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Process and Packaging: Different Worlds or Just Different Data?

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Processing and packaging have long been treated as two different worlds, walled off from each other by the obvious differences in the two functions. However, a growing number of industry professionals contend that, given the demands of today's business and regulatory environment, this wall has outlived its usefulness.

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Process and packaging—the manufacturing operations that combine to bring us the vast majority of the products that we use every day. Typically, though, they operate largely independently of each other. These are vastly different operations, with different mechanical and control characteristics, so their traditional separation only makes sense, right?

Wrong, say a growing number of industry professionals, who note that modern technology makes controls coordination and information sharing between processing and packaging lines feasible, and that the business realities make it desirable. Mark Langridge is one of them. “Today, we see a lack of communication between the process and the packaging sides of the operation," says Langridge, manager for food, beverage and commercial accounts for automation components supplier Sick Inc., Minneapolis. “We are trying to help organizations bridge that gap between process and packaging in terms of sharing information about what's actually occurring on the production line."

A prime focus for Langridge and his team in this regard is information on product dimensions. “With some of our large customers in the confectionary industry, we are looking at whether or not the product is meeting its dimensioning specifications, and feeding that information in real-time to both the processing and the packaging operations."

Langridge uses the example of a chocolate bar to illustrate the advantages of this type of rapid bi-functional communication. “If it is not meeting specification requirements, then packaging will know that there is an issue coming down the line, be aware of it and be prepared to take the necessary actions, while processing will be alerted to quickly make changes in order to bring the product back into specification."

On the other hand, the chocolate bars may be getting too big to wrap. Real-time communication between packaging and processing, Langridge claims, could flag this potentially costly trend more quickly than typical process quality-control systems. The subtext here is waste. “If you look at the amount of waste that comes out of end-user plants just because of, in my opinion, lack of communication between process and packaging, it's huge. For one bakery, the figure was 25 percent wasted product. These are massive figures. And it's not just wasted product, it's also wasted resources, wasted energy and wasted time. The volume," he stresses, "can be tremendous."

In addition to obvious waste, there is also “giveaway." This occurs when a product is made within tolerance, but at the upper end of that tolerance. “Using our chocolate bar example, you're giving the consumer more chocolate than you actually need to, so you are giving away product and losing money. Here's another example of where the lack of communication between process and packaging has a negative impact."

How widespread is concern over this lack of communication? Langridge says that amongst the customers he deals with, baked goods, confectionary, and beverage companies have shown interest in the subject, but for other companies, less so. “It doesn't yet seem to be their kind of issue."

Leo Petrokonis, business development manager—packaging, OEM business, for Milwaukee-based automation vendor Rockwell Automation Inc., concurs that interest in this subject still lags among many end-users who could potentially benefit from this sort of process-packaging interaction. Petrokonis, though, sees the key to this issue—and many others—in terms of integrated control and communication architecture. “We provide the same controllers for processing and packaging along with a uniform programming methodology, so it makes sense to look at ways of capturing and utilizing data from both sides of the plant in order to boost operational efficiency."

Capturing and utilizing that data, though, can still entail time-consuming and costly engineering efforts, notes Keith McPherson, Rockwell's director, market development, visualization & information software. “When you get equipment in from different OEMs (original equipment manufacturers), they're typically not programmed in a standard fashion, and it becomes a data-mapping challenge because it all has to be mapped and configured before you can begin to get meaningful data from the line."

The role of standards

Increasingly, claims McPherson, machine builders are realizing that the best way to bring order and efficiency to the data-mapping process is by following industry standards such as the International Society of Automation's ISA88/PackML, with its uniform definitions and terminology. This provides programmers with a predefined data structure based on industry standards and best practices, along with starter code that has already been written and tested. Machine builders can employ the PackML state model as their base specification and add fill-in-the-blank information provided by the end-user. “It's like using building blocks to write a program, rather than a blank screen, and efficiency grows significantly."

Another benefit of standard programming methodology, he continues, is that it helps simplify the set-up and integration of the end-user's performance-measurement software with the machine control system. With overall equipment effectiveness (OEE) and other performance data already defined in the machine controller using standard data models, configuring all of the individual performance parameter definitions in the analysis software is significantly easier. End-users eliminate the need to add custom code, which reduces complexity and accelerates start-up.

"Standards like PackML allow you, when you are programming and configuring your equipment, to essentially pre-wire some of the parameters you will need to monitor downtime and reason codes, and perform things like OEE calculations." He adds that it also eases the task of communicating with disparate

machines—the essence of process-packaging integration.

Potential benefits abound, including some that may not be obvious at first glance, such as the area of power consumption. “If you knew in real-time that an upstream processing machine was shutting down," says Petrokonis, “then, at precisely the right moment, you could instruct your downstream machines, including packaging, to go into a pause mode, saving electricity." Power usage, he notes, is becoming an increasingly important consideration, one that is likely to loom even larger in the future.

Some major players in the automation arena are approaching the issue of process-packaging communication from a more equipment-focused perspective. Case in point: Schneider Electric, Palatine, Ill., with its Magelis iPC line of industrial personal computers.

“Magelis iPC products provide more than basic operator interface and supervisory control of the individual machine," says Jacob Kimball, HMI product manager at Schneider Electric. “They also handle data management and communication for all parts of the process and present it using clear, intuitive graphics in real time. This data management improves quality assurance, security and traceability by recording when and where the products were, as well as who was operating, accessing and adjusting the machine."

Kimball points to the new Polaris polar coordinate palletizer from Nuspark Engineering Inc., Toronto, Ontario, Canada, as an example of the sorts of capabilities that these industrial computers can bring to a packaging application. The Polaris is a four-axis palletizer that can pick up boxes of varying dimensions and place them anywhere on the pallet.

“The Polaris is quite a complex system in the palletizer field because the (C400) controller has to calculate the position of the robotic arm on the fly at all times," says Michael Elent, Nuspark chief executive officer. The machine also utilizes a pallet pattern and packaging design software that helps users optimize product arrangement and orientation. An operator inputs box dimensions one time and the software creates a robotic code with the most efficient way to pack the pallet. Operators interface with this optimization software from the Magelis industrial PC. Importantly, the inherent versatility of the new Polaris is augmented by the ability of the Magelis to network with downstream and/or higher level systems, thus giving this end-of-line automation system the ability to adjust very quickly to any unscheduled changes upstream.

New regulatory environment

Kimball mentioned the ability of the Magelis to improve traceability. This has been a major concern for food and pharmaceutical companies for many years; now, though, it's huge. There is increasing emphasis on monitoring both the pharmaceutical production process and supply chain, as evidenced by the array of new laws and regulations on the horizon, not only in the United States, but worldwide, in this decidedly global business. In the United States, the comprehensive Food and Drug Administration (FDA) Amendments Act of 2007, along with 2007's Federal Food, Drug, and Cosmetic Act, phase in stiffer documentation and tracking requirements regarding both drug and food safety.

As often happens, California is in the forefront of this issue. Its Pedigree Law, SB1307 (commonly referred to as “e-pedigree") mandates that 50 percent of the drugs sold in the state will be subject to unit, case, and

pallet serialization by Jan. 1, 2015, with the remaining 50 percent subject to these requirements by Jan. 1, 2016. Wholesalers will have to comply by July 1, 2016 and pharmacies by July 1, 2017.

Overseas, France is leading the charge toward even greater traceability with a standard called CIP13 (Club Inter-Pharmaceutique) which mandates a 13-digit EAN code (for European Article Numbering) to identify and track batch, country of origin, product code and serial number. Other European Union countries, as well as the European Federation of Pharmaceutical Industries Associations (EFPIA), are following suit, along with emerging markets such as Brazil, which launched its own stricter track-and-trace initiative on Jan. 15, 2010.

Packaging equipment providers are being pushed to innovate to comply with these requirements. “Compliance issues are not new for consumer packaged goods companies," observes George Allen, a packaging specialist at Roberts PolyPro Inc., Charlotte, N.C., a division of Pro Mach Inc. and a supplier of custom packaging systems. “What is new is the increased level of traceability of pharmaceuticals—down to the individual primary and secondary package, and then linking those to shipping containers and pallet loads. In effect, legislation is creating a system where the lineage—pedigree of a product—will be verifiable from source to destination."

Allen notes that a unique identifier for every pharmaceutical carton can be created with either a 2D bar code or radio frequency identification (RFID) tags, both of which have significant data-storage capacity. “The choice of one identifier over the other for a converter depends on cost and the e-pedigree strategy selected for linking primary and secondary packages, shipping containers and pallets into a traceable chain," he says. But RFID and 2D bar codes are not mutually exclusive. Bar codes can be used cost effectively, for example, on the primary, secondary, and shipping packaging, while an RFID tag is applied to pallets. “As the cost of RFID technology falls, these tags may be a solution for primary and secondary packaging as well. E-pedigree software captures and stores all the relevant production and shipping data," Allen adds.

A key question is how does that software get that information? More specifically, to what extent is the packaging line receiving information from, and interacting with, the processing line, and to what extent is it passively executing orders sent down from the manufacturing execution system (MES) or other high level system?

The latter model is fine, says Joe Ringwood, chief operating officer of Systech International, Cranbury, N.J. To be sure, Ringwood is all for automation and enhanced communication—his firm creates what it calls packaging execution systems (PES) to globally manage packaging-line devices and share the resulting data with business systems. But he just doesn't feel that process-packaging integration is a particularly fruitful area to pursue.

“Integrating packaging line communication via a PES allows the MES to act as the bridge between process and packaging," he says, stressing that an integrated packaging system can react quickly to issues that arise without the need for greater integration with the processing side.

Many people today would agree with him. Rockwell's McPherson isn't necessarily one of them. He notes that the broad thrust of automation is toward faster, easier and more comprehensive communication, and it doesn't always respect traditional functional boundaries. He says that the economic downturn seems to have

pushed many companies into thinking outside the box when it comes to using the data they amass in their control systems in order to improve their asset utilization. Given that these improvements typically involve higher degrees of communication and integration, he observes, “Anything that makes it simpler for products and processes to integrate is going to continue to drive forward."

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