

IMPROVING PROCESS EFFICIENCY WITH WIRELESS VALVE AUTOMATION

Wireless technology has created monitoring applications for safety, reliability, maintenance, environmental compliance and increased personnel efficiency that are possible without incurring the traditional cost and time barriers imposed by wires. Globally, plants are replacing manual clipboard rounds, automating periodic inspections and monitoring more assets than ever before because of these new applications. But what is the status of wireless control of valves in particular?

THE CASE TO AUTOMATE

Engineers know there are advantages and consequences to every design decision. To understand the benefits of wireless for control of valves, a fresh look at the two basic types of control is needed: closed loop control and open loop control.

Traditionally, in a distributed control system (DCS) or programmable logic controller (PLC), closed loop control implies wired signal inputs applied to logic or a Proportional-Integral-Derivative (PID) algorithm to drive a signal output to a final control element—most often a valve. Traditional technologies include pneumatic, analog wired or bus wired. If the decision to automate was left to the process engineer, every valve would be automated. However, the cost of wired installations ultimately means that over 60% of valves remain manual—primarily on/off quarter-turn valves.

When financial analysis indicates a project's cost is too high, an engineer's fallback option is to select open loop control, where no automated feedback from the valve is used. This operating tactic is primarily made to get the control signal to the valve, and if something does not happen when it should, a human must

The economics and simplicity of wireless field instruments has allowed many industrial plants to expand the benefits of automation well beyond traditional "wired" control.

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A smart wireless gateway is strategically positioned on a control room roof.



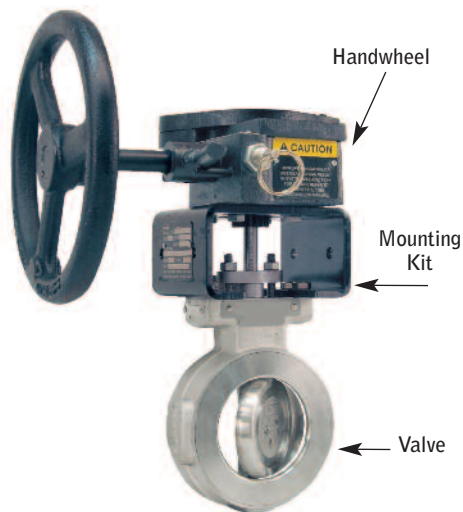


Figure 1. Manual valve

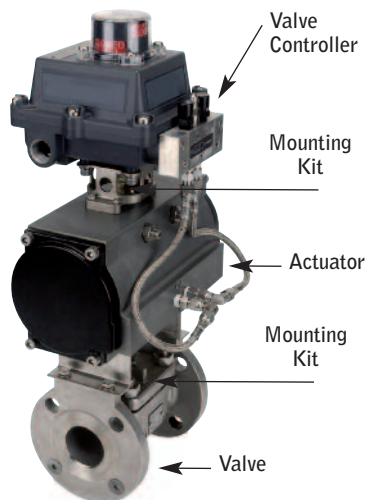


Figure 2. Typical valve automation package

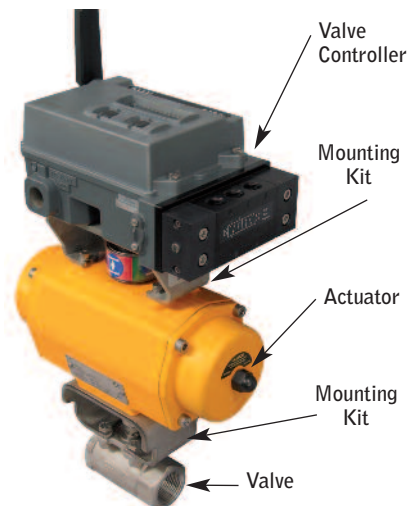


Figure 3. Wireless valve automation package

determine if the desired change took effect. Automation budgets can focus on the throttling control valves and the on/off valves that are either part of a safety shutdown system, that operate very frequently or that are too big to be manually actuated. The rest are left to manual operation.

People are the most important asset of any business, and people are affected by the consequences of open loop control. This is especially true in older plants trying to compete with newer plants or plants built with lower costs for labor and fewer governmental regulations for safety and the environment. When interrupted, distracted people make mistakes, take time to get to valves and become susceptible to plant hazards. Imagine the impact to process efficiency if the benefits of closed loop control could be obtained without the cost of wiring infrastructure. Imagine the advantage of reducing valve alignment time from hours to seconds, preventing human error that results in environmental spills or lost batches with associated cleanup costs, and minimizing worker exposure to ladders and chemicals that impact safety initiatives and productivity. These are possibilities with wireless technologies.

ALTERNATIVE TO SOLENOIDS AND HANDLES

The traditional method for closed loop control with an on/off valve is to use a solenoid and two limit switches. From

an automation perspective, this can be more expensive than a throttling control valve because the process requires one discrete output and two discrete inputs into the DCS.

The input/output (I/O) points, wires, engineering, materials, labor, project management and time costs are considered during the project planning phase; with just a solenoid or manual valve containing a handle, the costs are lower. A solenoid with no feedback leaves a process susceptible to operation with a stuck valve, and a handle creates the opportunity for human error. Wireless control eliminates both of these weaknesses of open loop control for valves in such a way that the loop can be closed on a budget. With a wireless device, the added costs of sending back the valve's position are included with the instrument, making it easier to automate more valves in the project planning phase.

MAINTAINING ESSENTIAL WORK PRACTICES

Emerging wireless controllers for valve automation essentially combine solenoid functionality with limit switch feedback into an integrated package that has all the benefits of digital communication and diagnostics, but is also powered by a battery. The result is that only a pneumatic source is needed to automate that valve. This capability maintains essential work practices while eliminating the barriers that result in just 1-2% of

existing manual valves being automated annually. Here's how:

Design Selection

A wireless controller is an alternative to a solenoid or digital bus-based controllers that still require wires. The wireless controller uses the same pneumatic actuator and valve. The selection criteria for choosing the valve and the actuator remain the same (Figures 1 and 2).

Application Selection

A wireless automated on/off valve is the ideal replacement for a valve currently actuated by a worker. The wireless controller eliminates the potential for human error and allows work practices to be automated into interlocks and safety checks. A wireless controller is an alternative to solenoids for applications that are not part of a critical safety shutdown system. It's also faster than those humans (Figure 3).

Control System Integration

The simplicity of wireless control ensures that a digital set point for open and close can be sent from the DCS or PLC and can receive position feedback from that same field instrument. A wireless controller is connected to a wireless network in an arrangement similar to traditionally wired I/O; however, the set point and position feedback are wireless—another type of I/O that can be integrated into interlocks, timing sequences and logic just like the wired alternatives.

Operation

A wireless automated valve is operated the same way as a solenoid and limit switches. When the right logic conditions exist or action is executed from the control system, the valve moves and reports back the position to the control system for confirmation of the change. If the valve does not move because of mechanical failure, the operator receives an alert that can be diagnosed remotely by looking at the valve position or investigated more closely using remote access to diagnostics of the valve assembly. For typical applications, a battery-powered valve should have the same life as a wired alternative in terms of valve cycle life and years.

Budget Approval

When estimating budgets using wireless automated valves, the material cost of wires, cabling infrastructure, junction boxes, engineering time and cost for connecting to the control system, labor time and cost for electrical installation can be eliminated, and the reduction in time spent managing these resources and schedule should be considered. Removing these barriers to project approval and adding the benefits of reducing consequences of human error and exposure to hazardous environments can ensure project approval.

WIRELESS FOR AUTOMATED CONTROLS

Engineers can deploy wireless automated valves to increase the effectiveness of their controls and decrease costs caused from mistakes and reworks. They can achieve a competitive edge by increasing the production levels of their facilities and reducing delays of waiting on labor to either make a change or

fix the product. The result is better throughput, reliability and quality.

Engineers should look for solutions that are multivendor and can be used globally. They should look at the tools needed to use these solutions. For example, they should determine whether they can use the same handheld configuration device for both wired and wireless instruments. From a wireless perspective, the network should be able to mitigate obstacles in the process environment, provide redundant paths for reliable communications and coexist with other wireless communication sources. If a wireless engineer is needed to perform a site survey and implement the wireless network, alternative wireless technologies should be considered.

THE TAKE AWAY

Wireless has been used for years for monitoring applications to extend the benefits of automation beyond process control. The technology has proven itself, and on/off automation can eliminate traditional cost and engineering barriers. Whether it is for a fill, feed, flush, bypass or other type of valve application, wireless automation can improve process efficiency, reduce costly mistakes, and improve worker safety and productivity. As wireless continues to prove its worth through closing open loops for off valves, look for other wireless closed-loop alternatives in the future. **VM**

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