MOV actuation: How much control do you need?

Matching your investment costs with available technologies

Control is a broad topic for process management, not only concerning the control valves of an installation. Indeed, there are also many On-Off valves on a plant. Control is directly linked to the general level of performance of all types of valves, including On-Off valves, and to the availability and performance of the whole process controlled from the DCS. Therefore, the ability to maintain and diagnose equipment as soon as possible is also a critical control issue for any user.

Control is thus the cornerstone of any site management process. Choosing the level of control for your site should be analyzed with regards to available technologies – electric actuator, integrated control, fieldbus configuration (…) – and taking into consideration investment & costs priorities.

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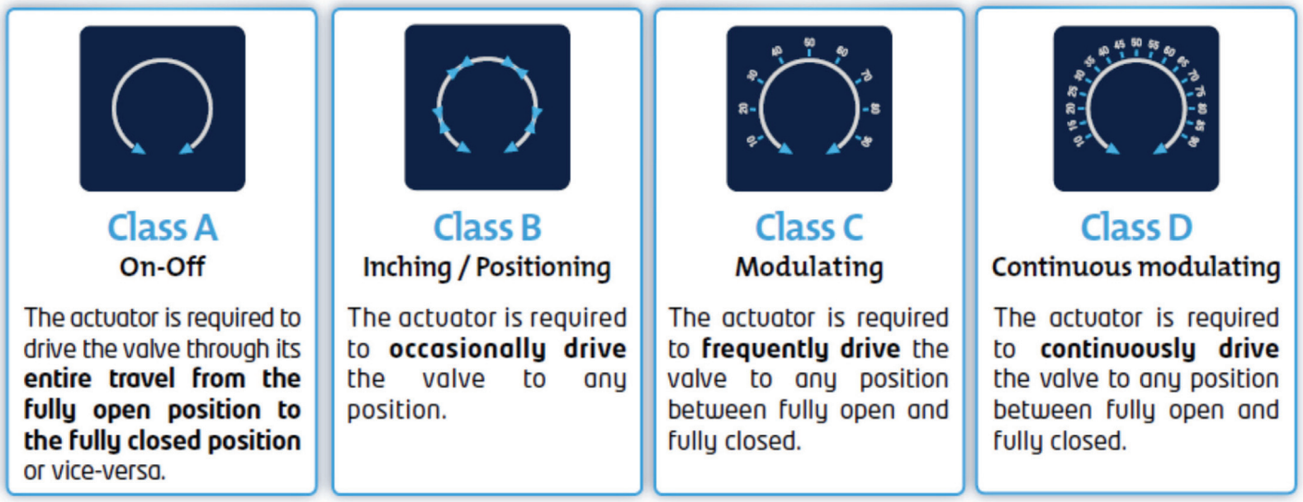
Control your process by selecting the appropriate actuator duty

MOV actuation involves the selection of both a type of valve and the appropriate electric actuator, so that the combination of the two devices specially fits the application. As the "pilot" of the valve, the electric actuator is definitely a key flow control device.

Dealing with electric actuators for industrial valves, the **EN15714-2 Standard** defines a duty classification for an electric actuator to operate the valve. Four classes with basic design requirements per movement (part-turn, multi-turn and linear) are presented[1]: Actuator duty depends on the type of valve to operate. For example, gate, ball or butterfly valves are frequently used for full travel Class A operation. Plug, globe, choke or triple offset valves are more used for Class B Inching/Positioning. For these types of applications (Class A or B), number of cycles i.e. **lifetime/endurance** of the actuator is a key criterion to consider to select the solution in line with the process requirements. Some users may want to maximize the lifetime of equipment on site, i.e. the lifetime of their installation. In such cases, electric actuator manufacturers such as Bernard Controls offer not only products complying with the Standard basic requirements, but also ranges with increased endurance.

On the other hand, in the case of Modulating (Class C) & Continuous modulating (Class D) applications, the selection of the valve and, especially, of the actuator is decisive. Indeed, these kinds of



The Duty classification defined by EN15714-2 presents 4 classes.

[1] More information in BERNARD CONTROLS' Electric Actuator Guide

processes require in-depth expertise in order to ensure the efficiency and performance of the control loop. Frequent to continuous movement of the MOV implies to be attentive to the ability of the electric actuator to start frequently (EN15714-2 specifies number of starts per hour plus lifetime). The motor service duty must be accurate (S4-intermittent duty). Furthermore, control of the modulating process implies to consider the **performance** of the electric actuator to position precisely the valve. Key performance criteria exist to select the right device, especially **resolution**, which refers to the ability of the actuator to promptly operate the valve by little steps. But also the dead band, response time and linearity of the actuator[2]. Electric actuators for modulating applications may represent higher buying cost but choosing the appropriate technology enables to save money through process efficiency and increased product lifetime.

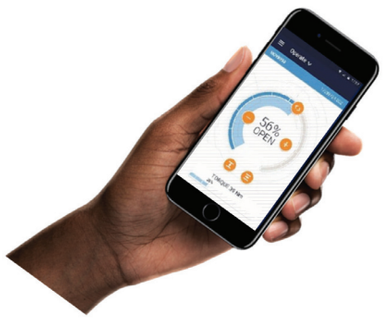
Integrated control and the accurate selection of the level of control inside your MOV

The choice of the control type is an important step for the end user. Several options are available depending on the required control specifications and where the user wants to house the control logic. **Standard DI/DO** (Digital Input/Digital Output)[3] configuration will have the electrical actuator equipped with only micro switches. The customer provides the control logic to handle all the data received from the actuator electric contacts. The reversing starters are housed in the customer's own enclosure. If the customer wants to include the control logic directly in the electric actuator, then integrated control technologies are available. In order to adapt to user's needs and cost constraints, intermediate or advanced integrated control must be considered. An **intermediate integrated control** includes all the logic which allows the user to handle the actuator with nothing but the power supply. Local commands are available. The main sensors (like position and torque) are supplied, and the power switching device like reversing contactor is included. Finally, an **advanced/intelligent integrated control** will offer additional features that can ease preventive maintenance and diagnosis. Each of these possibilities has its pros and cons. It is the type of application that determines the selection. In most cases, the intermediate control is suitable to meet the customer's control need and is the best alternative compared to a simple micro-switches-configuration. Indeed, the cost of implementation is lower with integrated control because most of the study for site design is not carried out by the end user but by the manufacturer. In addition, because power management is included in the device, the user needs less space in the control cabinet. Commissioning is non-intrusive and simplified thanks to local commands (especially when coupled with a user-friendly display), thanks to sensors such as the torque limiter that protects the valve, and to the integrated logic which ensures, for example, that the actuator operates the valve in the right direction. Finally, no matter the type of actuator (with or without torque sensor), the type of local or remote command is the same.
On the other hand, an advanced integrated control can offer extensive information about actuator operation (data logging) or key options such as ESD (emergency shut down), PST (partial stroke test), programmable timer or humidity, temperature and vibration sensors. These options can be of great importance for critical applications, when the user wants to maximize control and security on site. This type of configuration is more expensive from a CAPEX point of view, but can lower OPEX expenses through optimization of maintenance operations thanks to a wealth of information gathered from the MOV.
Once again, the type of application should be decisive in the choice of the end user. Integrated control helps to make the most of the control process. An intermediate control solution often combines the advantages of key control features and competitive pricing. Nowadays, this type of control becomes more and more relevant when coupled with a mobile application that enables the user to do the commissioning, settings and maintenance operations through the Bluetooth communication of a smartphone[4].

Communication between the control room and the site: advantages of fieldbus

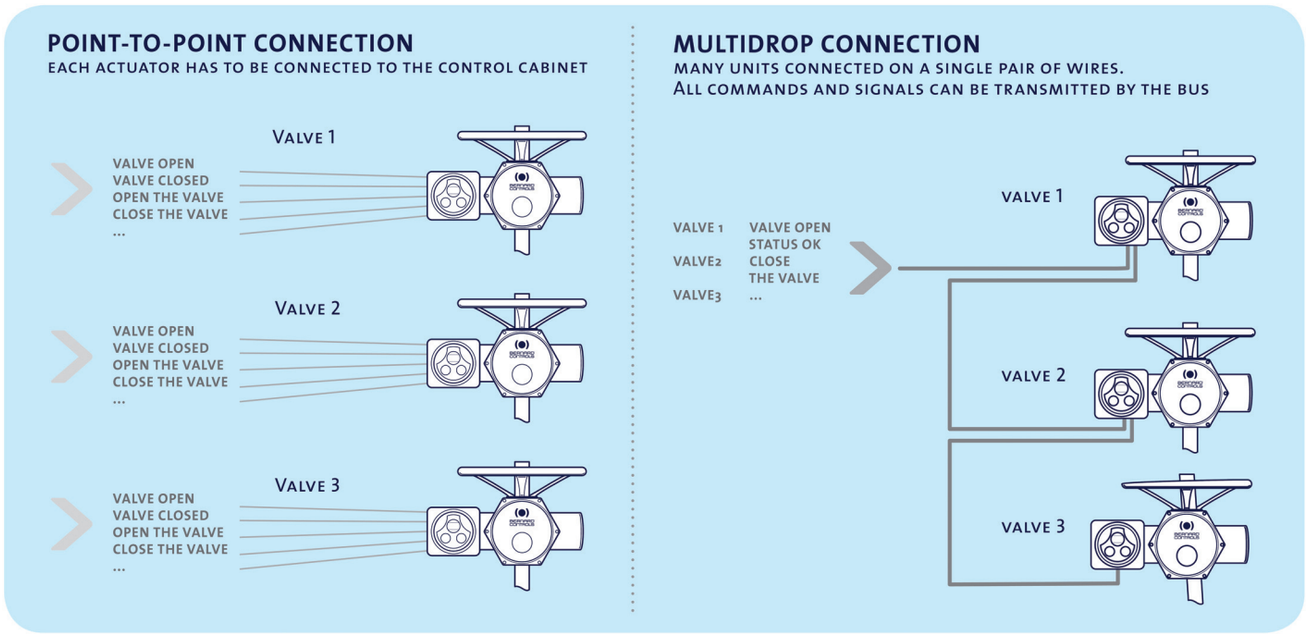
Once the type of control has been chosen, the end user can also consider the possibility to use fieldbus communication. The fieldbus, present on many installations, is used more and more to communicate information and commands with multiple actuators and devices wired in series on a single pair of wires. Indeed, whereas standard connection can only supply with a limited amount of information – one command being linked to one pair of wires – fieldbus enables to get lots of

User-friendly intermediate (LOGIC) or advanced (INTELLI+®) integrated control with local commands and large display by BERNARD CONTROLS



BC APP is the application to operate, set up and maintain your Bernard Controls actuators equipped with the latest generation of integrated controls

[2] More information on BERNARD CONTROLS' Duty & Modulating Classification in BERNARD CONTROLS' Electric Actuator Guide or on https://www.bernardcontrols.com/en/our-solutions/classification-gps-actuator
[3] Analogue Input 4-20mA / Analogue output 4-20mA is also possible for Positioning applications (feedback and command functions)
[4] See for example BC APP: https://www.bernardcontrols.com/en/our-solutions/BC-app



information feedback and to command the many actuators of your installation with just a single pair of wires.
While optimizing the wiring of your site and reducing the cost of installation, more information is available from each actuator, meaning that you clearly enhance your control of the process.
Furthermore, this type of configuration is suitable whatever the duty of your MOV (from On-Off Class A to Continuous Modulating Class D). You can add equipment to an existing network very easily[5], and modify or add operating data without adding cables and/or components to a cabinet (which may already be full by the way). The system also allows to recover maintenance data, sometimes without any programming to implement (FDT, DTM, EDDL, ...).

In case of a fieldbus configuration, the end user can also choose to use a master station solution as a turn-key user-friendly system to ease commissioning as well as maintenance operations.

Many standard open fieldbus protocols are available, such as Modbus, Profibus, Foundation Fieldbus, HART or Devicenet. The advantages of open fieldbus protocols are numerous: you can connect many types of slave/equipment (actuators, sensors, pumps, ...) from different suppliers on the same bus (total interoperability), communication speed is faster, diagnostic and maintenance tools are available on the market and inexpensive, and many suppliers are able to intervene on such type of bus because these are widely known and used in the business. Therefore, reliability is also widely proven.
From a financial point of view, fieldbus configuration represents investment during the site design stage but it is partly counter-balanced by savings made through reduced wiring and commissioning costs. In addition, this type of configuration offers key benefits in terms of performance, to ensure that the down time of a plant is lowered, and the plant runs longer and more efficiently. For critical processes, real time information enables to analyze the process and maximize performance and lifetime. Indeed, fieldbus eases the management of measurements & alarms and provides a remote access to a real periodic checking tool for the valve. Therefore, maintenance engineers could be able to detect a problem even before it occurs!

Conclusion

To conclude, several criteria should be considered when selecting the right equipment for an installation. Many different options exist and enable customers to match investment costs priorities while satisfying their control needs. There, the requirements of the process must guide the analysis. First and foremost, as a key device of the flow control system, the choice of the electric actuator, with the appropriate duty classification, will ensure smooth and efficient operation of the valves during a maximized lifetime. Moreover, the possibility to choose integrated control – intermediate or advanced – coupled with fieldbus configuration will be decided according to the criticality of the process or the level preventive maintenance required. Some critical applications address human and financial challenges of security and productivity. In such cases the risk of failure or the cost of plant downtime are so high that remote control features that help preventive maintenance, quick intervention on site and reduce downtime of the plant will be essential despite a high investment cost. And some customers would value more the gain in security and savings in annual maintenance than the initial investment incurred. In any case, to make the decision, the end user should consider the total cost of ownership for each option, both from a CAPEX/investment and OPEX/annual expenses perspectives in order to fully understand which provides the largest benefits to them.

[5] See later, especially in case of open protocol