil & gas industry since the crash in 2015, but also of more importance in general.

Added value has many facets, including improvements in actuator efficiency, size/footprint, speed, accuracy, output torque or linear force, and IIoT compatibility, to name a few. These are all market drivers, as further explored below.

Actuators can be broadly segmented by type, including pneumatic, hydraulic and electric, plus some hybrids such as electro-hydraulic, among others. They can be further segmented by output such as linear, or rotary quarter-turn, full-turn, or multi-turn, and by mechanism such as scotch yoke, rack-and-pinion, piston, diaphragm, and rotary vane.

The scotch yoke, rack-and-pinion, and rotary vane actuators are usually paired with  $1/4$ -turn valves such as ball, butterfly or plug valves. By contrast, the piston and diaphragm types are commonly paired with gate, globe and pinch valves, although different pairings are possible. Developments among this large family of actuators are driven by specific market demands, some of which are discussed below.

## Offshore and subsea markets

Space (and weight) is at a premium in offshore applications on platforms and Floating Production,

Storage and Offloading vessels (FPSOs) in the oil & gas industry. Consequently, there has been a growing demand for compact high-torque, explosion-proof or intrinsically safe electric valve operators not requiring the compressor, air filtration, air drying, air storage, and piping equipment associated with pneumatic systems that are still the mainstay of onshore industrial plants.

Similarly, subsea valve actuation is increasingly being provided by smaller-footprint electric actuators that require less costly and less bulky electric-cable umbilicals, as compared to the bulkier umbilicals required for pneumatic or hydraulic fluid actuators. In addition, electric actuators often provide a superior alternative to Remotely Operated Vehicle (ROV) operation of subsea valves. In some cases, the greater depths of subsea applications virtually preclude the use of conventional valve actuation. Therefore, offshore and subsea markets, with the attendant special performance requirements for valve actuators, provide a growing market opportunity for electric actuators.

## Pipeline markets

Pipelines include numerous valves for pipeline segmentation and shutoff for operational and safety reasons. These sectionalizing valves are typically installed at intervals of every 10–20 miles of pipeline, and at shorter intervals when pipelines are crossing streams, rivers or roadways. Many valves have traditionally been compatible with pneumatic actuators. In the pipeline market, this led to the development of special pneumatic actuators, operating with filtered and dry natural gas taken

## MARKET OUTLOOK

directly from the pipeline, rather than separate air systems. Today, with the increased awareness of environmental damage from natural gas emissions, a preferred alternative is gas-free electro-hydraulic operators or electric operators for pipeline valves. The electro-hydraulic operators are especially suitable for the high-torque requirements of very large pipeline valves that may be 40" or larger. Another pipeline application (both onshore and offshore) that has driven innovation in actuator designs is the High Integrity Pressure Protection System (HIPPS), combined with Safety Instrumented Systems (SIS), to protect pipelines and equipment against damage from over-pressure conditions. Without HIPPS, system piping and equipment must be protected by using multiple pressure safety relief valves, and possibly higher-rated piping and equipment that adds to cost, weight and size. HIPPS systems, by contrast, use high-speed isolation valves to protect equipment from over-pressure events. As such, HIPPS provides important market drivers for valves, actuators and safety instrumentation, including high-reliability pressure sensors and logic boards, high-speed isolation valves (mostly quarter-turn), and high-speed actuators, typically hydraulic or electric.

### Water-related markets

Water & wastewater treatment plants and desalination plants are growing in number along with the world's increasing demand for clean water, increased urbanization and population growth in developing countries. There is an increasing demand for valve automation at all levels within these plants to reduce operating costs and plant overhead. Due to the number of different valve types and sizes in these plants (gate valves, globe valves, ball valves, plug valves, large and small), it is not uncommon to see electric, pneumatic and hydraulic actuators all in the same plant. Electric actuators have been growing in the application due to ready availability of electric power that has always been present to operate pumps and aeration blowers, as well as the generally non-hazardous environment which does



Subsea

not require the use of the more expensive explosion-proof versions of electric actuators.

### Power and general industrial markets and IIoT

In most markets, including power and general industrial markets, there has been an ongoing trend for increased valve automation. This has been driven by the need for increased system efficiency, environmental protection and safety for the public and plant personnel. This trend has been focused on automation of many valves that previously had been manually operated, including on/off valves that serve isolation or bypass functions. Since the majority of valves (by number) are non-modulated block, isolation and bypass valves, the impact on actuator sales has been significant. Additionally, IIoT is driving increased valve automation, smart-valve technology, predictive and preventive maintenance (valves, actuators and positioners), and procurement practices reflecting consideration of both initial cost and Total Cost of Ownership (TCO).

### Summary of valve actuation technologies and trends

Valve actuator sales have been, and will continue to be, on an upward trendline that outperforms growth in the basic valve market. This trend reflects the following major areas of activity:

- Upgrades to existing control valve actuators in pipeline and plant operations to reflect the latest in actuator capabilities, including compatibility with encrypted wireless networks, non-intrusive commissioning, data logging, event history, torque profiling to monitor valve wear and facilitate preventive maintenance, and centralized supervisory control, among others.
- Retrofits for previously manually operated isolation and bypass valves with automated controls to improve plant efficiency, safety and operational capabilities. Worldwide this is an ongoing process in tank farm, pipeline, refinery and general industrial applications.
- Replacement of natural-gas pneumatic actuators on pipeline valves with more environmentally friendly electric or hydraulic actuators.
- Increased application of electric actuators across many industries, but especially in oil & gas tank farm, pipeline and refining operations, and offshore and subsea applications. Explosion-proof and intrinsically safe models, plus availability of fireproof coatings for actuators, have driven applications in hazardous environments common to these oil & gas applications.
- Increased promotion of value-adding actuator features including reduced actuator footprint, increased torque or linear force per unit weight, reduced operating costs, and compatibility with smart-valve and IIoT capabilities.
- Increased application of HIPPS and SIS along with the attendant valves, actuators and sensors as an environmentally preferred alternative equipment for over-pressure protection.

These and many other trends are tracked and forecasted by region, country, industry, actuator type and year in the newly released Valve Actuator Database from Resolute Research.

