CONTROL
Insider's Guide
FROM THE EDITORS OF CONTROL

NO-COMPROMISE BATCH AUTOMATION

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Honeywell

SMALL MANUFACTURERS WITH BATCH OR SEQUENCE-ORIENTED PROCESSES CAN FINALLY STOP SETTLING FOR LESS. A NEW GENERATION OF FULLY FEATURED PROCESS AUTOMATION SYSTEMS CAN NOW MEET SMALL MANUFACTURERS' AUTOMATION NEEDS—AND BUDGETS.

A large swath of manufacturers has long been caught betwixt and between two larger groups that are often the first to deploy new plant-floor automation technology. Their mode of manufacturing doesn't even have a real name—they're called "hybrid" environments. This is because the operations in their plants draw technology from both the continuous process industries such as petrochemicals, and from discrete industries such as automotive assembly. Sequential tasks, such as required for pharmaceutical manufacturing, further complicate these hybrid manufacturers' automation challenges.

Today, those hybrid environments have a name: flexible batch and sequence-oriented manufacturers. They may make specialty chemicals, food

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and beverages, pharmaceuticals or consumer packaged goods. And as automation systems have matured, these firms increasingly need solutions to serve their particular business objectives. Systems optimized for their kinds of operations.

Batch manufacturing plants currently use automation solutions derived from both camps—programmable logic controllers (PLCs) from the discrete world and distributed control systems (DCSs) from the process world. For the downstream side of their process, such as packaging and motor drive synchronization, PLCs are a good and cost-effective choice. But they often are ill-suited to handle the upstream, "wet" end of their operations, where batch processes require the same kinds of measurements, control algorithms and process management functions as continuous process plants. But these large-scale systems are typically too complex and are often out of reach, budget-wise.

Today, however, systems can be scaled down to meet even the smallest applications with a single PC and controller. Unnecessary features can be removed or hidden, while still delivering a system optimized for process control. This allows smaller manufacturers to gain access to the power, reliability and agility of a large-scale batch DCS in a package scaled—in size and cost and simplicity—to fit their flexible batch and sequence-oriented process.

THE SMALL-MANUFACTURING BUSINESS DILEMMA

Manufacturing organizations across the global economy share many objectives at the management level, starting with the general realization that change is constant and perhaps an accelerating fact of life. Many different kinds of manufacturers also share common quality management disciplines, and continuous improvement initiatives and performance management strategies.

But there are limits to those similarities. Batch processes, with their pipes, pumps, valves and vessels, closely resemble miniaturized continuous processes with smaller product runs for shorter periods. Start-ups, shut-downs, and product change-overs are more frequent as production orders move through the plant and the same equipment is used for multiple products. In addition, batch processes rely on the operator for some steps, whereas in continuous processes no operator involvement is desired. More complicated product lines, in turn, require management of a set of recipes defining the exact specifications for producing a product.

Turning to the automation required to serve such business goals, systems must enhance engineering, operations and plant productivity in several ways:

- Speed engineering efforts from design through scale-up and start-up of systems for faster product time-to-market.
- Ensure process and product quality, and reduce waste and rework, through tight control of the process.

- Enhance flexibility and agility with faster change-overs and provisions to manage change.
- Reduce downtime with greater system reliability, rapid changes and faster maintenance diagnostics.
- Improve compliance with critical regulations, standards, continuous improvement methodologies and performance management initiatives.
- Deliver a rapid and predictable return on investment throughout the system's life-cycle for a favorable total cost of ownership.

The following discussion will explain how the right system meets these needs.

DCS VS. PLC

The global industry standard used by batch processors and automation providers, ANSI/ISA-88 (and IEC 61512), emerged primarily through cooperation between manufacturers and process automation providers. It serves as a guidebook for manufacturers and automation providers alike, defining every term and detail of the batch environment under three overarching models for organizing equipment, procedures/processes, and activities (both manual and automated).

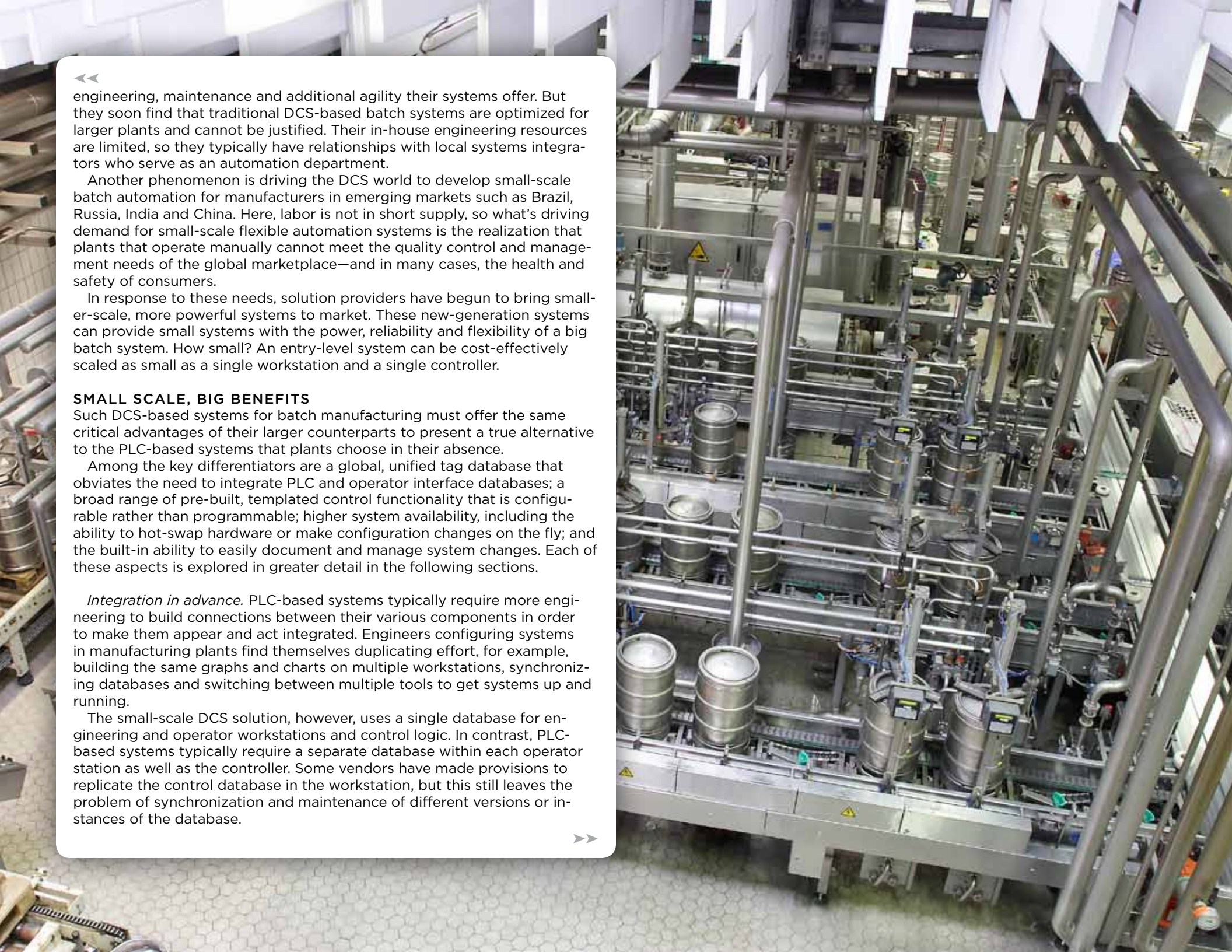
In theory, the standard can be applied on any type of automation platform. In reality, systems optimized to this standard need a lot more than just the standard to meet a company's needs. It's only the beginning, not the end, of a system's claim to fame.

Most vendors with PLC heritage have built batch systems by adding and enhancing their software and controls, which today are referred to not as PLCs but programmable automation controllers (PACs) to reflect the upgrades. But many lack built-in features and functions for reliable batch process control. And from the other side of the PLC-DCS divide, DCS platforms are generally acknowledged to offer more mature, robust and reliable systems for batch processing, in no small part because of their heritage in the more demanding continuous process environment. But DCS solutions for batch/sequential automation have historically been optimized for large plants. They have been too large, too complex, and yes, too expensive for small manufacturers.

GLOBAL TRENDS DRIVE SMALL-BATCH DEMAND

The need for flexible, small-scale batch and sequential manufacturing systems across the global manufacturing economy has led DCS vendors to reexamine their platforms and develop smaller-scale solutions. Their motivation for a growing number of small-scale DCS-based offerings is driven by two very different manufacturing needs.

In developed markets such as North America, Western Europe, Japan and South Korea, smaller manufacturers are looking to compete with much larger competitors, and are calling on DCS vendors for the ease of



engineering, maintenance and additional agility their systems offer. But they soon find that traditional DCS-based batch systems are optimized for larger plants and cannot be justified. Their in-house engineering resources are limited, so they typically have relationships with local systems integrators who serve as an automation department.

Another phenomenon is driving the DCS world to develop small-scale batch automation for manufacturers in emerging markets such as Brazil, Russia, India and China. Here, labor is not in short supply, so what's driving demand for small-scale flexible automation systems is the realization that plants that operate manually cannot meet the quality control and management needs of the global marketplace—and in many cases, the health and safety of consumers.

In response to these needs, solution providers have begun to bring smaller-scale, more powerful systems to market. These new-generation systems can provide small systems with the power, reliability and flexibility of a big batch system. How small? An entry-level system can be cost-effectively scaled as small as a single workstation and a single controller.

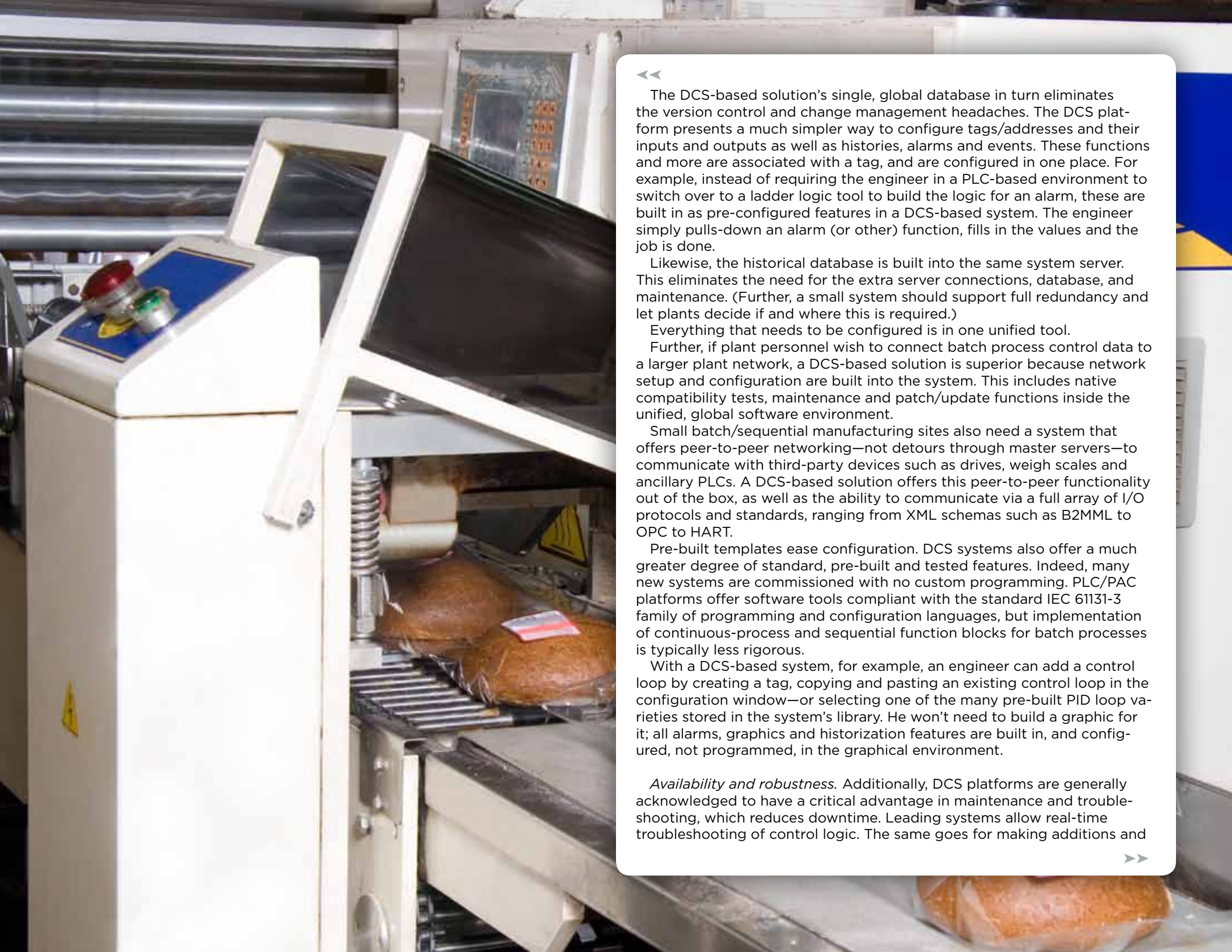
SMALL SCALE, BIG BENEFITS

Such DCS-based systems for batch manufacturing must offer the same critical advantages of their larger counterparts to present a true alternative to the PLC-based systems that plants choose in their absence.

Among the key differentiators are a global, unified tag database that obviates the need to integrate PLC and operator interface databases; a broad range of pre-built, templated control functionality that is configurable rather than programmable; higher system availability, including the ability to hot-swap hardware or make configuration changes on the fly; and the built-in ability to easily document and manage system changes. Each of these aspects is explored in greater detail in the following sections.

Integration in advance. PLC-based systems typically require more engineering to build connections between their various components in order to make them appear and act integrated. Engineers configuring systems in manufacturing plants find themselves duplicating effort, for example, building the same graphs and charts on multiple workstations, synchronizing databases and switching between multiple tools to get systems up and running.

The small-scale DCS solution, however, uses a single database for engineering and operator workstations and control logic. In contrast, PLC-based systems typically require a separate database within each operator station as well as the controller. Some vendors have made provisions to replicate the control database in the workstation, but this still leaves the problem of synchronization and maintenance of different versions or instances of the database.



The DCS-based solution's single, global database in turn eliminates the version control and change management headaches. The DCS platform presents a much simpler way to configure tags/addresses and their inputs and outputs as well as histories, alarms and events. These functions and more are associated with a tag, and are configured in one place. For example, instead of requiring the engineer in a PLC-based environment to switch over to a ladder logic tool to build the logic for an alarm, these are built in as pre-configured features in a DCS-based system. The engineer simply pulls-down an alarm (or other) function, fills in the values and the job is done.

Likewise, the historical database is built into the same system server. This eliminates the need for the extra server connections, database, and maintenance. (Further, a small system should support full redundancy and let plants decide if and where this is required.)

Everything that needs to be configured is in one unified tool.

Further, if plant personnel wish to connect batch process control data to a larger plant network, a DCS-based solution is superior because network setup and configuration are built into the system. This includes native compatibility tests, maintenance and patch/update functions inside the unified, global software environment.

Small batch/sequential manufacturing sites also need a system that offers peer-to-peer networking—not detours through master servers—to communicate with third-party devices such as drives, weigh scales and ancillary PLCs. A DCS-based solution offers this peer-to-peer functionality out of the box, as well as the ability to communicate via a full array of I/O protocols and standards, ranging from XML schemas such as B2MML to OPC to HART.

Pre-built templates ease configuration. DCS systems also offer a much greater degree of standard, pre-built and tested features. Indeed, many new systems are commissioned with no custom programming. PLC/PAC platforms offer software tools compliant with the standard IEC 61131-3 family of programming and configuration languages, but implementation of continuous-process and sequential function blocks for batch processes is typically less rigorous.

With a DCS-based system, for example, an engineer can add a control loop by creating a tag, copying and pasting an existing control loop in the configuration window—or selecting one of the many pre-built PID loop varieties stored in the system's library. He won't need to build a graphic for it; all alarms, graphics and historization features are built in, and configured, not programmed, in the graphical environment.

Availability and robustness. Additionally, DCS platforms are generally acknowledged to have a critical advantage in maintenance and troubleshooting, which reduces downtime. Leading systems allow real-time troubleshooting of control logic. The same goes for making additions and

changes in runtime. In both cases, changes can be made on the fly, while the process is running, without shutting-down controllers.

With a DCS-based system, users can easily change one element of logic, download it to the controller and track a version change for just that single modified element. There's no need to increment the version of the entire batch automation strategy.

Additionally, new recipes—whole new control schemes—can be added to the system by copying and pasting old recipes and changing the elements required for the new product, or a product with a raw material substitution. The new control scheme—control connections, PID loops, new sequences—can be tested, validated and saved so the plant can move back and forth between the two in a rapid change-over mode to accommodate production orders.

Accommodate future growth. Finally, if the business is growing and process expansions are likely, a DCS architecture scales up much more readily. Unlike a typical PLC/PAC-based system, a DCS doesn't "care" how many controllers, third-party PLCs or devices are on the network. It doesn't have to use a higher-level server or workstation to mediate communications, but does so on a peer-to-peer basis.

This shortcoming of PLC-based systems has its roots in discrete factory automation architectures, which were created to control cells that didn't need to communicate. In the DCS world, on the other hand, there has always been a need for the control system to have seamlessly integrated information access.

THE HONEYWELL SOLUTION: EXPERION LS

The key to crossing the chasm from a PLC/PAC architecture to the new, flexible DCS-based approach is one simple concept: The right solution is not one that offers simply the best components—it's the one whose components add up to the most capable, unified whole. The right system, scaled and implemented by knowledgeable professionals, results in a streamlined data flow and a system that's easy to engineer and maintain and provides a favorable return on the system investment through both project and system life-cycles.

A recent in-house study by the developer of one such system concludes that a plant can save up to $20,000 per year in system support alone, compared to a PLC/PAC-based system of comparable scale and scope. A facility in Scotland with both a 1,000 I/O DCS system and a 1,000 I/O PLC system reported that when they need to make a change to the process flow, it's far easier to make it with the DCS. They make changes once per quarter and it takes an average of 2 man-weeks extra to make the changes in the PLC, and at $60 per hour and that comes to about $5,000 per change.

The vendor that did that study is Honeywell Process Solutions, which in 2009 introduced the Experion LS, the company's scaled-down DCS solution for small manufacturers with batch and sequence-oriented processes. Systems can start with a single PC and controller and grow as business and operational needs evolve.

"Many applications in the food and beverage, specialty chemical, pharmaceutical and life science industries would benefit from the functionality of a DCS, but the installed base has been limited due to the perceptions of lack of scalability, great complexity and high costs," says ARC Advisory Group analyst Craig Resnick.

Resnick—credited with coining the term "PAC"—said this upon the unveiling of the new Honeywell system in January, 2009. He added, "Experion LS appears to address these issues by being designed to be a DCS for the masses, one that can be specified, purchased, installed, and maintained in a scalable fashion by organizations that have not utilized DCS systems in the past."

The new system and its wide-open appeal owes to the maturity and heritage of the DCS, because Experion LS retains the architecture of its big, full-scale brother, the Experion Process Knowledge System (PKS). The difference is that it has been optimized for smaller plants, yet retains the full set of process and batch control features in a robust, unified system. Further, Experion LS executes batch sequences at the controller level, making them faster and more robust than with supervisory, server-based batch systems. Engineering changes, too, are far less complex and time-consuming than with a PAC/PLC-based system, which would normally require a shutdown for configuration changes to take effect. The Experion LS platform allows changes to be made on the fly--without disrupting operations.

Other "Big-DCS" features also are standard: These include a robust historian, controller-based batch sequencing, advanced control, change control for validated sites, configuration and operational audit trail, and reporting capabilities. Out-of-the-box software objects reside in a native, single-database environment that reduces implementation time and cost as well as ongoing maintenance.

And when it's time to expand, Experion LS can grow. Or, the plant can migrate to the PKS environment. Experion LS controller, I/O hardware and wiring are already part of the PKS family and do not need to be replaced. When moving to a larger server, all software can be easily exported. When it's time to expand network capability Experion PKS provides the computers, servers and switches.

Plants can work through their local Honeywell Account Manager or local authorized Honeywell Experion Implementers to provide project implementation and ongoing application support. Honeywell provides training, support and ongoing technical assistance to both manufacturing users and their outside engineering and automation partners to promote plant reliability, flexibility and to promote project—and long-term—life-cycle success.

For more information about Experion LS and other Honeywell solutions designed to help batch manufacturers improve their process economics and reduce lifecycle costs, visit www.honeywell.com/ps.

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