Q: What are the advantages and disadvantages of traditional, hard-wired, pneumatic valves?
A: Traditional automation systems control each pneumatic solenoid valve via a discrete output module. Each solenoid is either wired individually or via a multicore cable. The advantage of this installation concept is that the installation and wiring process is simple and straightforward. As long as the technician can read a wiring diagram, they can accomplish the installation. Historically, the overall capital cost of this solution was also the lowest, when compared with more sophisticated options. The disadvantage is that the installation is labor-intensive and the solution lacks any real diagnostic capability. Troubleshooting can be straightforward, but time-consuming, often requiring the technician to inspect many individual wires to find a fault. Intermittent faults are especially frustrating.

Q: What are the advantages and disadvantages of these systems?
A: There are two primary advantages, labor savings and diagnostic capability. Electrical installation is as simple as connecting power and communication cables to the manifold. The diagnostic capabilities range from simple indications like undervoltage errors, to advanced features like time-stamped error memories that can capture and store brief intermittent faults that could otherwise frustrate even the most capable technician. Additionally, these products often offer the capability to interface with a wide range of signal types including analog and digital I/O, RTD and thermocouple temperature instruments, high-speed counters, and proportional pressure controls.

The primary disadvantage is the higher initial capital cost. While the ROI calculation for large, complex machines often shows a clear business advantage for embracing this technology, the math remained murky for smaller, simpler applications that required a lower solenoid count or only basic I/O requirements.

Q: What new advancements have taken place?
A: Counterintuitively, macro trends...
in the larger marketplace, including IIoT and the proliferation of Ethernet-based protocols have created a new market space for simple, low-cost variations of the networked pneumatic solutions that the market has already been using for many years. From an evolutionary perspective, it’s natural to assume that simple would come before sophisticated. In the case of networked valve terminals, the relatively high costs of the communication hardware itself drove the initial development of these solutions to include features that would justify this cost. The fact that it is now possible to design and produce the “heart” of these systems at a much lower cost now allows the market to support simple solutions that are available at a much lower cost than was ever possible before.

Q: How do these advancements benefit machine designers?
A: To put it simply, these advancements open a whole new range of applications to the application of intelligent, networked valve manifold I/O. It used to be true that simple applications were best served by hard-wired I/O and sophisticated applications were best served by networked I/O. The new hardware that is now available makes it possible to gain the advantages of labor savings and diagnostic capability even for simple applications. In fact, using technologies such as IO-Link, it is now possible to implement an intelligent solution for an initial capital cost that is actually lower than the traditional solution outlined in the first question.

Q: What is the next logical step in this progression?
A: As with other aspects of industrial automation, several trends are converging to allow for some exciting new possibilities. As more and more devices, including pneumatic systems, are connected to our control systems via intelligent networks, relevant, actionable data about the long-term health and performance of our systems becomes available. As the technologies that are building IIoT or Industry 4.0 are connected with this data, the possibilities for long-term trend analysis and more precise predictive and preventative maintenance come into focus.

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Our expertise in automation, both electric and pneumatic, can solve all your motion challenges.