Controlling past, present and future

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Since the first PLC was introduced, automation controllers have been a staple in industrial applications, boosting productivity and enabling the digitalisation of manufacturing activities. As the needs of users have evolved, these devices are continuing to keep up with the latest innovations to help companies succeed in their automation strategies.

Eamonn Garry, Operations Director at Optimal Industrial Automation, discusses how controllers have developed as well as their role in modern and future automation systems.

Today's controllers have very different capabilities to their ancestors, and our relationship with them has also transformed. Being at the core of every industrial automation application today, it is only natural for controllers to evolve to address the needs of their users as well as current industry trends, such as Industry 4.0 and the Industrial Internet of Things (IIoT). More specifically, PLCs are now designed to support data-driven applications by offering a number of key functions.

A walk down memory lane

One of the most obvious examples is the extraordinary advances in the processing power of PLCs as the requirement for faster cycle times has become a common denominator of competitive companies. Only 20-30 years ago, systems that

required high-speed control typically used PC-based controllers. Nowadays, PLCs are so powerful that they are able to offer the same level of performance.

As the need to store more data, information and programs for data-oriented applications is skyrocketing, PLC memory has also been growing exponentially. It is now easier than ever to offer gigabytes within a product. This new capability has revolutionised programming activities.

When it was essential to minimise memory requirements, coding practices such as pointers and indirect addressing served as key strategies. While these addressed this main issue, they also made maintenance activities particularly challenging. As more memory became available, programming activities changed to favour ease of maintenance, discouraging indirect addressing and including more comments.

Besides, early PLCs were designed to replace complex relay-logic and timer-based circuitry. The ladder logic programming format was developed to enable technicians to program the system without specialist high level coding expertise. Further programming approaches were then introduced including standardising under IEC 61131 which defines two text-based languages and 3 graphical configuration formats.

Additionally, programmers can now take advantage of libraries containing pre-defined code blocks, which can further simplify interactions, reducing the time and cost associated with automation projects. This opportunity has been a true blessing for pharmaceutical manufacturers, for example, as it can streamline labour- and capital-intensive process validation activities by reducing the necessary qualification requirements.

Maximum control over interconnectivity

The onward progression of PLC technology has proceeded alongside developments in related industrial automation solutions, in particular, robotics, motion control and vision systems. As the technology has evolved, it has become easier and less costly to integrate modern PLCs with these technologies, for example monitoring and controlling processes via SCADA and HMIs.

Although many PLCs still retain legacy communications interfaces, such as RS-232 and RS-422/485, to enable connectivity with older devices, Ethernet has become the standard for most applications.

Moreover, given that data sharing is fundamental for future-oriented, smart manufacturing, modern control systems now use standardised, technology-agnostic communications protocols for more integrated communications between PLCs, HMIs and SCADA. Along the same lines, there is now greater alignment in data management and collection to higher level systems, e.g. via standardised solutions such as OPC UA (Unified Architecture) with more detailed diagnostics to support data gathering and analytics. Many process operators and manufacturing companies now integrate their PLCs through OPC UA to ERP, PAT and MES systems.

Also, the use of authentication certificates is supporting improved cybersecurity in increasingly interconnected setups.

Finally, digitalisation is influencing the way operators interact, learn and troubleshoot their devices. In the past, the only place where it was possible to find answers was via technical documentation. Now, virtual wizard tools, online courses and remote

training from automation vendors and system integrators help users increase the effectiveness of their operations.

As the functions and capabilities of PLCs continue to evolve, specifying the right product is more important than ever. An expert system integrator, such as Optimal, can guide you in this process. An experienced specialist will also help you evaluate the size of the entire system, types of interconnected interfaces, whether you need redundancy, safety or the ability to withstand particular operating conditions. Based on these considerations, a solution that is best suited to address your needs can be defined and implemented.

Image captions:

Image 1: As the needs of users have evolved, controllers are continuing to keep up with the latest innovations to help companies succeed in their automation strategies. (Image Source: iStock: 1365238716)

About Optimal Industrial Automation (OIA)

Optimal Industrial Automation has more than 30 years' experience building, integrating and optimising manufacturing automation systems for challenging and highly regulated industries. Projects are typically for the pharmaceutical, life science, chemical, aerospace, green energy, food & beverage and other high-value process sectors. The company's primary aim is to deliver measurable reductions in production costs, while finding substantial improvements in productivity, product quality and business sustainability. Part of its capability in achieving this aim is experience in the implementation of Optimal's print and inspect system product – synTI®, plus sister company Optimal Industrial Technologies' leading PAT based process management software platform synTQ.

The company employs a large technical team qualified in software, electrical, electronic, vision and control hardware disciplines. The team has built and developed individual machines and process skids to meet regulations such as FDA 21 CFR Part 210/211 – Pharmaceutical Industry GMPs, and FDA 21 CFR Part 11 – Electronic Records and Signatures. It is also ISO accredited and has years of experience working within GAMP guidelines.

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