

Look Below the Surface

Discover how distributed control systems can help municipal authorities manage operations more efficiently and cost effectively

BY DOUG JOHNSON

At the highest level, municipal water and wastewater system operators are tasked with ensuring public health and safety. But they also face daunting challenges as they go about the daily operation and management of sophisticated physical, chemical and biological processes — all in a highly-regulated environment that must operate 24/7. More and more, municipalities are turning toward [distributed control systems](#) rather than PLCs to help address operational challenges.

While PLCs have been applied successfully to municipal water and wastewater treatment systems for quite some time, as operations continue to increase in complexity and regulations become more stringent, municipalities are realizing the full benefits of utilizing DCS technology as the foundation of a longer-term automation master plan.

Although both technologies have evolved over the years, it's interesting to note that PLC systems were initially introduced for discrete manufacturing processes, such as automotive manufacturing — operations which could be shut down, problems fixed as needed, and manufacturing then resumed. On the other hand, DCS systems were developed to control continuous processes that could not easily be interrupted, such as [power generation](#) or [water/wastewater treatment](#).

Given the public bidding practices of many utilities, capital expense is often the primary basis of selecting an automation system. However, this can be misleading. It is important for municipalities to take a broader view that goes beyond the capital expense alone and considers a number of other relevant factors, including total cost of ownership over the expected useful life, overall system capabilities, including security as well as other advanced features and functions, maintenance and upgrades, and long-term service and support.

TOTAL COST OF OWNERSHIP

The initial cost of installing either a DCS- or PLC-based system is generally considered to be equivalent, as long as the systems are being installed in a new facility. However, if older control technologies are being replaced, some DCS suppliers can provide migration tools that can make the upgrade simpler and more cost effective than a wholesale “rip and replace.”

Likewise, the cost and time associated with commissioning each type of system can be quite different. Since a DCS is fully integrated with hardware and software that is developed, tested and maintained by a single supplier, commissioning is relatively straightforward. PLC-based systems are often assembled by a systems integrator with



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hardware from one supplier and software from another, making it difficult to achieve the level of integration and overarching system-level support that is possible with a DCS.

Redundancy tends to be the norm for continuous process operations, making it a core strength of DCS technology. While many PLC-based systems offer a redundancy option, the additional cost — including equipment, configuration and maintenance — can be significant.

Software licensing is another important cost consideration. PLC vendors typically license a limited number of tags, and additional costs are therefore often incurred as the system grows over time with process changes or plant expansions. Reputable DCS suppliers generally do not charge “per tag” licensing fees.

It's important to remember that annual software license costs can vary greatly among suppliers, and annual fees need to be well understood when considering how much a system will cost over time. It's particularly important to understand HMI software licensing costs with PLC-based systems.

SECURITY

Even in the absence of formal regulations, security is certainly top-of-mind for municipal water and wastewater system operators, and is therefore an important factor to consider. Compared with PLC-

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based systems that are often assembled by a systems integrator who might source controller and HMI software from different suppliers, it is inherently less complicated (and therefore less expensive) to build comprehensive [cybersecurity](#) features into an integrated DCS supplied by a single manufacturer. The maintenance aspects of security — ensuring that systems remain effective against changing threats over time — likewise become simpler and more cost effective with a single, integrated DCS platform.

ADVANCED FEATURES AND FUNCTIONS

Some DCS suppliers have extensive experience in their served industries as well as deep process expertise. Their understanding of the needs of these industries often drives them to develop advanced applications that can help end users improve their operations in ways that users who rely on PLCs or third-party systems integrators simply cannot. Many DCS suppliers can provide advanced control capabilities in a number of areas, such as:

- Process optimization
- Energy management
- Pump efficiency monitoring
- Pump allocation
- Chemical feed optimization
- Simulation
- Security
- Asset management
- Integration of remote SCADA operations and treatment plant controls
- Remote visualization
- Backup, off-site control centers for emergency operations
- [Machinery health](#) for protection of large rotating assets such as pumps, motors and centrifuges

MAINTENANCE AND UPGRADES

Installing systems with components sourced from different suppliers can also increase time and expenses related to maintenance. DCS technology is typically easier and more cost-effective to maintain, while also offering integrated diagnostics capabilities, which provide comprehensive, system-wide information that can signal problems before they result in costly equipment or process failures.

Another point of differentiation concerns the system's database. Because PLC systems often require multiple databases, adding points in conjunction with a plant expansion, or changing points to reflect new equipment or processes, requires careful management to ensure there are no conflicts. These concerns are eliminated with a DCS, which uses a single, common database. Upgrades are also typically more straightforward, as DCS suppliers are expected to ensure forward

compatibility of their hardware and software throughout the life of the system. As PLC-based systems are upgraded, the task of ensuring that future releases of one element of the system are compatible with the remainder of the system can become burdensome. Systems integrators may also be unaware of compatibility issues between PLCs and HMI software as those components evolve over time.

LONG-TERM SERVICE AND SUPPORT

Perhaps the most important consideration for selecting an automation system is something that is often overlooked during the procurement process: long-term service and support. A vendor should be an integral part of the end user's team of trusted advisors. While PLC systems integrators can provide a certain level of tech support, they may have to rely on the manufacturer for extensive troubleshooting. Conversely, DCS suppliers typically employ and train a network of qualified engineers offering interactive technical support capabilities that can be drawn upon for the duration of the relationship.

SUMMARY

When choosing between a DCS- or PLC-based automation system, municipal water and wastewater system operators should look beyond the initial capital expense and weigh a variety of factors. But before doing so, it is beneficial to first take a step back and develop an automation master plan. This plan should be based on a strategic vision for the organization's long-term needs and an understanding of how automation technology can address those needs today and well into the future. Increasingly, forward-thinking municipalities are developing an integrated automation master plan that lays the foundation for strategically unifying operations throughout the entire service area in a phased approach, over a period of time — 5, 10 or even 15 years. This enables organizations to expand and take advantage of new technologies as circumstances dictate.

As operational, regulatory, environmental and economic issues facing the water and wastewater industry continue to evolve, one thing remains unchanged: the need for municipalities and regional authorities to do more with less. Deploying DCS technologies can help organizations effectively address these challenges, enabling them to be good stewards of the public assets entrusted to them not only today but well into the future. **WW**

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